



NORGES BANK

**EDITED BY ØYVIND EITRHEIM, JAN TORE KLOVLAND
AND JAN FREDRIK QVIGSTAD**

HISTORICAL MONETARY AND FINANCIAL STATISTICS FOR NORWAY

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Historical Monetary and Financial Statistics for Norway

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Oslo 2022

Preface

Work on historical monetary and financial statistics in Norges Bank started in the 1990s. We were inspired by Bank of England's work on the collection of data for UK inflation over 300 years, which appeared in connection with its tercentennial in 1994. In 2001, Norges Bank's project was extended with commissioned contributions from a national network of academic experts. The aim was to produce a set of historical data series, which covered as wide range as possible, based on available sources, of the past two centuries since Norges Bank was established in 1816. This project provided the basis for constructing composite long-run historical time series in areas of interest for a central bank with a focus on price stability and financial stability.

The project was documented in two books, which arrived in 2004 and 2007 respectively, and the historical data were used intensively in connection with the *Norges Bank bicentenary project 1816-2016*. The output from the bicentenary project counts five books, published by Cambridge University Press, the Norwegian publisher Fagbokforlaget and Oxford University Press, respectively. In addition, more than 60 research publications can be downloaded from Norges Bank's web-pages. Numerous articles have also appeared in academic journals. This research has also led to a significant expansion and overhaul of Norges Bank's historical database in order to circumvent shortcomings and where we detected weaknesses in the data as we moved along with the bicentenary project. It is this enlargement of the historical database which is documented in detail in this book, which we have called *Historical Monetary and Financial Statistics for Norway* (or in short *HMFS for Norway*). During the project the bank established and developed contacts with the international network of economic historians and we were fortunate to have Professor Michael D. Bordo (Rutgers University) and Professor Marc Flandreau (University of Pennsylvania) as academic consultants during the entire project. This international network of economic historians has been instrumental in bringing together researchers within and outside the central bank community and has stimulated the kind of work of which this HMFS project is a good example.

We have also benefitted from the fact that we are not alone in this endeavour. A BIS network on *Historical Monetary and Financial Statistics (HMFS)* has been organized amongst ten central banks that are engaged in work in this field. The ten central banks who participate in this network are Bank

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of Canada, Bank of England, Banque de France, Banca d'Italia, Bank of Japan, Danmarks Nationalbank, Federal Reserve, Norges Bank, Sveriges Riksbank and Oesterreichische Nationalbank.

We cover in this book more than two centuries with historical data for the main items on Norges Bank's balance sheet, its income accounts and operating profits in this period. We have included a more detailed study of the size and composition of Norges Bank's international reserves. The book also provides an overview over two centuries of data for government revenues, expenditures and debt since 1815. The time series for Cost of Living Indices/Consumer Price Indices (CLI/CPIs) start in 1492. Previous estimates of CLIs have been revised and Norges Bank's historical database has also been supplemented with monthly data series for wholesale price indices and consumer price indices. As a consequence of these revisions to the historical CLIs, previous estimates of historical wage data also needed to be revised. The time series for wages start in 1726.

From the beginning it has been an explicit purpose of Norges Bank's project to enhance data availability and to facilitate the use of historical data for economic research and analysis. All data have therefore been available in a downloadable format at Norges Bank's web-site. The database is updated and managed by the bank's Data Management unit (with some expert assistance). Historical data are frequently used by top and senior management in briefings and speeches, as well as by Norges Bank staff in analytical work and for research purposes. The data are also used by the bank's communication department (again with some expert assistance).

Norges Bank has followed two main principles in its pursuit to collect and systematize data on historical monetary and financial statistics. First, we have followed the data in the sense that we have been searching for hitherto unexplored sources of historical data. In this respect we have been very lucky to find such underutilized data sources. Second, we have benefitted tremendously from the collaboration with competent academic experts who have been helpful in providing the necessary documentation and discussion of methodological issues involved in the construction and maintenance of the Norges Bank HMFS database. We are grateful for continuous support from the Norwegian School of Economics since this work started in the early 2000s.

The Bank of England is still the inspiration. The Economic Statistics Centre of Excellence (ESCoE) has been established, as recommended by Professor Sir Charles Bean in his Independent Review of UK Economics Statistics. ESCoE provides the Office for National Statistics (ONS) with research that addresses all types of challenges in measuring the modern economy. A UK Historical Data Repository has been developed in joint collaboration between the Bank of England, ESCoE and ONS. This is intended to be a repository for historical data for the UK along with relevant statistical publications, but also a hub that links to other data websites and sources.

It is our hope that a similar repository of historical data for Norway can be established in the future. We hope that Norges Bank's project on historical monetary and financial data for Norway will be seen as an important contribution to such a repository.

Oslo, 2022

Øyvind Eitheim, Jan Tore Klovland and Jan Fredrik Qvigstad

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1

Introduction

Øyvind Eitrheim, Jan Tore Klovland and Jan Fredrik Qvigstad

1.1 On central banks use of historical data

”Der Geist” of central banks

The aim of a central bank is to serve the public interest by promoting monetary and financial stability and a safe and efficient payment system. This sentence is an attempt to characterise the core tasks of central banks as they appear today, but the words can also be said to capture perspectives which are quite timeless and which have fostered what we may recognize as ”der Geist” of central banks and central bankers.

Norges Bank’s project on *Historical Monetary and Financial Statistics (HMFS)* focus on the collection and documentation of historical data which describe long-term trends in monetary and financial variables that are central for these core tasks of central banks. Central banks are also interested in a wider set of variables, which help put their core tasks in a more general context. The real economy interacts with the central banks’ core tasks through numerous channels. These channels may evolve over time and are subject to long-term changes in preferences, technology and institutions. Monetary and financial variables are also often in need of a scale variable to portray them in a broader context. It is therefore useful to illustrate developments in prices and quantities related to monetary and financial markets relative to entities such as GDP or GDP per capita. The broad mandate of many central banks today may call for an even wider perspective, which includes key indicators of demography, inequality and climate risks.

Why long time series?

The welfare of a nation is a path dependant process and develops slowly. Many aspects need to be studied over long time periods, for example economic growth, climate, demography, literacy rates, and various form of measurement of institutions. To understand whether the warmer climate that we experience today is just a normal variation or a new trend, we need long time series.

In demography, we often need long time series to study important phenomena. We refer to ”the demographic transition” when there is a shift from a situation with high birth rates combined with high infant mortality to a situation with low birth rates and lower mortality rates, in particular among infants, as societies develop over time. A Norwegian audience will recognize ”Sundt’s law”, which says that small cohorts of births will be followed by a similar downturn in births around 30-35 years later.¹ A recent study by Goodhart and Pradhan (2020) has argued that demographic trends need to be factored into the analysis in order to fully understand the current revival of global inflation.

Price stability is always under threat because ”printing money” may seem like a cheap way of

¹ The Norwegian demographer Eilert Sundt’s essay from 1855, *On Marriage in Norway*, produced Sundt’s widely known theoretical insight, ”Sundt’s Law”, as the Swedish statistician Axel Gustav Sundbärg dubbed it. Sundt describes how he came to discover this law in almost lyrical terms (p. 21). In essence he argued that the sharp increase in marriages in the 1840s (24 per cent up on the 1830s) was, to a great extent, independent of the economic circumstances of the time or of any change in moral conditions (an increased recklessness and improvidence on the part of the poor was often alleged); rather it was a product of a baby boom in the decade after 1815 which led to a massive increase of almost 40 per cent in the 20-30-year-old age group between 1835 and 1845. This baby boom of the post-Napoleonic period was, in its turn, not a product of the circumstances of that time, but of an earlier surge in the birth rate in the 1790s. Sundt traced this wave-like movement back as far as the recorded data permitted - to the 1740s.

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finance. The costs, however, may show up after a long time lag. Government expenses need to be paid for. Taxes are never popular and borrowing can at times be difficult. Through history, there are many examples of financing the government by seigniorage. Sometimes it is the only way for example when a sudden crisis occur, like the threat of war or war itself. Then there is no time collect taxes and the difficult question arises on how to restore price stability after the crisis has passed.

There is a long-standing debate regarding the role that monetary policy should play in preventing asset price bubbles. Brunnermeier and Schnabel (2016) have analysed this question in a historical perspective. They focused on twenty-three bubble episodes. The first one being the "Tulipmania" in the Netherlands 1634-37, and the last one being the Spanish housing bubble in 1997-2012. This implies that severe asset bubbles are infrequent phenomena. Black swans do exist, but are rare. In order to learn about this kind of rare phenomena there is no real alternative than to go to history. It is important that institutions like central banks have a long memory.

We are often met with the phrase "This time is different!" when warning that the proposed policy have led to serious mistakes earlier in history. Is it possible to learn from history? Are there eternal "truths", or "is this time different?" It is very convenient to believe that this time is different and conclude that the historical experience does not apply this time. In some situations this may be correct, but not always.

Economic policy is about solving problems of today, but putting today's challenges in perspective can sometimes be useful. We lived a long time in a low inflation world and may have gotten used to think that an inflation rate of 2 per cent or even lower is "normal". However, 30-40 years ago a double-digit inflation was considered the "normal". We have in the recent past again experienced a rise in inflation after the Covid-19 pandemics.

In the 19th century, deflation and inflation can be said to have been equally "normal", but one might want to distinguish between "good", "bad" and "ugly" versions. In the aftermath of the Napoleonic wars in Europe and after World War I and World War II several countries experienced hyperinflation.

If we look at the Norwegian price history and expand the horizon to more than 500 years, a long-term average around 2 per cent inflation can be considered to be the "normal". This tells us that no perspective stand out as "the right one". It depends on the question being asked!

Policy in democratic states need to be communicated. Long time series are efficient when to do so. We do not have the ambition to collect and repose all the long time series that shed light on the development of the good of the people. We focus on the variables that can throw light on monetary and financial stability.

Introduction

Are long time series meaningful?

Publishing long time series for a specific variable is a difficult task. Helen MacFarlane and Paul Mortimer-Lee wrote in their article:

"Calculating how much prices have risen during the last 300 years is a difficult task. Part of the reason for this is that the bundle of goods and services that was available in 1694 and the bundle consumed now show some important differences. Some elements are, of course, common to both - for example, basic foodstuffs such as eggs, lamb and bread - so their prices can be compared. Potatoes, which had arrived in Britain by 1694 but were not widespread until much later (price data are available only from 1762), can be thought of as a close substitute for such foodstuffs. But it is more difficult to find seventeenth-century analogues of other elements in today's Retail Price Index (RPI). What can we compare with the price today of a second-hand car - a second-hand sedan chair? And although we might be able to discover the relation between the ticket prices for a concert of Purcell's music now and in 1694, we cannot compare the prices of digital compact disc recordings of his music." (MacFarlane and Mortimer-Lee, 1994)

When economists describe the functioning of a barter economy they will typically assume that the double coincidence of wants is satisfied at all times. This reminds us of the Norwegian folk song about "Per the Fiddler (Per Spelmann)", who swapped back his fiddle for a cow. The example obviously refers to a barter economy without money. However, even under admittedly strong assumptions that a fiddle can be considered a fiddle, i.e. as a homogeneous instrument ignoring well known nuances such as brands and quality characteristics, this does not necessarily hold for the other leg of the barter either. "A cow" may not be "a cow" after all, but will be subject to some rather significant transformations over time. For instance, in 1835 the average weight of a cow when slaughtered was 65 kilogram, in 1875 this had increased to 108 kilogram whereas in 2021 it was 302 kilogram.² Her average production of milk changed accordingly, in 1835 a cow yielded 720 kilogram of milk a year, in 1875 this had increased to 1126 kilogram whereas in 2021 it yielded 8191 kilogram.³

However, some products are more homogeneous with well known standards and metrics. Abildgren (2018, p. 38) has shown the price development of butter, coffee and rye bread in Denmark from 1860 to 2015. If we are interested in the development of prices facing households in general, we can construct a price index of "the basket" of the consumption goods and services a household buys. Then we need to know how the content of the basket changes over time. One has to do practical choices how this is done and use judgement. It is then important to document this.

Not all historians have a lot of enthusiasm for such historical long time series. According to Professor Marc Flandreau the "opposition" to such time series comes in two groups.⁴ The first group questions the way the data is produced. Sometimes data is produced in somewhat meaningless ways, and in the end it is not clear what is measured for example when boundaries change a lot or when places where data are measured are not representative. A good criticism of the abuses that are often committed is Boldizzoni's *the Poverty of Clio* (Boldizzoni, 2011). According to Flandreau, intelli-

² Sources: Statistics Norway and <https://www.animalia.no>. Animalia is Norway's leading research and development specialist in meat and egg production.

³ Statistics Norway and livestock control statistics from TINE <https://medlem.tine.no/fag-og-forskning/?filters=husdyrkontrollen>. The TINE Group is owned by a cooperative of Norwegian dairy farmers.

⁴ E-mail to Jan F. Qvigstad 11.08.17

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gent long run data gathering has been essential among even semi quantitatively minded economic historians. Long run price series such as those produced by the *Annales School* in the interwar period played a key role in supporting the notion that there was a global economic cycle in history.⁵ The other group of historians do not disapprove of long time series; they are not particularly interested by this aspect of things. As Flandreau writes: "... and why not, there must be a variety of tastes on earth." The debate is more about how you produce these data and how far you can go in making inferences.

Even if some of these choices may seem arbitrary and the sources of the time series may be scattered, sometimes we see that the macro time series do make sense. Our time series for wages has as a source for example the wage bills to workers constructing the Royal Castle in Oslo 1824-1849, the sailors' wages and so on. The price data is constructed from a completely different source like market data for meat and milk etc. When constructed the data for GDP, a third source was used, the output of the mines, harvest in the agriculture sector, fish caught etc. If we have wage series and price series, we can construct a real wage series which we can compare with the GDP series. Great was the joy among the editors of this book, when we saw that these two series, the GDP and real wage, was of "the same world"!

A happy marriage between central banks and academia

In international academia, there are many researchers working in this field, for example Michael Bordo, Lars Jonung, Barry Eichengreen, Carmen Reinhart, Kenneth Rogoff, Marc Flandreau and many others.

There are also researchers working on establishing databases for long time series. Òscar Jordà, Moritz Schularick and Alan M. Taylor and their *JST Macroeconomic Database* is one example. Another example is the *Maddison Project* initiated in March 2010 by a group of close colleagues of Angus Maddison, with the aim to support an effective way of cooperation between scholars to continue Maddison's pioneering work on measuring economic performance for different regions, time periods and subtopics. It is based in the Groningen Growth and Development centre at the University of Groningen. A third example is the *Federal Reserve Economic Data (FRED)*. It is a database maintained by the Research division of the Federal Reserve Bank of St. Louis that contain 816 000 economic time series from 108 sources (March 2022). The data can be viewed in graphical and text form or downloaded for import to a database or spreadsheet, and viewed on mobile devices. They cover banking, business/fiscal, consumer price indexes, employment and population, exchange rates, gross domestic product, interest rates, monetary aggregates, producer price indexes, reserves and monetary base, U.S. trade and international transactions, and U.S. financial data. The Federal

⁵ The *Annales School* is a subgroup of historians among French historians in the 20th century who focused on long-term social history. It is named after its scholarly journal *Annales d'histoire économique et sociale*, founded in 1929 by Lucien Febvre and Marc Bloch, which broke radically with traditional historiography by insisting on the importance of taking all levels of society into consideration and emphasized the collective nature of mentalities. Its contributors viewed events as less fundamental than the mental frameworks that shaped decisions and practices.

Introduction

Reserve compiles the time series and many are collected from government agencies such as the U.S. Census and the Bureau of Labour Statistics.

Many central banks have over the past years engaged in data projects aiming at the collection and documentation of historical monetary and financial statistics for their respective countries. For these countries, long runs of data for key macroeconomic time series are now available and are increasingly being used in policy-oriented research of interest to various institutions. Information from these historical databases is used to draw historical parallels between current developments and historical events to shed light on today's policy issues in the areas of price stability and financial stability.

Bank of England's *Millennium spreadsheet* can be used as an example (Thomas and Dimsdale, 2017). There the annual, monthly and quarterly sections each contain a 'headline series' sheet containing a set of continuous time series for the main macroeconomic and financial aggregates that involve linking various historical components together using a number of assumptions. Users who just need a long time series and are happy to accept the assumptions underlying the composite time series can consult these sheets first. But there are also more detailed worksheets available, which show how the composite time series have been calculated, often together with alternative historical data series that can be used. Users are then free to make their own assumptions about linking particular series together. For an overview of the most recent version of the historical databases presented by the Bank of England, see Bank of England (2022) and Thomas and Dimsdale (2022).

Similar historical projects are conducted in Sveriges Riksbank and Danmarks Nationalbank. The Swedish project on Historical Monetary and Financial Statistics now count three volumes (Edvinsson, Jacobson and Waldenström, 2010, 2014, 2022), which provide an impressively broad coverage of macroeconomic data for Sweden. A comprehensive historical database for Denmark is documented in Abildgren (2017).

Under the auspices of The Bank for International Settlements (BIS), a network has been established between ten central banks who have already invested in the construction of local national historical databases, using the BIS as a hub in order to get inspiration and learn from each other. The BIS project has two guiding principles, comparability of statistics across countries and time and transparency in how those statistics are produced. A recent BIS Paper (Bignon, Borio, Eitheim, Flandreau, Jobst, Qvigstad and (eds.), 2022) explains the aims and scope of the project and discuss some methodological issues related to the construction of historical data for interest rates, credit and house prices.

The BIS project is an attempt to take stock of what counts as "good practice" and how it should be implemented in different contexts. Arriving at a definition of "good practice" criteria for producing macro historical series in money and finance is far from being a straightforward matter. One important aspect is that of the relationship between the crude data series we can observe in available primary sources, and the economically meaningful data series we want to draw correct inferences from.

Overall, this calls for an approach whereby available "user friendly" historical data should ideally

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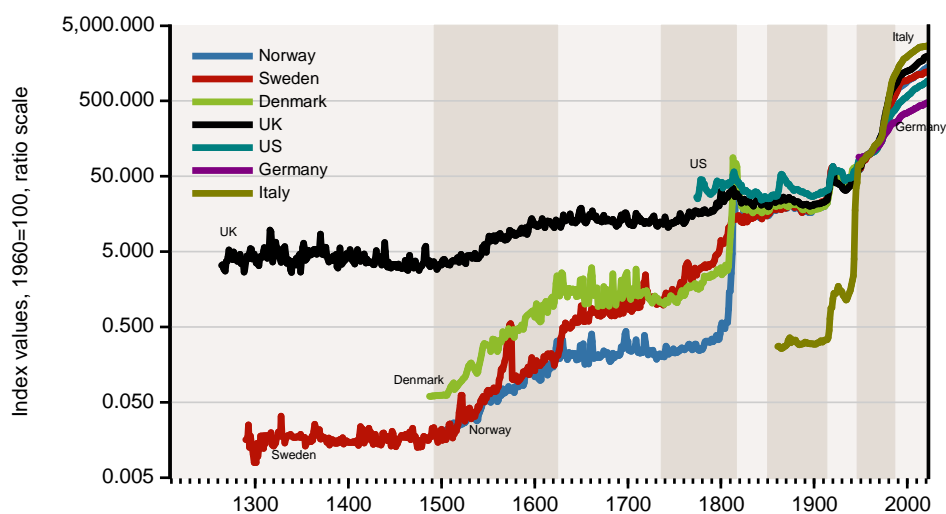


Figure 1.1 Historical price indices for Norway, Sweden, Denmark, UK, USA, Germany and Italy.
Source: Norges Bank HMFS, Grytten (2020), Klovland (2013) (Norway), Edvinsson and S oderberg (2010) (Sweden), Abildgren (2009) (Denmark), Muscatelli and Spinelli (2000) (Italy), Thomas and Dimsdale (2017) (UK), <https://www.bankofengland.co.uk/statistics/research-datasets>, <https://www.measuringworth.com/> (US). For the recent period the historical price indices are spliced with CPIs from MEI-OECD (Main Economic Indicators).

be accompanied by solid documentation of all primary data sources and the methods used to produce the composite data series, in a manner that would enable any reader to retrace all steps taken and possibly disagree.

One question pending is that of understanding why such a seemingly straightforward effort has been slow to come, and still needs to be developed. We suggest that this situation has to do with incentive problems. Analytical papers that use the data are admitted in the academic journals, but so far, the same journals are not keen on admitting the data producing articles. One way to describe the outcome is to say that high quality data production is a public good and that in the absence of a proper design of incentives, it tends to be in short supply.

We have come to the view that central banks are actually in a quite good position to remedy this shortcoming provided they can take on a limited role and responsibility and help coordinate and foster work in each country such that a national repository of historical data can be built up, which cover the area of interest for central banks.

Figure 1.1 show historical price indices for a group of countries. The construction of historical data series of high quality rests on and require serious work by academics which cover the relevant field of expertise. We have included a brief overview of the key sources from which we have collected the historical time series in this figure. Obviously, more could have been added to make the list

Introduction

complete. A comparison across countries reveal many interesting aspects of the history of prices in these countries. There are for example striking parallels between inflation rates in the Scandinavian countries and UK in the 16th century. Another parallel is between countries who experienced very high inflation such as Denmark and Norway in 1812-1817 and Italy during the two world wars in the 20th century. Unfortunately we have not found similar data for the hyperinflation in Germany (violet line) in 1923. The fact that we have long time series for the history of prices for many countries increases the value of this kind of information for each individual country. It is also a good thing that we are not alone undertaking such exercises but can learn from other countries.

The national repositories with historical data need to be thoroughly documented such that researchers in due time can understand what has been done and, if needed, revise and improve the data set.

Three levels of documentation

The focus of this book is on data, not analysis. The work focuses on primary sources, data collection and documentation of historical data. We have identified three levels of interest for documentation, which are very much inspired by the ongoing BIS-project on *Historical Monetary and Financial Statistics (HMFS)* referred to above (Bignon et al., 2022).

- The raw material
The original material must be available. It should be as far as possible "untouched" and accurately reproduced to be easily verified by future researchers, accompanied with a description of the original primary sources. It will hardly ever be possible to extract data from a single primary source across the long stretches of time of interest for us in this project, may be going centuries back in time. Numerous different sources of data may need careful investigation, including national and regional archives, historical publications and old newspapers. We benefit today from digitalization of old archives and, in some cases, textual material has also been transcribed. New techniques in IT ("Google technology") open up new possibilities for collecting huge amounts of data to study historical periods.
- The composite time series
Central bank economists are interested in long composite time series for consumer prices, interest rates, indicators of economic activity etc. The meteorologist is interested in the temperature for a certain place over long time. Based on "the raw material" referred to above, how should one proceed to construct the long-run composite time series of interest? What are the options? Are break-adjustments required? How are the various subperiods linked together, over which we want to form one composite time series? It must be possible for other researchers to understand how this has been done.
- The applications
The purpose of analysis varies. The research question may influence on how we conduct the splicing of historical data at the previous level so we should acknowledge this interaction between

1.1 On central banks use of historical data

these levels and that other researchers may take a different approach. Historical data can illustrate arguments made in a speech, for example to explore what can be viewed as eternal and what are time dependent truths. The arguments may relate to broad (big) societal questions or smaller ones zooming in on more specific topics. The analyses can be based on "homemade" data or data produced by other researchers. Today there seem to be very different traditions across disciplines regarding the extent to which researchers are credited for the tedious work involved in producing high quality databases.

Why revisions? Are not data data?

We revise because we get new insight; through more thorough work and new research. Historical data are in this sense very much alive! Adding more hard work and new findings may result in considerable improvements in the data. The historical data for the Cost of Living-Consumer Price Index (CLI-CPI) which was published in HMS I (2004) is one example. New research has led to substantial revisions in the historical CLI-CPI for Norway due to new contributions from Ellingsæther (2007), Klovland (2013) and Grytten (2020), see Chapter 11 for details. One has to use judgement and evaluate how these new insights may also have an impact on how we view historical data in other areas. One has to analyse the situation and make a decision on how and why our judgement has changed and whether the new insights in one area calls for revisions in other areas to. In this particular example the revisions in the historical CLI-CPI has led us to substantially revise nominal wage data as well. We refer the interested reader to Chapter 11 for a complete presentation of these revisions.

There are many reasons for why one should not expect the current vintages of historical data to be settled once and for all. One reason is the increased availability of historical documents and archives from digitization. This will generate new research which eventually will supplement with new data what we have learned from earlier excavations of these sources.

1.2 Historical monetary and financial statistics for Norway

How it started

The roots and inspiration underlying Norges Bank's project on historical data takes us back to 1994 and Bank of England's 300 year anniversary. In the May issue of the Bank of England Quarterly Bulletin that year an article appeared titled "Inflation over 300 years". The article also contained long time series for wages, real wages and house prices (MacFarlane and Mortimer-Lee, 1994).

That article inspired us to start more systematically to collect historical data in Norges Bank. From the early 2000s onwards the work was organized as part of economic research in the bank, and we invited two external academic experts to participate in the project. Professor Ola Honningdal Grytten and Professor Jan Tore Klovland, both at the Norwegian School of Economics in Bergen, joined the project from 2001 onwards and have been instrumental in developing this research project. This work has now kept us going for more than two decades.

The first phase of the project produced a series of papers published in Norges Bank's Occasional Paper series (Eitrheim, Klovland and Qvigstad, 2004; Eitrheim and Qvigstad, 2005; Eitrheim, Klovland and Qvigstad, 2007). These three books were all focused on documenting the sources and methods used to collect primary data and put together a historical database with variables of interest for central banks. Norges Bank's database on historical time series has been used by policymakers and analysts at the bank, in policy-related research and in speeches. The database has also been updated on an annual basis and the entire database has been available at the bank's web-site together with available documentation. During the years since the data were first published, we have also in some cases incorporated major revisions of the historical data and we have also seen some extensions of the data coverage.

What we present in this book

The first volume with historical monetary statistics for Norway was published in 2004, reporting the construction of consistent historical time series for a set of key macroeconomic variables for Norway. The first volume covered historical consumer prices from 1516, monetary aggregates from 1819, bond yields from 1820, exchange rates from 1819, stock prices from 1914 and housing prices from 1819, as well as real GDP and main demand components from 1830. The time span covered by the book was mainly between 1819–2003. In addition to the voluminous documentation of data, the book also discussed some of the methodological issues involved in constructing historical time series spanning long periods of time, as well as some of the institutional aspects of financial markets in Norway during that period.

The second volume with historical monetary statistics was published in 2007 and contained historical data for central bank interest rates from 1818, balance sheet records for individual private banks in the 19th century, for savings banks from 1822 and for commercial banks from 1848. The historical developments in nominal wages were covered from 1726. Both volumes were written in

1.2 *Historical monetary and financial statistics for Norway*

English for an international audience interested in monetary history and have been widely used and cited in the literature.

In this third volume (*HMFS for Norway*) we present a wide range of new historical data plus some important revisions to old data from the two first volumes. The most important additions to the database are mentioned in the following:

Chapter 2 provides an overview of items on Norges Bank's balance sheet from 1817, which also includes a discussion of the transition of key items on the balance of its predecessor from 1814, the Temporary Riksbank, to those of Norges Bank. Chapter 3 provides a detailed overview of Norges Bank's foreign exchange reserves and the bank's development from initially holding predominantly metal reserves, first in the form of silver coins, later in the form of gold coins and gold bullion during the gold standard period, to the modern day diversified portfolio of foreign exchange reserves.

Today most credit is channelled through regulated financial institutions. Norges Bank was established in 1816 and was the first bank in the country. The first saving bank came in 1822 and the first commercial bank in 1848. Before the establishment of Norges Bank, all credit was thus channelled in an unregulated market. Through the 19th century, a banking sector merged and credit was gradually moved from the unregulated market to the regulated institutions. We know, however, very little about the size of the credit granted in the unregulated market. When we measure the development of credit, we know little whether this is growth in total credit or just a change from the unregulated to the regulated sector.

Chapter 4 provides a complete record of money and credit aggregates recorded in the balances of money creating institutions and other financial institutions across the past two centuries. Chapter 5 give a picture of credit formation in the early part of the 19th century and shed some light on mortgage credit in the early years of financial institutions in Norway. In Chapter 6 we give an overview of the central government's revenues, expenditures and debt from the time when Norway left the union with Denmark in 1814 until today.

We have also included new and revised data for historical GDP and industrial production (Chapter 7 and Chapter 8), revised and extended historical data for wholesale prices (Chapter 9), consumer prices (Chapter 10), and revised nominal wages and historical house price indices (HPIs), including a discussion of their real-time properties (Chapter 11).

Finally we have collaborated with researchers at Statistics Norway who discuss sources and methods related to Norway's demographic history. These data are covered in detail in Chapter 12 (historical demographic sources) and in Chapter 13 (demographic concepts and methods).

1.3 Historical perspectives on monetary value

Norges Bank's communication department receive questions from the general public on a continual basis. They may for example be asked about a specific episode, which involves, say, the price of a particular commodity or the value of a piece of property at some point of time in the 19th century, or may be in the 18th century or earlier. What would that price or value correspond to today? This may sound like a simple straightforward question, but it turns out to be not so simple at all. Professor Trygve Haavelmo, recipient of the Nobel Memorial Prize in Economic Sciences in 1989 used to say to his students that the difficult task may not be to find the right answer, the difficult task is to formulate the right question.

Furthermore, we soon recognize that the type of data we need in order to answer questions of this kind depend critically on the precise way we formulate the question. And we often find that we need a much broader set of data than, say, just one long historical time series for the general consumer price index in order to provide an interesting answer to the question.

The exercise of translating value between *then* and *now* shed light on the three key functions of money, as *unit of account*, *means of payment* and *store of value*, as illustrated in the following paragraphs. The questions we consider here have one thing in common. They call for us to make a value comparison.

Only relative prices can be observed when we consider the exchange of goods and services in pure barter economies. When we introduce money and monetary units as basis for value comparisons we can make use of the *unit of account* function of money, which makes it possible to compare the values of different commodities when expressed in the same monetary unit of account.

We see immediately that this framework is very general. It can be used to compare the value of two different commodities at one particular point t_0 and it can be used to compare the value of one particular commodity on two different points t_0 and t_1 . In the latter case we also touch upon the *store of value* function of money as we use the selected monetary unit of account and its development over time as basis for comparison. Furthermore, when we have data for exchange rates between monetary units of account for different countries we can extend the scope of comparisons to also cover comparisons between countries at one calendar point t_0 or between two calendar points t_0 and t_1 in the case of a cross-country comparison.

We note that in order to formulate the question precisely we will need to specify in full detail the two commodities or pieces of property the comparison involves, which calendar points in time t_0 and t_1 we are interested in and, eventually, if the comparison involves monetary units of accounts between different countries. We should add that we also need to take into consideration whether there have been changes in the involved monetary units of account between countries and/or between the two calendar points we are interested in.

Let us consider some examples of how we can formulate a set of different questions for which we may provide an answer if we have available the necessary set of composite historical data series.

First, we may consider the case when we want to compare the value of a particular commodity or

1.3 Historical perspectives on monetary value

piece of property at calendar time t_0 with the value of another commodity at time t_0 , in other words a contemporary comparison. Across history this would be an easy task if we have the possibility to observe the prices on the two commodities as expressed in a contemporary historical source such as a published list of current prices at t_0 . If the calendar time t_0 belongs to a year in which a *commodity standard* was effectively in place for the monetary unit of account, such as the silver standard (between 1842 and 1874 in Norway) or the gold standard (between 1874 and 1914) we would be able to make a comparison with some equivalent physical amount of the monetary commodity (silver or gold) and a basis for such a contemporary comparison. We may also want to consider how the preservation of value between t_0 and some later date t_1 would depend on precisely how we specify the comparison alternatives.

A simple way to phrase the question of comparison is to ask what a particular value expressed in monetary units at time t_0 corresponds to at a later calendar time t_1 when expressed in monetary units at time t_1 . In Norway the monetary unit has been kroner from 1874 onwards. Thus, if both $t_0, t_1 \geq 1874$ we will not have to make further preparations before we can answer a question of this type taking into account the growth in the general price level as this is expressed in a historical cost-of-living index (CLI) or consumer price index (CPI). It is also quite easy to make value comparisons when t_0 is some year before 1874 and t_1 is a year after 1874 but it is important to take into account all changes in the monetary unit that have taken place between t_0 and t_1 .

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		TO						
		Riksdaler (bf 1795)	Riksdaler courant (bf 1795)	Riksdaler (1795–1813)	Riksdaler courant (1795–1813)	Riksdaler (1813–1816)	Speciedaler (1816–1874)	Kroner (1874–today)
FROM	Riksdaler (bf 1795)	1	1,225	–	–	0,2042	0,0204	0,0817
	Riksdaler courant (bf 1795)	0,816	1	–	1	0,1667	0,0167	0,0667
	Riksdaler (1795–1813)	–	–	1	1,25	0,2083	0,0208	0,0833
	Riksdaler courant (1795–1813)	–	1	0,8	1	0,1667	0,0167	0,0667
	Riksdaler (1813–1816)	4,896	6	4,8	6	1	0,1	0,4
	Speciedaler (1816–1874)	48,96	60	48	60	10	1	4
	Kroner (1874–today)	12,24	15	12	15	2,5	0,25	1

Figure 1.2 Transitions between different monetary units in Norges Bank's price calculator at <https://www.norges-bank.no/en/topics/Statistics/Price-calculator-/>.

Both Norway and its former union partner Denmark were subject to serious economic disturbances in the period 1790-1820. Norway used several different currencies as unit of account during this period, e.g. riksdaler species, riksdaler courant, riksbankdaler and speciedaler, and there were three devaluations, in 1813, 1814 and 1816, respectively. Figure 1.2 shows a table with statutory rates of conversion between banknotes issued in the various currencies. This table is helpful when we need to convert between different monetary units used in the Dano-Norwegian union and in Norway prior to the introduction of Norway's currency unit *kroner*, which was introduced in 1874. In addition we note that one problem occurs when the original source of the time uses the term "daler", but leave out specifying which specific one of the abovementioned. Since the inflation in this period reaches the maximum of the inflation rates of failing states, it matters a lot which currency we choose to apply.

We have illustrated some of the points mentioned in the previous paragraph in the following example of historical value comparisons. The example is based on the Bogstad estate, a large property located in the outskirts of the capital Christiania/Oslo, which was the home of Peder Anker who became Norway's first prime minister in Stockholm after the dissolution of the Dano-Norwegian union in 1814. The diary of Thomas Malthus' travels in Norway in 1799 reveals that he visited the Bogstad estate and the Anker family during his stay in Christiania (Malthus [1799], 1966, Friday 28 June 1799).

1.3 Historical perspectives on monetary value



Figure 1.3 The Bogstad estate in Christiania/Oslo. The home of the first Norwegian prime minister in Sweden in 1814, Peder Anker. The Bogstad estate played a key role in the years around the dissolution of the Dano-Norwegian union as a centre of the Norwegian elite. Peder Anker was for example related to the minister of finance in the government, Herman Wedel Jarlsberg, who was married to Peder Anker's daughter. The diary of Thomas Malthus' travels in Norway in 1799 reveals that he visited Bogstad and the Anker family during his stay in Christiania (Malthus [1799], 1966, Friday 28 June 1799).

Example: The Bogstad estate in Christiania/Oslo

Peder Anker, bought the Bogstad estate in 1772 for 90 000 riksdaler silver species. The weight of the silver amounted to 2 280 kg and if this silver was exchanged into gold at the prevailing ratio around 15.7:1 the equivalent amount of gold would have been 145 kilo. If this amount of silver had been sold today, the value would be around 14 million kroner, whereas the value of 145 kilo gold would have been around 81 million kroner in 2020.

Silver and gold coins were examples of commodity money and were used as international monetary units under the silver standard and gold standard periods. The purchasing power of silver and gold based currencies could be observed via prices on bills of exchange issued in the respective currencies, the nominal exchange rates quoted at Christiania Stock Exchange since April 15, 1819. If cost-of-living or consumer price indices (CLI-CPIs) had been available for the different countries involved, it would have been possible to compare prices in two countries expressed in a common currency.

Since CLI-CPIs only became readily available in the early 20th century we have to think of this as a thought experiment, *how*, in a counterfactual case, we could have made use of this information. A CLI-CPI expresses the development over time in the value of a bundle of goods, given the weights of

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the different goods and their current and past prices, and we use such indices to measure the general level of inflation.

If we adjust the 90 000 riksdaler for the general inflation from 1772 to 2020 the value would be around 34 million kroner in 2020.

A different perspective arises when we observe that 90 000 riksdaler in 1772 would approximately correspond to the total annual wage budget of around 1 257 workers at that time. In 2020 the wage sum of 1 257 workers amounts to around 745 million kroner. This example brings to the forefront the strong growth we have observed in the real economy over the past centuries, which to a large extent is the result of industrial developments, technological advances and huge productivity gains. Productivity growth has been a key driver behind the growth in real wages, and as we noted in the previous example real wages have shown around a twentyfold increase over this period. We would have seen similar developments if we had considered the growth in real GDP or real GDP per capita, for which we however only have historical data from 1816 onwards. Ola H. Grytten has written about this in Chapter 8 in this book.

Finally, in this thought experiment we consider a case where the initial investment worth 90 000 riksdaler in 1772 had been used to develop a land area of, say 100 000 m², close to the Bogstad estate in Christiania/Oslo for housing purposes. The thought experiment indicates that the value of 90 000 riksdaler in 1772 might have increased to a gross value of 1.5 billion kroner in 2020. The estimate is based on rough assumptions of a development project at the Bogstad estate for housing purposes, which would amount to building houses of various types totalling approximately 25 000 m² distributed over an area of 100 000 m². We have used 60 000 kroner as a crude estimate of the average price per m² in Oslo in 2020.

It would also be reasonable to expect that a higher degree of utilization of land for housing purposes at this beautiful area (see Figure 1.3) would utterly have increased the property value. The Bogstad estate was, however, regulated as a national heritage, and the private owners were then prohibited to develop it into private housing. On the contrary, running the estate as a national heritage was so costly that the private owners in 1955 donated the estate to a charity, *Bogstad foundation*, which is managed by *Norsk Folkemuseum* (The Norwegian Museum of Cultural History).

So, if we ask what is the equivalent to 90 000 riksdaler in 1772 today, the answer could be anything from 14 million kroner or zero to host a gross value of housing capital amounting to 1.5 billion kroner or so depending on how we chose to specify the question. That would, in turn, of course depend on what we are really interested in. But to answer these different questions, we recognize that we may need to have available a fairly broad set of composite historical data series. As a final note in this last thought experiment, consider the case if the owner of the estate would have received, say, ten percent of the total gross value of the developed housing capital stock as compensation, this would amount to 150 million kroner, which would be a significantly higher return on the initial wealth in 1772 than keeping the wealth in the form of silver or gold as we have seen above.

In this example we have used historical market prices for silver and gold since the 18th century. We have used price indices for the general price level which are measured using modern type of cost-of-

1.4 The chapters that are not here

living (CLI) or consumer price (CPI) indices. Wage indices have been meticulously constructed on the basis of available archival records and accounting statements from different types of institutions across the entire spectrum of sectors in the economy. In addition we have made use of data from historical national accounts, which provide long runs of historical data series for aggregated GDP and its subcomponents and we have demographic data series which keeps track of the development of the size and composition of the population in order to calculate GDP per capita as a check of consistency of the composite data series for real wages. Finally, we have also available a set of estimates of the broad trends in house prices in Christiania/Oslo going back to the first half of the 19th century.

1.4 The chapters that are not here

Historical data for air temperature

The economy and the climate are closely linked. Many economic activities have an impact on the environment. Burning of energy carriers like coal, oil and gas contribute to climate change, while waste from factories can pollute our land, rivers and sea. The environment can affect the global economy too. We will now turn to a couple of other professions which are also of great importance if we want to understand developments in a country in a long-term perspective. One such area concern long-term developments and trends in climate indicators such as meteorological variables like air temperature. Another area concerns long-term trends in energy consumption.

Some examples: *Laki* in Iceland erupted in 1783. The meteorological impact of Laki contributed significantly to several years of extreme weather in Europe, and has been credited as a catalyst for the French Revolution of 1789. *Tambora* in Indonesia stands for the most violent eruption in history in 1815, and temperature anomalies continued through 1817, and 1818. Norway, very dependent on import of grain, had suffered from the British blockade during the Napoleonic wars. The suffering was prolonged by the bad harvests due to the cold weather in the years thereafter. *Krakatoa*, also in Indonesia, erupted in 1883, and gave meteorological effects even in Kristiania (now Oslo). Some argues that the Edvard Munch painting "The Scream" is inspired by the spectacular twilight caused by the Krakatoa eruption, which Munch apparently witnessed ten years before he painted the motif.

The steady rise in human activity - and the subsequent greenhouse gas emissions - witnessed since the industrial revolution has already had a considerable and measurable impact on our planet. Scientists estimate that global temperatures have risen by around 1°C since 1850. This figure could exceed 4°C by the end of this century if no action to limit emissions is taken. Central banks have recently started to take an interest, especially Bank of England with governor Marc Carney has been taking a leading role. Also Norges Bank is putting climate risk high on its agenda.

There is a tradition in the meteorological science do research and establish long time series. The Norwegian Centre for Climate Services (NCCS) is the coordinating organ for The Norwegian Me-

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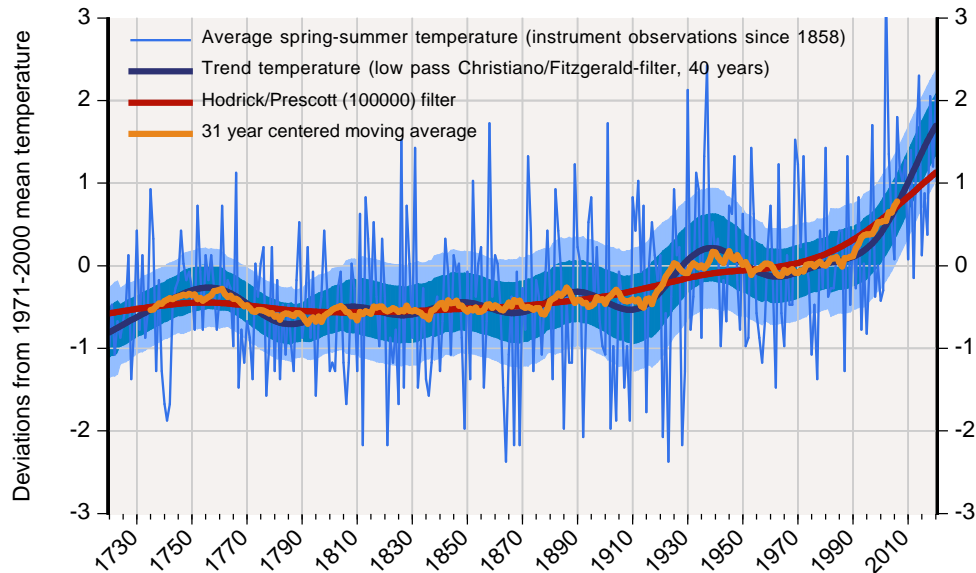


Figure 1.4 Long-term trends in the average spring-summer temperature in Trøndelag, 1720-2020. The primary data sources and methods of construction are documented in Nordli (2001); Nordli et al. (2002); Nordli (2004) and were used in Norges Bank in connection with work presented in Qvigstad (2005), see also Skeie (2005). Nordli's data for spring-summer temperatures in Trøndelag have been updated with average May-August temperatures 1995-2021 (based on monthly observations of homogenized mean temperatures observed at Værnes airport (station SN69100), which were downloaded from <https://seklima.met.no/>). In addition to the direct and indirect estimates of the spring-summer temperature (May-August) we have reported three filtered series, a simple centred 31 year moving average, a Christiano-Fitzgerald (CF) low pass filter (with $PL=2$, $PH=40$) and a HP-filter with a large lambda equal to 100 000. Around the CF-filter we also plotted bands based on estimated 30 and 50 percent bands, calculated on the basis of a 40 year rolling window in order to highlight extreme observations (outliers).

teological Institute, The Norwegian Water Resources and Energy Directorate and The Bjerknes Centre for Climate Research. They are the repository for historical climate data.

Figure 1.4 shows long-term developments in the average spring and summer temperatures (May-August) in Trøndelag from the early 18th century. We collected these data already around the time when we finished the first volume in this project. The historical temperature data were used to illustrate potential effects that negative shocks to the temperature could have on crops and, in the next round, on inflation and output in agriculture and on mortality rates in the 17th and 18th century (Qvigstad, 2005). The primary data sources and methods of construction are documented in Nordli (2001); Nordli et al. (2002); Nordli (2004), see also Skeie (2005).

We have updated and summarized the long-term trends in updated historical temperature data from 1720 to 2020 in Figure 1.4, which shows spring-summer temperatures in °C measured as deviations from the average spring-summer temperatures in a reference period 1971-2000. The zero-line in

1.4 The chapters that are not here

Figure 1.4 uses the same reference period as was recently used in Hanssen-Bauer et al. (2017, p. 16), which reports simulations of different scenarios for annual temperatures in Norway going forward towards 2100.

From 1858 onwards the data shown in Figure 1.4 are based on direct instrument observations of temperature, which have been homogenized to form consistent composite data series. These instrument data have been merged with indirectly measured temperature data for the years prior to 1858, which are based on proxy observations. The spring-summer temperatures in Trøndelag 1701-1857 are based on annual records of the first harvest dates from a sample of farms in Trøndelag, see Nordli (2004) for details. We return to this in a later paragraph where we discuss key principles regarding the documentation of historical data, which are also advocated in the international HMFS-project (Bignon et al., 2022, forthcoming).

We have plotted the historical spring-summer temperature data together with three filtered trends, one from applying a low pass Christiano-Fitzgerald (CF) band filter, one from a two-sided HP-filter with large lambda (equal to 100000) and a simple centred 31 year moving average. We have also plotted bands around the CF-filtered trend based on estimated 30 and 50 percent spreads, calculated on the basis of a 40 year rolling window in order to highlight extreme observations (outliers). As usual a note of caution is in order here since filtered series depend critically on some key assumptions underlying them. We have applied simple two-sided filters and the results are very sensitive to endpoint effects, the choice of band width and other parameters.

We see that over the past three centennials spring-summer temperatures were around 0.5 °C lower than in the reference period (1971-2000). The period covered in Figure 1.4 begins right after a period which has been referred to as the coldest part of the so-called "Little Ice Age" in the 17th century (Huhtamaa and Ljungqvist, 2021, p. 668). The recorded temperatures seems then to have increased through the 20th century, in a stepwise pattern. All trend estimates shown in Figure 1.4 do however indicate a rapid increase in the average spring-summer temperature over the most recent decennials. Some caution is necessary when interpreting trend estimates like this, since they are sensitive to endpoint effects which depend critically on assumptions underlying each filter.

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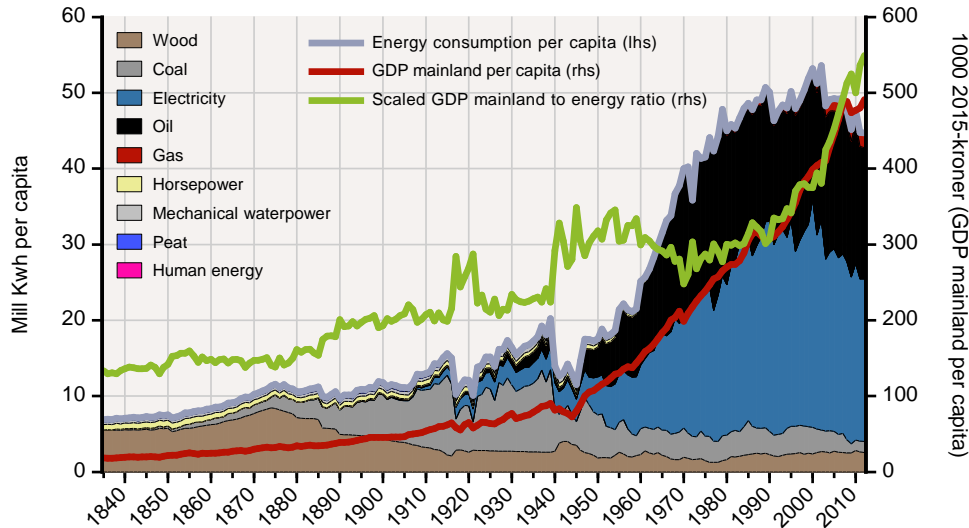


Figure 1.5 Long-term trends and decomposition of energy use, 1835-2012. The primary data sources and methods of construction are documented in Lindmark and Minde (2018).

Historical data for energy consumption

Figure 1.5 shows the long-term trends in energy use in the mainland economy since 1835. Historical data for the use of nine different energy carriers from 1835 until 2012 have been collected from numerous data sources and were used to construct a composite aggregate measure of energy consumption in the Norwegian mainland economy for this period (Lindmark and Minde, 2018). The study explains the main principles and methods used when data for these nine different energy carriers are transformed into common accounting units of energy consumption.⁶ Estimates of energy consumption in the 19th century rely heavily on assumptions regarding the quality of wood in the first period from 1835 onwards and later regarding the quality of coal. Wood-estimates are viewed as more uncertain than coal-estimates.

The main energy carriers have varied across different sub-periods. Energy from wood dominated until around 1900 when coal took over as the main energy carrier. One important aspect of the transition to coal was that it had to be imported. The disruptions in coal imports during World War I and World War II caused temporary upward shifts in wood consumption. After the World War II it turned out that oil and electricity soon became the two dominating energy sources used in the mainland economy. Figure 1.5 focus on energy consumption per capita measured in million KWh per capita (left hand axis) and how the composition of the uses of energy has changed from wood

⁶ (Lindmark and Minde, 2018) have used Peta Joule (PJ) as their common accounting unit, $1PJ = 10^{15}J$, where $1J$ corresponds to the amount of energy produced by applying 1 Watt (W) effect in 1 second. Since it is 3600 seconds in one hour we can easily transform energy expressed in Peta Joule (PJ) into Kilowatt hours (Kwh), 1 billion Kwh = 3.6 PJ.

1.4 The chapters that are not here

(area in brown colour) to coal (area in gray colour) and later to oil and electricity (areas in black and blue colours, respectively).

A key driver behind the strong growth in energy consumption per capita in the mainland economy in the 20th century is the strong growth in GDP mainland per capita (red line, right hand side axis). We note that energy consumption per capita peaked around the turn of the millennium and has since then declined by around 20 percent until 2012. This reflects in part that energy efficiency has increased over time. We have illustrated this by a scaled GDP mainland to energy ratio (green line) in Figure 1.5. The growth in energy efficiency has been particularly strong during the past three decades. From the perspective of this book we are primarily interested in the sources and methods used by Lindmark and Minde (2018) when they constructed composite time series for the uses of energy in mainland Norway from the 1830s onwards. The authors note that the large merchant fleet, which Norway have operated since the 19th century, needs to be treated in a separate study of energy consumption outside the mainland economy. The energy use in the foreign shipping sector transitioned from wind (sail ships) to coal (steam engines) in the 19th century and later to oil as fuel (combustion engines) in the 20th century. Readers are reminded that there has been increased international attention to analysing energy transitions in a historical perspective in studies which focuses on technological change and industrial development. An early contribution to this literature is Landes (1969) and more recently an overview of the use of energy in Europe over the past five centuries appeared in Kander et al. (2014). On the background of Norway's rich endowments of different energy sources this area has also been investigated by domestic and international historians with research interests in industrial development (Lindmark and Minde, 2018).

We will not try to summarize this research here, we will only briefly mention that studies of energy uses in Norway range from studies of the burning of coal to be used in the iron mills of the late 17th through the late 19th century, when iron mills using coal made from wood were replaced by iron mills using coal from coal mines, to studies of the use of mechanical waterpower, e.g. in the timber industry of the 18th and 19th century, to studies of the transition of the merchant fleet from sail to steam engine and later to engines fueled by oil, beginning in the 19th century. Furthermore, we have the increasing use of oil in combustion engines, e.g. in the transportation sector of the 20th century and the transition from burning wood to burning coal and oil for the purpose of heating private houses and apartment buildings. Finally, there have been numerous studies of the developments of hydroelectric power plants in Norway from the early 20 century onwards, and the later expansion of the capacity to distribute domestically produced electricity during the second half of the 20th century, which separated the destination of production from the destination of consumption of electricity. And then, in the late 1960s Norway found oil and gas and became a huge net exporter of energy to the world market.

Historical data on inequality

Inequality has come to the forefront of economic policy. There is a rich literature which underscores that institutions are important for the growth and welfare of nations, by authors like Francis

Introduction

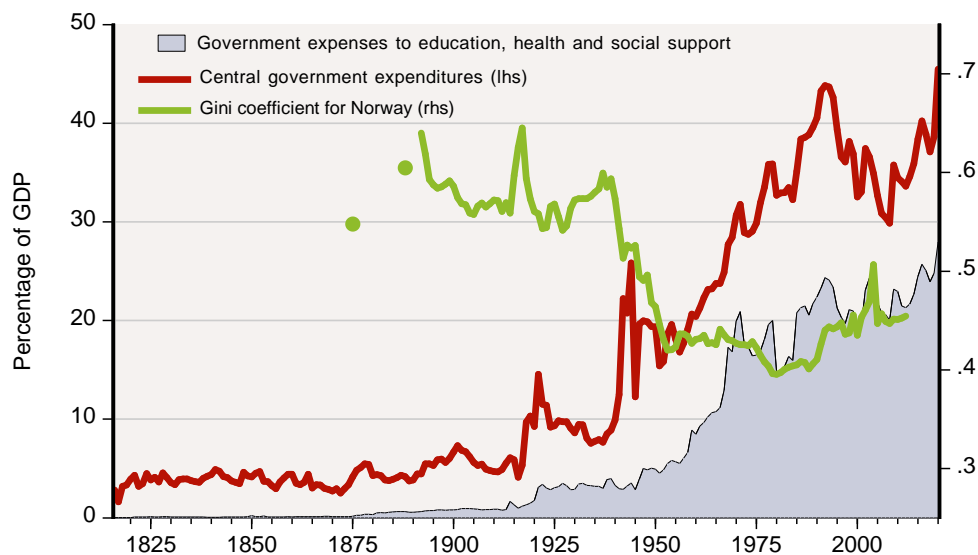


Figure 1.6 Income inequality in Norway. Aaberge et al. (2016, 2020) presents Gini-coefficients and other measures of income inequality derived from tabular data with information about the distribution of incomes, municipal and central government taxes and social support in Norway back to the late 19th century.

Fukuyama, Douglas North, D. Acemoglu and J. Robinson, and Andrew G. Haldane to mention a few. Measuring inequality in income and wealth are important aspects in this respect. This has been a field of interest for authors like Anthony Atkinson and more recently Thomas Piketty. In a recent study of Norwegian data Rolf Aaberge, Anthony B. Atkinson and Jørgen Modalsli have done important work "On the measurement of long-run income inequality: Empirical evidence from Norway, 1875-2013" (Aaberge et al., 2016, 2020). They find evidence of very high-income inequality from the late nineteenth century until the eve of World War II, followed by a rapid equalization until the 1950s; see the green line in Figure 1.6. Income inequality remained low during the post-war period but has increased somewhat since 1980.⁷

The welfare state has been expanded. Around the time of birth of the nation in 1814 government expenditures (the red line in Figure 1.6) were concentrated on a few core functions like running the central administration, the legal system, defence, police etc. If we spool fast forward a modern welfare state has been developed, here exemplified with data showing expenditures on education, health and social support in percentage of GDP (the gray area in Figure 1.6). This welfare state offers a wide range of public services to the entire population. Over the past century we have observed

⁷ Rolf Aaberge, Jørgen Modalsli, Edda Solbakken have also analysed wealth inequality in their paper "Measuring Long-Run Wealth Inequality" (Solbakken, 2018) (Chapter three in Edda Solbakken's doctoral thesis, April 30, 2018). This paper is a part of the research project "People and their incomes in Norway, 1859-2013" (231625) financed by the Norwegian Research Council.

1.4 The chapters that are not here

considerable growth in the size of central government. Central government expenditures have fluctuated at levels between 30 and 40 percent of GDP since the early 1970s, and in short periods at even higher levels. The sources and methods used to derive composite historical data series for the central government's revenues, expenditures and debt across the past two centuries are discussed in detail in Chapter 6 in this book.

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Norges Bank's balance sheet, income accounts and profits,
1817-2021

Øyvind Eitrheim, Mats Bay Fevolden and Vetle Hvidsten

2.1 Introduction

This chapter presents the main characteristics of development in Norges Bank's balance sheet from its beginning of operations in 1817 until the present day. We give a complete albeit fairly aggregated overview of the bank's assets and liabilities across this long period of more than two centuries. The main sources for the historical data presented here are Norges Bank's published annual reports and statements, but we have supplemented this with information from other sources where deemed necessary. One limitation is that the annual statements only show the position of the bank's balance sheet at year-end, and therefore we will obviously miss out on many important events which occurred within each year.

There have been many changes in the published records of Norges Bank over the past two centuries with respect to the level of detail provided for its balance sheet. Accounting standards and definitions have also been subject to changes. In order to achieve a sufficiently high degree of consistency in our representation of the balance sheet we have therefore made numerous adjustments. An overview of these adjustments is provided in sections 2.3-2.8.

This is to our knowledge the first presentation of a complete set of composite consolidated balance sheet data for Norges Bank. The work brings together data which have only appeared in separate sources earlier.

Firstly, we have used the limited subset of historical data from Norges Bank's balance sheet which were presented already in the first volume of Historical Monetary Statistics for Norway (HMS I, 2004). These data appeared in a chapter which focused on developments in monetary aggregates for Norway from 1819 to 2003, beginning around the time when Norges Bank had become operational as the country's bank of issue (Klovland, 2004). Klovland's main focus was on items collected from the liability side of the balance sheet, i.e., the total amount of *central bank money*, consisting of the sum of *banknotes in circulation* outside Norges Bank and the private bank's deposit reserves in Norges Bank, known as *bank reserves*. The sum of these are also known as *high powered money M0*. Klovland (2004) also recorded two items from the asset side of the balance sheet, notably the level of the bank's *foreign reserves* and the level of *domestic credit*, respectively. From 1850 onwards these items were presented on a monthly basis.

Secondly, we have made use of balance sheet data from spreadsheets which were compiled by colleagues in the bank's Data Management section during the 2000s and early 2010s. For the early period of Norges Bank's history, prior to World War II, we have made use of historical balance sheet data which were put together and compiled into two spreadsheets. The first spreadsheet covered the period 1817-1876 when the bank's accounts were reported in *speciedaler*. The second spreadsheet covered the period 1877-1939 when the bank's accounts were reported in *kroner*.¹ A set of consolidated balance sheet data for the entire period 1817-1939 was published in Hvidsten (2013) as part of *Norges Bank's bicentenary project 1816-2016*.

Other spreadsheets covered balance sheet data for different sub-periods after the start of World

¹ For the record we remind readers about the conversion rule, 1 *speciedaler* = 4 *kroner*.

2.1 Introduction

War II, notably for the sub-periods 1940-1944, 1945-1949, 1950-1972, 1973-1988, 1989-1991, 1992-2002, 2003-2011 and 2012-2021. These spreadsheets specify the balance items in various degree of detail, reflecting differences in granulation of the published balances. We have included a brief overview of the main data sources behind Hvidsten (2013) in Appendix 2.C.

Given this variation in granulation details in the published balances, it has been a key goal of this study, and a lot of work, to combine this information into a set of balance sheet items, for which we may construct composite consolidated data series which cover the bank's history over more than two centuries.

In addition to these building blocks we have also collected information from other sources where this was necessary to make aggregations and break-adjustments in order to meet the requirements of this study regarding the long-run composite historical balance sheet data. These sources are primarily from Norges Bank's annual reports and various articles and papers. A detailed overview and discussion of Norges Bank's balance sheet was for example published in Aamodt and Lerbak (2013). They covered the period 2003-2012 using monthly data.

The level of detail of the composite consolidated balance sheet will by necessity reflect what it is possible to read out from the available published sources. But we have also looked at other central banks such as the Swedish Riksbank, Denmark's Nationalbank and the Bank of England for inspiration before deciding on the final list of asset items and liability items.²

The rest of this chapter is structured in two sections. Section 2.2 provides a bird eye's perspective on the structure of Norges Bank's assets and liabilities across the past two centuries. We have also included an overview of the bank's equity and its decomposition in shares and different funds. We end the section with an overview of the bank's revenues and profits over the past two centuries and how profits have been distributed to the owners of the bank.

In sections 2.3-2.8 we take a closer look at the data sources we have used in this study and discuss the different aggregations and break-adjustments we have made. These sections are also the main academic contribution of this study for an international audience who may be interested in sources and methods applied to Norway.

Section 2.3 describes the period of transition from 1813 onwards, starting with the new Riksbank which was established in the final year of the Dano-Norwegian union, in which its Norwegian branch became renamed as Norway's Temporary Riksbank after the dissolution of the union in 1814. Norges Bank was then established in 1816 and became a fully operational bank of issue a couple of years later. In Section 2.4 we describe the complex fund structure which characterized Norges Bank in the 19th century. We describe sources and methods we have used to construct a consolidated balance sheet for Norges Bank from the published balances of each of these funds from 1817 to 1892. Section 2.5 deals with Norges Bank during World War II. We have combined information from two distinct sets of accounts of the bank's activities during the war years, in Norway and in London, respectively. To our knowledge this is the first attempt to present a consolidated balance sheet for

² We have selected items with a view to achieve consistency over time but also to facilitate comparisons with aggregated data representations of the balance sheet of central banks in other countries. Our list has in particular been inspired by a similar study of Sveriges Riksbank's balance sheet (Fregert, 2014).

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Norges Bank during the years 1940-1944. This is also, admittedly, a relatively crude approach as we have applied the aggregated view of Norges Bank's balance sheet. Section 2.6 deals with the postwar period and Section 2.7 deals with other break-adjustments necessary to construct the balance sheet items we have selected for this study. Section 2.8 provides an overview of changes in the accounting principles which have been followed for the bank's balance sheet and its income accounts and profit and losses statements.³

2.2 A long view of Norges Bank's balance sheet

Composite aggregates

The asset side of Norges Bank's balance sheet consists of foreign reserves, loans and domestic securities. On the liability side we find currency in circulation (banknotes and coins), deposits and equity. Liabilities account for the *sources of funds* and assets for the *uses of funds*. The items listed in Table 2.1 represent aggregated components of Norges Bank's assets and liabilities, respectively, which are selected in order to give a coherent overview of the bank's balance sheet over its entire history.

Table 2.1 *Aggregated components of Norges Bank's balance sheet (assets and liabilities).*

Composite break-adjusted variables 1817-2020

Assets (uses of funds)	First year of entry	Liabilities & Equity (sources of funds)	First year of entry
Claims on international organisations ^a	1933	Liabilities to international organisations	1951
Metal reserves	1818	Banknotes in circulation (+ coins since 1962) ^b	1818
FX assets (deposits, securities, other) ^c	1840	Deposits, private sector ^d	1818
Domestic FX claims ^e	1915	Deposits, government	1817
Loans, short-term ^f	1818	Deposits, financial institutions ^g	1899
Loans, other (mortgage loans)	1818	Other foreign liabilities ^h	1889
Loans, government ⁱ	1817	Other liabilities	1817
Domestic securities	1893	Equity, shares	1818
Other assets	1817	Equity, various funds	1817

^a Claims on Bank for International Settlements (BIS), European Payment Union (EPU) and International Monetary Fund (IMF).

^b Prior to 1962 the Royal Mint resided under the Ministry of Finance.

^c Assets denominated in foreign currencies are here referred to as *FX assets*.

^d The private sector includes banks and other financial institutions before these were reported separately.

^e Claims on residents denominated in foreign currencies.

^f Discount loans and borrowing facilities.

^g Separate information on deposits from financial institutions (mainly banks) is based on Skånland (1967).

^h Initially this was debt to Nationalbanken and the Riksbank during the Scandinavian Currency Union (SCU) period.

ⁱ This was initially the *Redemption loan* (1817-1835), from 1940 onwards the *Occupation account* (1940-1957), which was renamed as *The central government's consolidated account in Norges Bank* (1958-1981).

This section focuses on composite aggregates which describe the different items on the asset side

³ Thanks for thoughtful comments and discussions with the co-editors of this volume Jan T. Klovland and Jan F. Qvigstad. The views expressed in this paper are solely those of the authors. Our thanks go also to numerous colleagues in Norges Bank who have shared their knowledge with us and helped us during the process of data collection.

2.2 A long view of Norges Bank's balance sheet

and the liability side of the balance sheet. We will mainly present the historical data in charts in order to save space. Tables with annual data for Norges Bank's assets and liabilities since 1817 are reported in two appendices to this chapter.⁴

Figure 2.1 shows the developments in Norges Bank's balance sheet across two centuries, measured in mill kroner (a) and in percentage of nominal GDP (b). Two subperiods stand out in this figure when Norges Bank's balance sheet has been strongly influenced by events in which the bank has been involved in and provided its services to the central government.

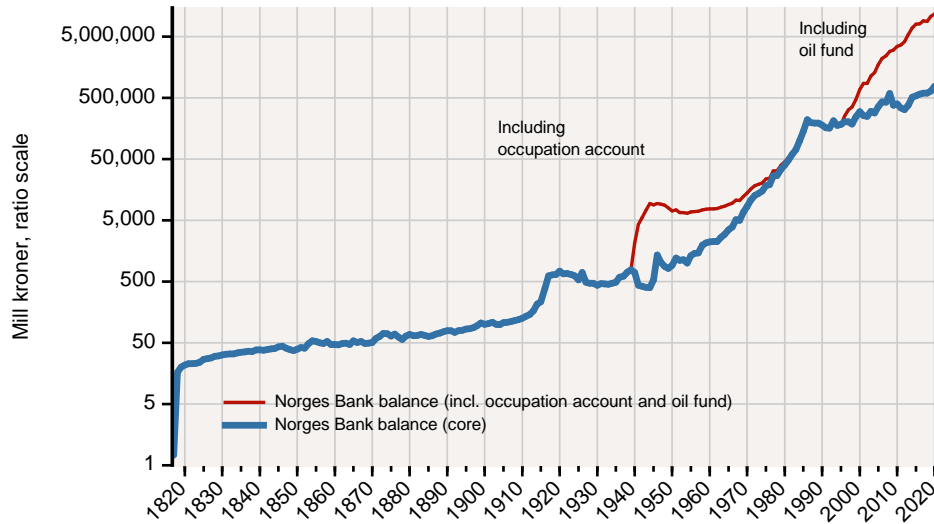
- The first subperiod concerns World War II and the post-war period where we see that the bank's balance sheets were dominated by the *occupation account*, which the German occupants used to finance their expenses in Norway during five years of occupation, hence the name of this account. The occupation account is categorized as a loan to the government. The question of how this account should be treated when the war ended in 1945 was a subject of public debate, which was first concluded in 1958, 13 years after the war.
- The second subperiod from 1996 onwards is a period where the bank's balance sheet gradually became dominated by the size of the *Government Pension Fund Global, GPF*, here dubbed as the *oil fund*, which the bank manages on behalf of the government, and which is included in the bank's balance sheet. In this chapter we will zoom in on Norges Bank's balance sheet in light of the bank's responsibilities for monetary and financial stability. In the following we have therefore focused on Norges Bank's balance sheet excluding the oil fund. This is quite simple since the oil fund's entries on the asset side and liability side are equal by definition and can be subtracted from Norges Bank's balance sheet.⁵

Figure 2.2 shows Norges Bank's foreign reserves (in percentage of GDP) over the past two centuries, the blue line shows the total balance sheet of Norges Bank. The area between the blue line and the level of reserves denotes the bank's assets held in the form of loans and securities. Figure 2.2 also shows the transition from silver reserves to gold reserves in the 1870s. Norway adopted the gold standard from 1874 onwards. We also note that the bank held reserves at commissioners in foreign countries from the early 1840s onwards. These holdings are marked in the green area shown in Figure 2.2.

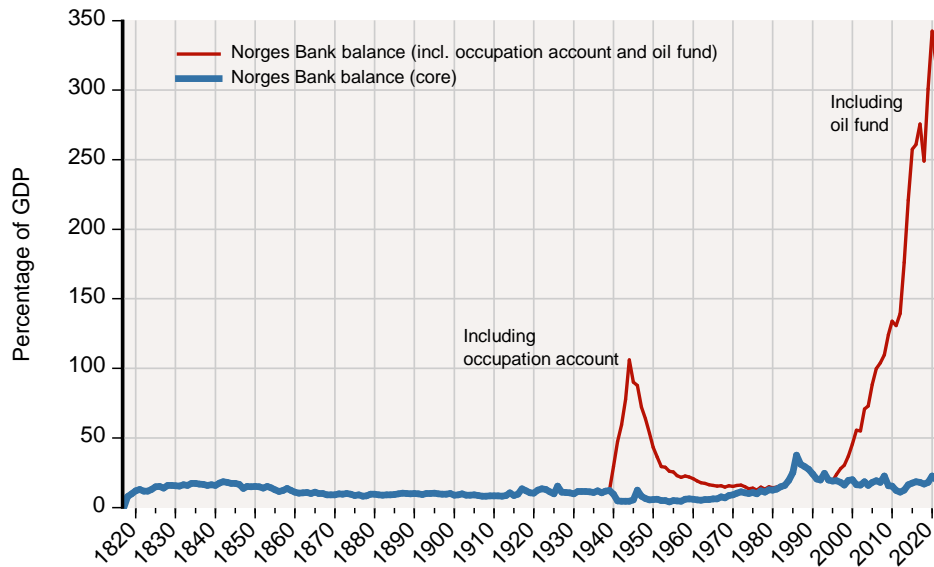
⁴ There are also more detailed specifications of Norges Bank's balance sheet for different subperiods, which are available in spreadsheet format at Norges Bank's web-site. See Appendix 2.C for a brief overview.

⁵ We have also removed items from the balance sheet we present in this study, which account for specialized services provided by Norges Bank in the role as the government's bank, a role which was written into the bank's statutes when the Norges Bank Act was revised in 1892. One example is the bank's holdings of small coins of exchange on behalf of the government on the asset side and the corresponding debt to the government in the state cashier's exchange account on the liability side. Similar to the entries of the oil fund, these items on the asset and liability side were always equal by definition and appeared in the bank's balance sheet from 1893 until 1958. In 1959 Norges Bank took over the stock of divisionary coins from the government and the recorded holdings of divisionary coins on the asset side increased correspondingly. From 1962 onwards coins only appears on the liability side of Norges Bank's balance sheet after Norges Bank took over the Royal Mint from the government, hence all liabilities to coin holders, which had previously rested with the government, now appeared as liabilities on Norges Bank's balance. This is similar to the principle we have applied for the amount of *banknotes in circulation*, an item which only appears on the liability side of Norges Bank's balance sheet today, cf. Table 2.1 above.

Norges Bank's balance sheet, income accounts and profits, 1817-2021



(a) Mill. kroner



(b) Percentage of GDP

Figure 2.1 Norges Bank's balance sheet, 1817-2021. The thick blue line denotes the size of Norges Bank's balance sheet when we remove the *occupation account* and the *Government Pension Fund Global (GPF)*, which is referred to here as *oil fund*. We will refer to this interchangeably as the balance excl. occupation account and oil fund, or as the core balance of Norges Bank.

2.2 A long view of Norges Bank's balance sheet

Whereas foreign reserves in the early decades of the bank's history hovered at levels around one third of the total balance, this level gradually increased to a level of around one half of the balance in the latter part of the 19th century and until the dawn of World War I. This reflects that in the beginning, during the first part of the 19th century, note issuing regulations were such that the bank could issue notes in a ratio 2:1 to its silver reserves. The size of the balance sheet during the first half of the 19th century seems to confirm this. Later in the 19th century the note issuing regulations which determined the ratio of banknotes to reserves were relaxed. We will discuss more details on this later in this chapter.

The changes in the composition of Norges Bank's balance sheet also reflect transformations of the bank, which took place during the 19th century. In its early years up and until the early 1820s Norges Bank was *the* bank of issue and, in fact, the only bank in the country. When savings banks and commercial banks emerged, from 1822 and 1848 onwards, respectively, Norges Bank became one among many other banks, before it specialized and became a bank for the other banks around the turn of the century - in modern parlance *a central bank*.

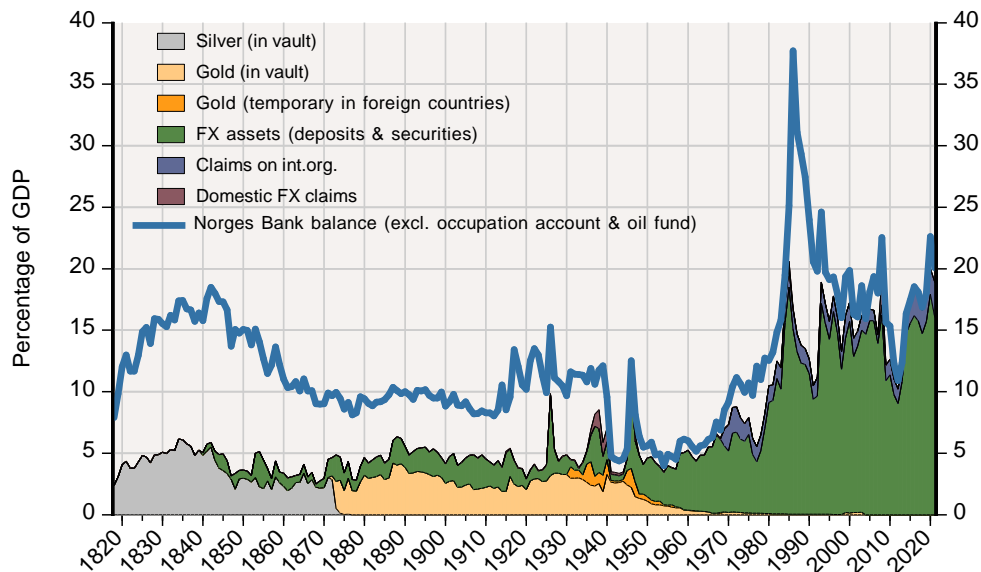


Figure 2.2 Norges Bank's balance sheet, 1818-2021 (in percent of GDP), excluding the occupation account and the oil fund, and with a crude decomposition of the bank's foreign exchange reserves in silver reserves, gold reserves and FX assets, respectively.

Assets

Figure 2.3 provides a bird's eye perspective of the asset side of Norges Bank's balance sheet across two centuries, in percentages of GDP and as percentage shares of the total balance sheet. We have excluded the oil fund after 1996 but we have included the occupation account from World War II onwards (1940-1981)⁶.

The birth of Norges Bank was drawn out in time. The legislation introduced in 1816 laid down principles which would only be satisfied several decades later. The time schedule turned out to be overly optimistic. The 1816 act stated that the bank's silver fund should be in place and lay the ground for resuming silver convertibility of the bank's speciedaler notes already from 1st January 1819.

Even under the alternative where the bank's silver fund had to be established through mandatory silver deposits from around 100 000 taxpayers it was assumed that the collection of silver would be finished by the end of 1818. Furthermore it was assumed that the interest-free loan Norges Bank would extend to the Temporary Riksbank, paid in new speciedaler notes issued by Norges Bank to facilitate the redemption of old riksbankdaler banknotes and make the changeover to speciedaler banknotes, would be fully amortized when ten years of tax installments had been paid in 1827.

The outcome was very different. The silver fund was not completed until 1827, the redemption loan was not fully amortized until 1836 and the resumption to silver convertibility was delayed until 1842.⁷

During the early years of its operations the annual statements from Norges Bank recorded in detail the collection of silver reserves for the mandatory bank fund (the silver fund), and, related to this, the necessary work involved in issuing shares of stocks and establish a register of the shareholders in Norges Bank. This work is also reflected in the fairly large volume of tables in the published accounts from the bank from 1819 onwards. The scramble for silver came at a time of crisis in the young nation, only a couple of years after the Napoleonic war had ended, a war which hit Norway as a country hard. The consequences of the war had hit different sectors of the economy rather asymmetrically and this was also the case across different geographical regions. The monetary system was in a state of chaos in the entire country and it was the task of Norges Bank to restore this system and build the necessary trust and confidence in the country's banknotes.

The south-eastern part of the country had suffered severely from a long drawn out crisis in the previously so prosperous timber industry. The economic conditions were more favourable along the long western coast of Norway, dominated by the fishing industry, which was in a much better shape. The deep crisis had severely reduced the income and wealth of the richest and the mandatory contributions came on top of a high tax pressure, which was imposed on the young nation.

Another issue which was also closely monitored in the published accounts of the bank concerned the amortization of the redemption loan which Norges Bank had granted to its predecessor, the

⁶ More on this in Section 2.5.

⁷ See Eitrheim, Klovland and Øksendal (2016b, Chapter 3) for a detailed discussion of the birth of Norges Bank and the thorny road to resumption.

2.2 A long view of Norges Bank's balance sheet

Temporary Riksbank. This loan funded the changeover from old riksbankdaler banknotes to new speciedaler banknotes issued by Norges Bank in 1818-1819. According to the plan this loan was supposed to be amortized linearly by a special tax on income over the next ten years. The amortization period stretched out and lasted until the mid 1830s. As the redemption loan was gradually brought down towards zero in this period this opened up for increased lending from Norges Bank to the general public (cf. the shrinking red area in the left part of Figure 2.3(b) during the 1820s.).

Metal reserves and other foreign exchange assets

Foreign reserves include both *metal reserves* and other *FX assets*. The latter include both *FX deposits* in foreign banks and holdings of *FX securities* (bills of exchange, bonds and equities).

Thus we distinguish between foreign reserves held as silver and gold in domestic vaults and foreign reserves held as deposits at Norges Bank's correspondents abroad, mainly key financial houses and banks in key financial centra in Europe. We have emphasized consistency of variable definitions between the Chapter 2 and Chapter 3 in order to facilitate comparisons.

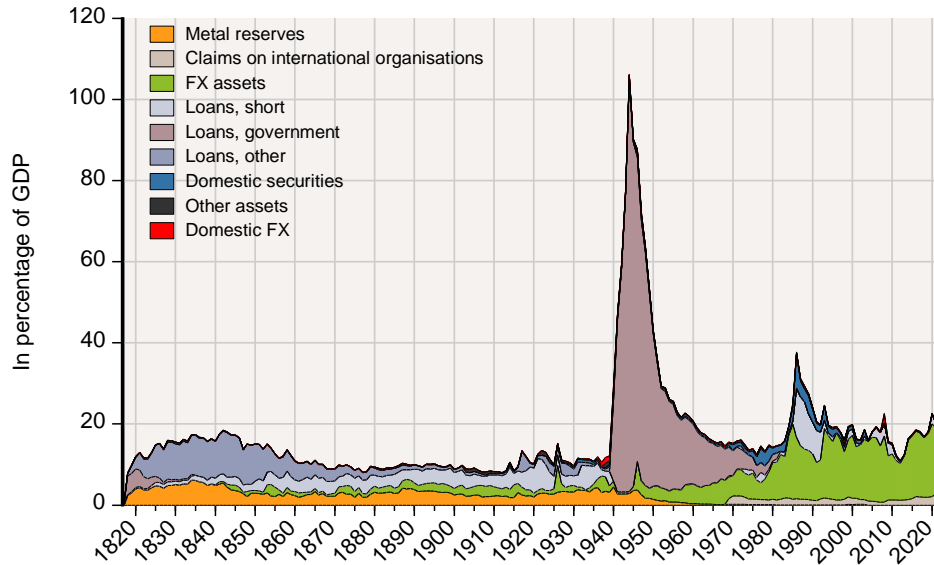
The data we present in Chapter 2 are derived from a top down process where we give priority to the data published in the bank's annual statements. In those statements the bank typically focused on total silver reserves, which from around 1840 also included holdings at Norges Bank's correspondent banks abroad. The sum of the bank's *metal reserves* and *FX assets* held abroad were also the legal foundation and statutory basis of the bank's issue of banknotes, largely until World War II, cf. the areas in gold and green in Figure 2.3. More on this in Section 2.4.

A further breakdown of foreign reserves into a more granular set of subcategories is presented in Chapter 3. For this we will need additional information typically found in the notes of the bank's annual reports. Thus, in Chapter 3 we have taken more of a bottom-up approach and collected data from numerous detailed sources, including the mentioned notes, in order to identify these subcategories.

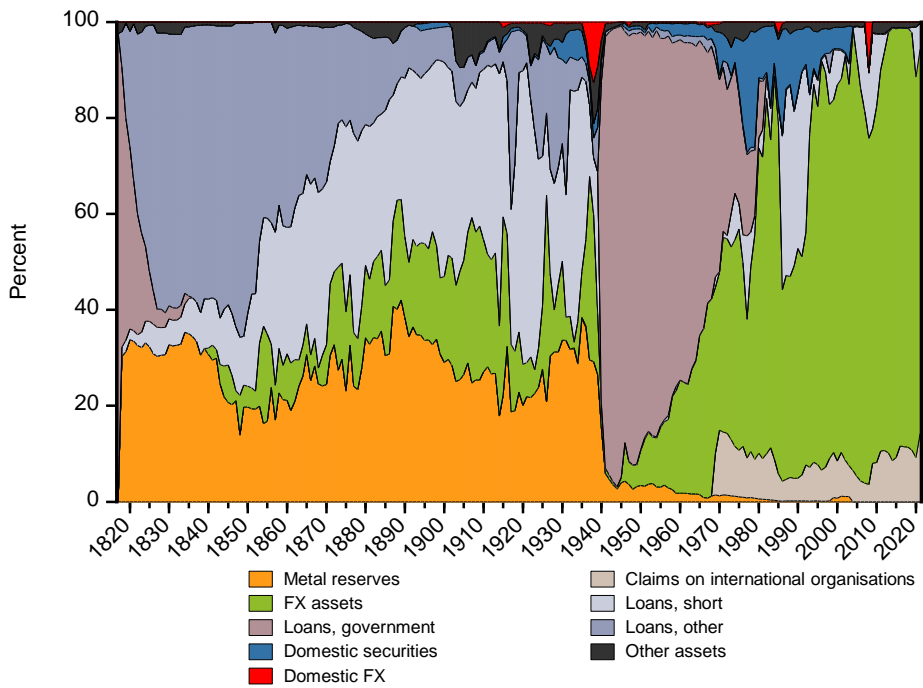
Mortgage and discount lending

The dominating form of lending from the beginning of operations was mortgage loans secured by property. These were gradually expanded in tandem as the redemption loan to the Temporary Riksbank was repaid. These loans were six-months loans which in practice were turned into long-term loans by being rolled over automatically every six months, and hence they prepared the ground for a quite illiquid loan portfolio. Figure 2.3 shows the developments in *short-term loans* in the form of discount lending and borrowing facilities (light gray area in Figure 2.3), and *other loans* in the form of mortgage loans (dark gray area in Figure 2.3). Contemporary writers in the early 1830s such as Jakob Aall and Anton Martin Schweigaard were both quite critical regarding this lending practice. Aall and Schweigaard engaged in a public debate on the state of monetary affairs in the country, which started in 1832. They shared the opinion that Norges Bank should have adhered to well-established principles of banks of issue internationally, which to a greater extent engaged in

Norges Bank's balance sheet, income accounts and profits, 1817-2021



(a) Assets relative to GDP



(b) Assets relative to total balance

Figure 2.3 The asset side of Norges Bank's balance sheet, 1817-2021

2.2 A long view of Norges Bank's balance sheet

short-term lending and the fostering of a well-functioning money market and a payment system centred on rediscounting short-term bills of exchange.⁸

It was not until the 1860s that short term discount lending became the largest and dominating form of lending from Norges Bank. At that time Norges Bank had become only one of many banks in the country. Savings banks emerged already from the early 1820s, the first one was Christiania Sparebank in 1822 and was soon followed by many more, but predominantly local savings banks. In 1848, spurred by the credit crunch caused by the 1847-1848 financial crisis, the first commercial bank Christiania Bank og Kredittkasse was established, which offered short term loans on bills of exchange issued by the new bank. More commercial banks were established in the largest cities during the late 1850s, spurred by the financial crisis which hit Hamburg in 1857, such as Bergen Privatbank, Den norske Creditbank and Privatbanken Trondhjem.⁹

Norges Bank also transformed its loan portfolio from mortgage lending to discount lending during the 1850s. A new state bank, a public mortgage bank (*Hypotekbanken*), was established in 1851 and had surpassed Norges Bank as provider of mortgage loans already in the early 1860s. During the 1850s and 1860s we also saw a rapid expansion of the private banking sector and Norges Bank was also surpassed by commercial banks and urban savings banks which also overtook the bulk of short-term lending against bills of exchange and bill bonds. These were important structural changes which marked the beginning of an epoch with rapid expansion in private banking in Norway during the latter half of the 19th century. Norges Bank took on a more withdrawn position in these markets, although Norges Bank continued to lend directly to the public. Its role as the banks' banker emerged only gradually, partly in response to crises, partly in response to maturing financial markets. In the wake of the Kristiania crash in 1899, Norges Bank opened the discount window for commercial banks for the first time. During the remaining years before World War I this activity increased and Norges Bank's rediscounting for the commercial and savings banks became the dominating part of Norges Bank's normal activity.¹⁰

Some main developments in Norges Bank's balance sheet

Norges Bank's loans to the general public expanded only gradually and were held back by the interest-free redemption loan, which funded the abovementioned redemption of the old riksbankdaler banknotes. As the redemption loan was subsequently amortized over the period 1819-1836, this opened for increased lending to the general public. This lending took, however, predominantly form of secured mortgage lending, which were routinely rolled over, and it can therefore *de facto* be seen as long-term lending. Short-term discount lending against bills of exchange remained a relatively

⁸ Although Aall and Schweigaard disagreed on the strategy and terms regarding the silver convertibility of Norges Bank's banknotes they shared these more critical views on the bank's lending practices. The original articles from this debate during 1832-1836 are available (in Norwegian) and may be downloaded from Norges Bank's web-site, see Norges Bank Occasional Paper No. 50 (Eitrheim, Eriksen and Sæther, 2016a).

⁹ See Eitrheim, Klovland and Øksendal (2016b, Chapter 4) for a detailed discussion of the financial breakthrough and expansion of private banks (savings banks and commercial banks) and state banks (Hypotekbanken) 1850-1870.

¹⁰ See Eitrheim, Klovland and Øksendal (2016b, Chapter 5 + 6) for a detailed discussion of the monetary developments in the periods 1870-1892 and 1892-1914, respectively.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

modest share of total lending. It was not until the mid-1860s that discount lending accounted for more than half of Norges Bank's total lending (Figure 2.3(b)).

Norges Bank's metal reserves formed the basis for the bank's note issuing capacity. In the early years silver reserves made up around one third of the total balance, which was in accordance with the note issuing regulations. After these regulations were made more flexible in 1842 the level of foreign reserves fluctuated between the low 20s and high 30s when measured in percent of the total balance. We recall that foreign reserves here include both silver reserves and *FX assets*. We provide more details about the construction of historical data for Norges Bank's foreign exchange reserves in Chapter 3

These early *FX assets* stemmed originally from the receipts from selling old and worn-out coins in precious metals (silver and gold), following a changeover of circulating coins which took place around 1840. In the latter half of the 19th century up to a third of the bank's reserves could be held in foreign banks. Gold reserves and FX reserves hovered around 50% of the balance during the gold standard period from the mid 1870s until 1914.

Following the Kristiania crash in 1899 Norges Bank served as lender of last resort to banks in need of liquidity. After the immediate crisis Norges Bank also managed the dissolution of one of the failed banks (Industribanken). As a consequence of the crisis *other assets* increased to around ten percent of Norges Bank's balance sheet (Figure 2.3(b)).

We note a huge spike in the item *other loans* in 1917 during World War I. This is due to the so-called *fish loan*, which Norges Bank accepted to grant for the purpose of financing fish exports to UK. We will touch upon this event in Chapter 6 where we provide an overview of historical data for central government revenues, expenditures and debt since 1815.

Both *short term loans* and *other loans* increased significantly during the interwar years. First, Norges Bank supplied liquidity to banks during the initial phase of the severe banking crisis which started already in 1920. Second, the increase in *other loans* can be explained by rediscount loans which the banks had originally granted the government subject to a rediscounting guarantee that the banks could turn to Norges Bank to rediscount the securities. The resumption policy of the 1920s also made a visible mark in the balance sheet. A currency stabilization fund (Valutakonsortiet) was established in 1926 with the purpose of purchasing foreign exchange reserves in an attempt to slow down the krone appreciation in 1926 (cf. the steep spike in the green area in 1926 in Figure 2.3). The attempt had limited success and the costs were mutually shared in a ratio of 1:3 between Norges Bank and the Ministry of Finance. Norway resumed gold parity at the pre-war level in 1928.¹¹

The item *domestic securities* appeared for the first time on the balance sheet short after the 1892-act was in place. Initially the bank held only small amounts but from the late 1920s there were significant increases and *domestic securities* accounted for more than five percent of the total balance in the early 1930s (dark blue coloured area).

The most significant development in the balance during World War II was the build-up of the

¹¹ See Eitheim, Klovland and Øksendal (2016b, Chapter 8.5, pp. 328-340) for a detailed account of this episode. The financial accounts of these interventions were originally recorded by the bank as domestic lending. We follow Klovland (2004, p. 197) and have recorded the assets of the currency stabilization fund (valutakonsortiet) as part of *FX assets*.

2.2 A long view of Norges Bank's balance sheet

occupation account to a level of more than 95 percent of the bank's total balance in 1945. In gross terms the liquidity injection amounted to more than 11 billion kroner, around 170 percent of the pre-war level of GDP. During the war around 3 billion kroner had been sterilized by government reimbursements, leaving a net value of 8.4 billion kroner by end of 1945, around 130 percent of pre-war GDP. We will return to this in Section 2.6 below.

The post-war period introduced financial repression followed by deregulation in the 1980s. The FX crisis in 1947 depleted *FX reserves* but represented the beginning of a long period of reserve accumulation. Short-term loans to banks increased in the late 1960s after the new borrowing facility was introduced. The collapse of the Bretton Woods regime in 1971 was followed by a period of significant krone appreciation, and a decline in the krone value of FX reserves. This was reversed in the late 1970s and was followed by a period with frequent devaluations during the years 1976-1986. Liquidity support to banks increased dramatically in 1986 when the banks lost a significant amount of their short term funding from foreign sources. The *short-term loans* to banks were scaled down first after the banking crisis was over in 1993.

Norges Bank purchased large amounts of government bonds during the downturn of the business cycle in the late 1970s which brought the share of *domestic securities* up to a level close to 25 percent of the balance. This was reversed and the share fluctuated between 10 and 15 percent most of the 1980s before it was brought even further down in the final 1990s. In 2003 there was a change in the Norges Bank Act which stated that the bank could no longer purchase government bonds in the first-hand market. Hence, from 2004 onwards there have been no *domestic securities* on the asset side of the bank's balance sheet.

From 1969 Norges Bank took on the claims on IMF on its balance sheet. This item has typically fluctuated between five and ten per cent of the balance sheet and has been stable around ten percent after the increases in the claims on IMF which followed after the global financial crisis in 2008. We also note that *FX reserves* and *claims on international organizations* taken together accounted for more than 95 percent of all assets before the Covid-19 pandemic hit in 2020.

The huge amount of liquidity which had been built up during the World War II years meant that Norges Bank did not extend much credit to private banks in the early post-war period. Its lending to private corporations continued, however, in particular in the northern regions, often in collaboration with private banks. Unfortunately, in the 1950s and 1960s the recorded loan items do not distinguish clearly between loans to financial institutions (*short term loans*) and loans to private (*other loans*). Therefore, *other loans* may contain loans to banks in the form of discount or overdraft lending, which we would have liked to record as *short term loans* prior to 1973, from which time the bank made this distinction more clear. A new borrowing facility for private banks was also introduced in the mid 1960s.

However, the share of *short term loans* to banks showed large temporary increases during crisis years in the post-war period. Firstly, from the mid 1980s onwards, secondly, during the global financial crisis 2007-2009, and, finally, during the Covid-19 pandemic in 2020 (cf. the gray areas in the right part of Figure 2.3(b)).

Liabilities and equity

The composition of Norges Bank's liabilities and equity is shown in Figure 2.4, which provides a bird's eye perspective of the liability side of Norges Bank's balance sheet across two centuries. We have excluded the oil fund after 1996 but we have included the occupation account and all offsetting items on the liability side from World War II onwards (1940-1981).

In the early years there were really only two items which dominated the liability side, notably around one third in *share capital* and more than 60 percent in *banknotes in circulation* and folio deposits.¹²

During the early years of Norges Bank's operations the country's payment system centred on the use of Norges Bank's banknotes and the amount of coins in circulation. From the mid 1820s it was also possible to use folio deposits to conduct payments between payers and payees in different regions of the country. A payer could make deposits in one branch and instruct the payee to receive the payment from another. Banknotes and folio deposits trended upwards until they accounted for around 90 percent of Norges Bank's total balance short before World War II broke out.

The composition of the liability side in the post-war period reflects what happened during the war, mapping the development of the offsetting items to the occupation account such as massive injections of banknotes and deposits by both private banks, private customers and the government. We will comment further on this development in Section 2.6 below and in Chapter 4.

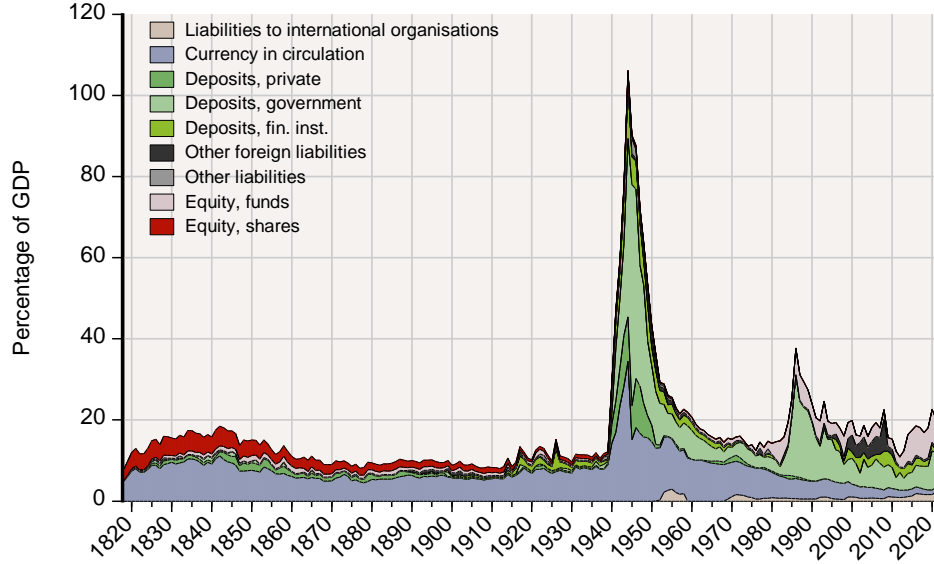
Banknotes in circulation

Norges Bank banknotes made up between 50 and 60 percent of the balance during most of the 19th century until the dawn of World War I. After some turbulent interwar years the share of banknotes showed an increase to around 70 percent of the balance when World War II broke out in 1939 (Figure 2.4(b)). The banknotes were originally denominated in *speciedaler*, introduced by the legislation which laid the foundation for Norges Bank and the monetary system in 1816. The *speciedaler* banknotes were immediately put in circulation through a changeover of old banknotes, which took place during 1818 and 1819. We discuss this in more detail in Section 2.3 below. When *kroner* was introduced as new currency unit from 1874 onwards there was a second changeover to banknotes denoted in *kroner*.

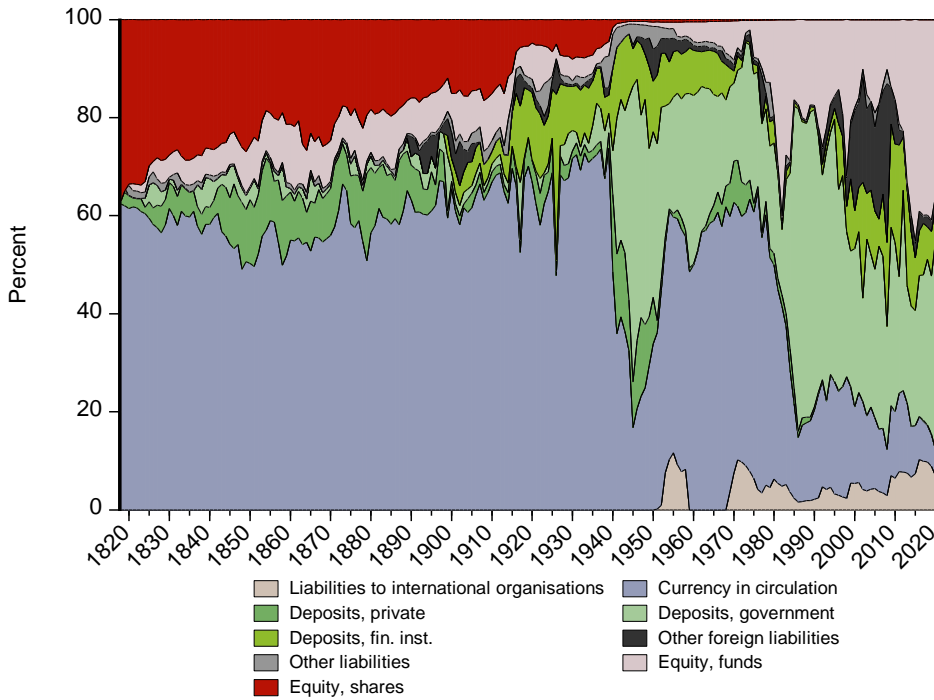
Figure 2.4(a) shows the massive increases in deposits and currency in circulation which took place during World War II. When the war was over a third changeover of banknotes took place in September 1945 in order to bring the monetary overhang down. We may note that banknotes in circulation (plus coins from 1962) have been on a steady downward trend relative to GDP through the entire post-war period, and this tendency has continued after the Covid-19 pandemic in 2021.

¹² We will discuss the years of transition from 1814 to 1819 in more detail in Section 2.3, starting with the years in which the former bank of issue, *The Temporary Riksbank*, first supplied the country with a significant amount of new banknotes before its doors were closed in 1816. We describe the changeover process in which different types of old banknotes in circulation were exchanged into new *speciedaler* banknotes issued by Norges Bank. This coincides with a description of how Norges Bank gradually developed to become a fully operational bank of issue during the years 1817-1819.

2.2 A long view of Norges Bank's balance sheet



(a) Liabilities relative to GDP



(b) Liabilities relative to total balance

Figure 2.4 The liability side of Norges Bank's balance sheet, 1817-2021

Folio deposits

When Norges Bank was founded in 1816 the customers had to pay a fee for holding deposits at the bank. From 1824 they also paid 0.1 per cent negative interest rate on top of this fee. From 1842 onwards the bank started to pay a positive interest rate of 2.5 percent on folio deposits. The bank's annual reports provide information about government deposits as well as the regional dispersion of folio deposits across the bank's different branches and offices, but we have only scarce and incomplete information about the distribution of folio deposits between private and public financial institutions and the private non-bank sector.

Folio deposits were initially quite low, less than five percent of the balance until the mid 1820s and fluctuated between five and ten percent of the balance in the late 1820s and 1830s. The bank's folio deposits saw a significant increase during the 1840s and fluctuated around 15 percent of the balance in the late 1840s and early 1850s and were on average 10 percent during the next 50 years until the dawn of World War I.

Norges Bank took on a more active role as the government's bank after the 1892-revision of the Norges Bank Act. Government deposits with the bank did however not increase significantly until World War II and the massive injection of liquidity which followed, see Figure 2.4(b) and Eitrheim et al. (2016b, Chapter 10). In the early post-World War II period we see that government deposits were a dominating item on the liability side of the bank's balance sheet for a number of years. We discuss this period in more detail in Section 2.6 below. In the first two decades of the 21st century government deposits have hovered around 20 percent of the balance whereas banknotes in circulation has continued along a downward trending trajectory.

Other liabilities

We have made a distinction between *other liabilities* (in kroner) and *other foreign liabilities*. The former consist of items from accounts such as unpaid dividends, unsettled losses and uncollected debt, to name a few examples. *Other foreign liabilities* appears for the first time in 1889 and denotes at that time debt to either Sveriges Riksbank or Danmarks Nationalbank (or both) under the clearing arrangement of the Scandinavian Currency Union (SCU).¹³ The increases in *other foreign liabilities* from 1993 onwards are due to increases in debt to foreign banks when Norges Bank started to use repurchase agreements (repos) as part of its management of foreign reserves (Aamodt and Lerbak, 2013, pp. 4-6). The accounting of this instrument expands the bank's balance sheet since the FX securities involved remain on the balance, whereas cash deposits (collateral) held in foreign banks are added to the item *FX assets* on the asset side. On the liability side the increased debt to foreign banks reflects the commitment to reverse these cash deposits when the repo agreement expires. The

¹³ The published accounts typically recorded this item on the asset side and eventual net debt to Sveriges Riksbank and Danmarks Nationalbank was deducted from the gold stock account. Since we have made a distinction between *metal* holdings and holdings of *FX assets* we have recorded claims on Sveriges Riksbank and/or Danmarks Nationalbank as bank deposits in *FX assets*. We have recorded eventual debt to Sveriges Riksbank and/or Danmarks Nationalbank in this period as *other foreign liabilities*. The total balance has been adjusted up accordingly in the years where this applies from 1889 until 1917.

2.2 A long view of Norges Bank's balance sheet

overall magnitude of repos were substantial in the late 1990s and early 2000s and accounted for almost 20 percent of the total balance before these instruments were scaled down around 2010.¹⁴

Equity, share capital and funds

The composition of Norges Bank's equity capital and its distribution between share capital and equity funds is shown in Figure 2.5 in percentages of the bank's balance, whereas Figure 2.6 and Figure 2.7 show Norges Bank's equity capital in percentages of GDP and its different subcomponents, respectively. Norges Bank's share capital accounted for around 35 percent of the bank's total balance sheet during its first years, and more than four percent of GDP at the time. This is a reminder of the significant extra financial burden the mandatory deposits implied, which were imposed on the country's population for the explicit purpose of funding the new bank of issue. Norges Bank was established as a privately owned bank, initially with a large number of shareholders. During the 19th century the number of shareholders decreased and the government's ownership increased when the share capital was increased during the early 1830s and in 1863 when the loan fund (of 1842) had reached its target level and the fund was converted into shares held by the government. This conversion is shown in Figure 2.5 as the red area, which denotes the size of the loan fund, disappears after 1862 and the share capital is increased correspondingly.

The bank's total equity remained a relatively stable fraction (around 35 percent) of the balance until the early 1870s. During the gold standard period, which lasted from the mid 1870s until World War I, we can observe a gradual decline in total equity, in percentage of the bank's balance. The equity share fluctuated around 25 percent from around the turn of the century. This was achieved, in part, by four rounds of injecting new share capital in 1900, 1908, 1912 and 1917, respectively. The equity share dropped when the bank's balance increased rapidly after World War I broke out in 1914. It fluctuated thereafter somewhat above 10 percent until the late 1930s when an upward shift in note circulation contributed to bring the equity share down to 7.5 percent of the total balance at the eve of World War II in 1940. We note, however, from Figure 2.5 that increases in the bank's profits due to this expansion of the balance sheet had led to substantial increases in the bank's equity funds, see for example the expansion of general provisions (cyan-coloured area) during the war and the early post-war period. These equity funds represented a buffer which was soon depleted when the bank suffered huge losses during the banking crisis during the first half of the 1920s (Eitrheim et al., 2016b, Chapter 8.3).

Although the recorded equity was intact in nominal terms after World War II the reality was that the bank's equity was deep in the negative given that the occupation account had only illusory value. It had been serviced to a certain degree during the war years through transfers from the Ministry of Finance. We discuss this in more detail in Section 2.5.

¹⁴ The bank also started to use reverse repos in their reserve management in the early 1990s. This instrument only affects items on the asset side of the balance sheet and does not expand the balance sheet. Furthermore, in this study these items are all elements *within* the aggregated item *FX assets*. Thus, the use of reverse repos as part of the bank's management of its foreign reserves leaves the total *FX assets* unchanged and is not detectable in the decomposition of the balance sheet we present in this chapter, cf. Table 2.1 above. See Aamodt and Lerbak (2013) for more details. We will return to this in Chapter 3.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

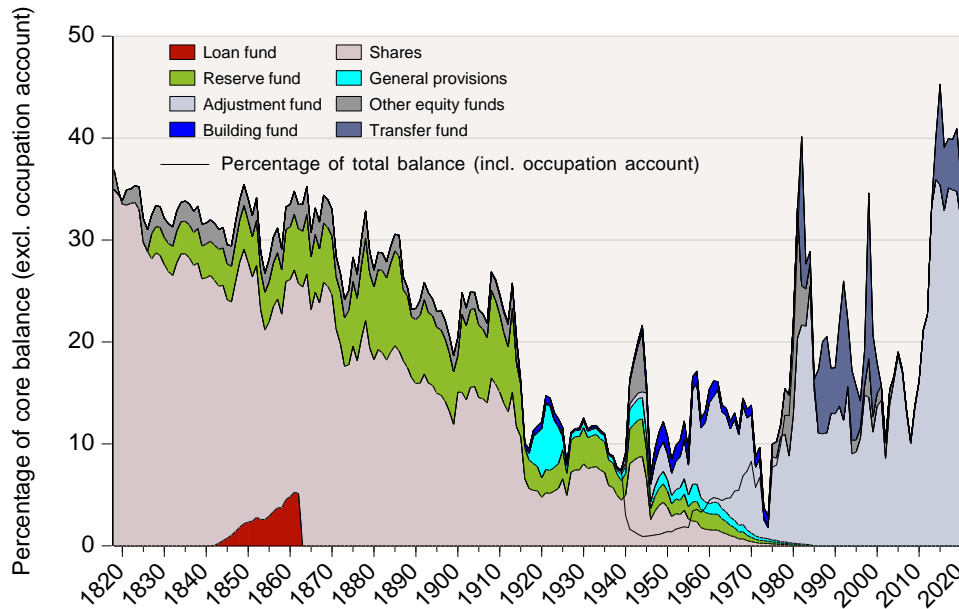


Figure 2.5 Norges Bank's equity (in percent of balance excl. the occupation account), 1817-2021. A thin line shows equity in percent of balance incl. the occupation account.

After World War II the equity share measured in percent of the balance excl. the occupation account remained around 10 percent until the mid-1950s, rising to a somewhat higher level up towards 15 percent until 1970 before the equity share plunged and reached its lowest level at three percent in 1974. This period coincided with a period with appreciation of the krone, which led to a fall in the krone value of foreign exchange reserves. The following decade with frequent devaluations implied a reversal in the equity ratio, which rose to a maximum of 40 percent in 1982. A rapid expansion of the balance contributed to a decline in the equity ratio which hovered around 20 percent in the 1990s before a new spike was reached in 1998 after a year with strong depreciation of the krone. The equity ratio showed a decline in the following years and in 2002 a decision was made to increase the target equity ratio such that it would correspond to a maximum of 40 percent of international reserves. We will see in the following section how this decision affected the transfers of Norges Bank's earnings to the government.

2.2 A long view of Norges Bank's balance sheet

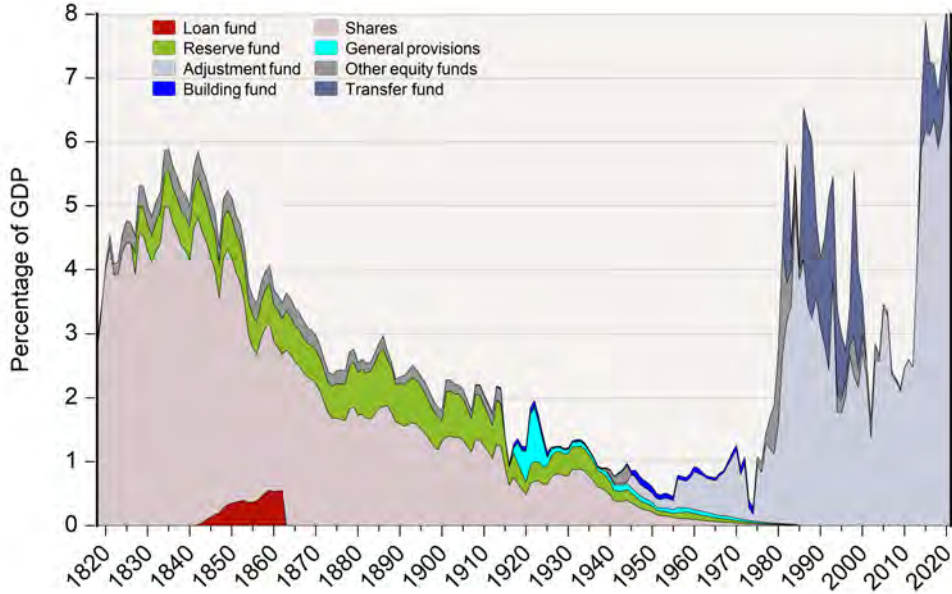


Figure 2.6 Norges Bank's equity (in percentage of GDP), 1817-2021

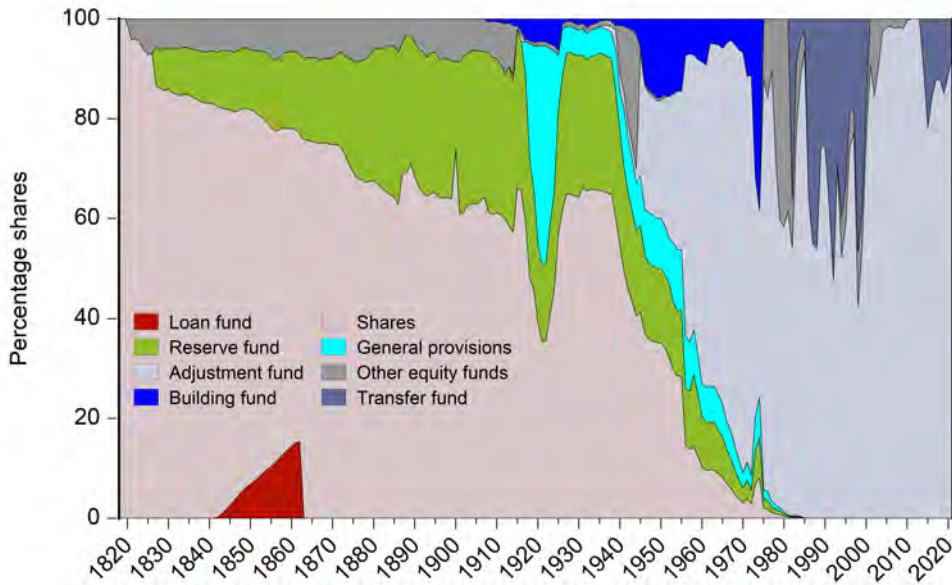


Figure 2.7 Norges Bank's equity composition between share capital and various funds and provisions (in percentage shares), 1817-2021

Income accounts and profits

The Executive Board published extracts from Norges Bank's accounts for the first time in 1820.¹⁵ The bank's Supervisory Board had voiced their reservations regarding this move towards more openness about the bank (Rygg, 1918, p. 179), but the prevailing view held by the bank's directors was that it would strengthen the bank's credibility to regularly show that the bank was on a route to achieve its targets. The publication of the accounts would also, it was thought, speed up the process of collecting the remaining silver deposits.

The following sections provide a bird's eye perspective on Norges Bank's main sources of net earnings and the distribution of profits to shareholders and to the government. A broad view of the developments in the bank's net earnings and distribution of profits over the past two centuries are shown in Figure 2.8. The main components of the bank's revenues, expenditures and profits are shown in the top (2.8(a)) and the distribution of the bank's profits in the bottom (2.8(b)). All data items have been scaled and are expressed in percentage points of GDP.

The bank's income statement in this study is divided into six categories. We distinguish between *operating income* and *operating expenditures* (negative), *domestic* and *foreign net financial income*, respectively, *exchange rate and other adjustments* and *financial losses*.

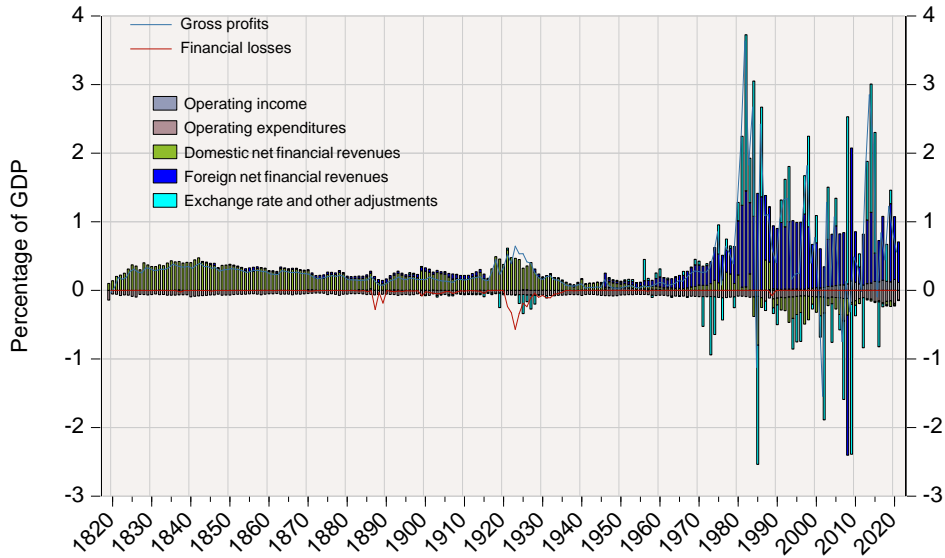
The published annual reports from the bank are the main source of these historical data series for the six categories. Operating expenditures include costs of banknote production as well as costs of the bank's administration across its many regional branch offices. In the 19th century net financial income arose predominantly from domestic lending (green bars in Figure 2.8(a)). This changed as foreign exchange reserves were accumulated during the 1950s and 1960s. Foreign net financial revenues then became the largest source of income (blue bars).

We note from Figure 2.8 that the volatility of the items in the income accounts in the post-Bretton Woods period from the early 1970s onwards is of a larger order of magnitude. After the collapse of the Bretton Woods regime in 1971 we have seen significantly higher volatility in the bank's gross profits. One major source behind this is the effect on the bank's profits from increasing exchange rate volatility during the period with floating exchange rates in the first half of the 1970s and the following decade with frequent devaluations of the Norwegian krone from 1976 to 1986. But there were also contributions to this volatility from value adjustments in the bank's holdings of foreign securities, as the cyan-coloured areas in Figure 2.8(a) show.¹⁶

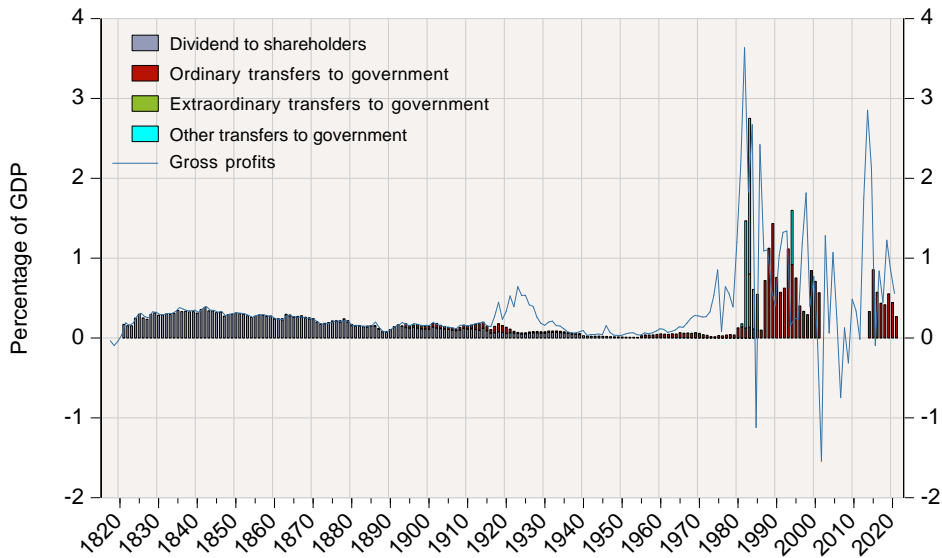
¹⁵ See newspaper extract in *Den norske Rigstidende*, 1820 no. 37.

¹⁶ In the postwar period we have noted a couple of instances of changes in the way exchange rate and other adjustments were recorded in the bank's annual account. We will comment on this in a later paragraph. Between 1975 and 1982 the annual reports did not distinguish between exchange rate changes and changes in the market valuation of foreign securities. Starting with the bank's Annual Report for 1983, however, these items were reported separately and we have consequently recorded changes in the market valuation of foreign securities as part of the item *foreign net income* from 1982 onwards.

2.2 A long view of Norges Bank's balance sheet



(a) Revenues, expenditures, losses and profits



(b) Distribution of profits

Figure 2.8 Norges Bank's net earnings (top) and distribution of profits (bottom) across two centuries, in percentage of GDP

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Norges Bank's accounts are recorded in kroner whereas the dominating use of funds during the post Bretton Woods period has been as international reserves in a broad portfolio of foreign exchange assets, which is converted into kroner in the balance sheet accounts. The accounting principles for the recording of exchange rate changes have varied over time. From 2011 onwards the bank follows the IFRS standard and report its asset allocation in kroner using current market observations of exchange rates. In periods when the krone has appreciated we will typically see a marked negative shift in profits, and a negative contribution from exchange rate changes whereas in periods when the krone has depreciated we observe positive shifts in recorded profits. The composite historical data series shown in this section have also been tabulated in Appendix 2.A and Appendix 2.B, respectively. Table 2.A.4 shows data for net domestic and foreign earnings, operating income and expenditures, gross profits, dividends, transfers and losses, all measured in speciedaler during the period 1817-1876. This format makes it easy to check the tabulated data against those published in Norges Bank's annual reports in this period. Table 2.B.4, on the other hand, shows consolidated composite data for the same variables measured in million kroner for each year since 1817.

As we have mentioned Figure 2.8 shows huge variations in the volatility of profits before and after the breakdown of the Bretton-Woods system in the early 1970s. This is to a large extent a consequence of changes in the exchange rates. This makes it also difficult to inspect details in these figures. In the following we will therefore zoom in on developments in the main elements of the income accounts and the distribution of profits before and after 1970 in Figure 2.9 and Figure 2.10, respectively.

Figure 2.9(a) shows the developments in key aggregates of the bank's income statement before 1970. The figure show items such as operating income and operating expenditures (negative), net income from domestic and foreign financial instruments, respectively, financial losses as well as adjustments for changes in exchange rates and market values of securities.

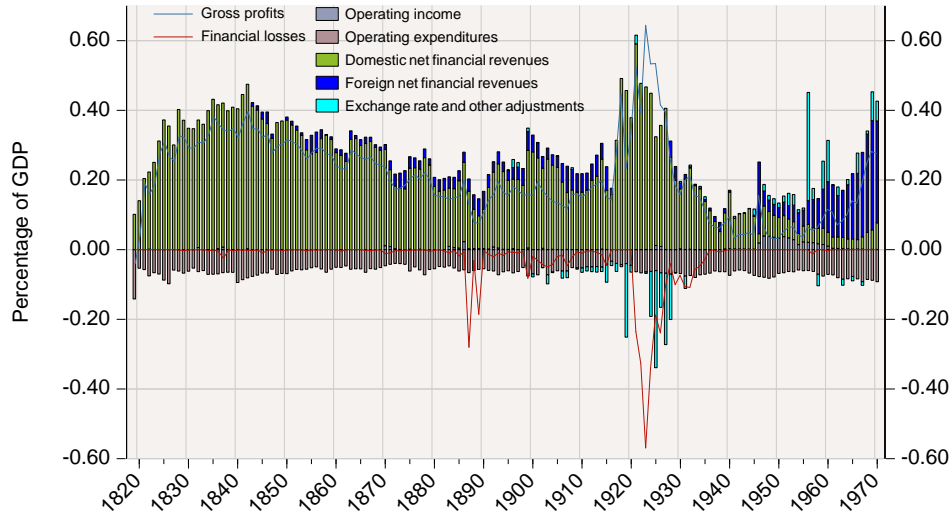
The main source of revenues through the entire period before World War II has been domestic net financial revenues (green bars in Figure 2.9(a)). After World War II the main source of revenues has been foreign net financial revenues (blue bars in Figure 2.9(a) and Figure 2.10(a)).

Norges Bank's financial losses have been of a significant magnitude relative to GDP during two episodes only, one in the late 1880s and one during the systemic banking crisis of the 1920s (red line in Figure 2.9(a)).

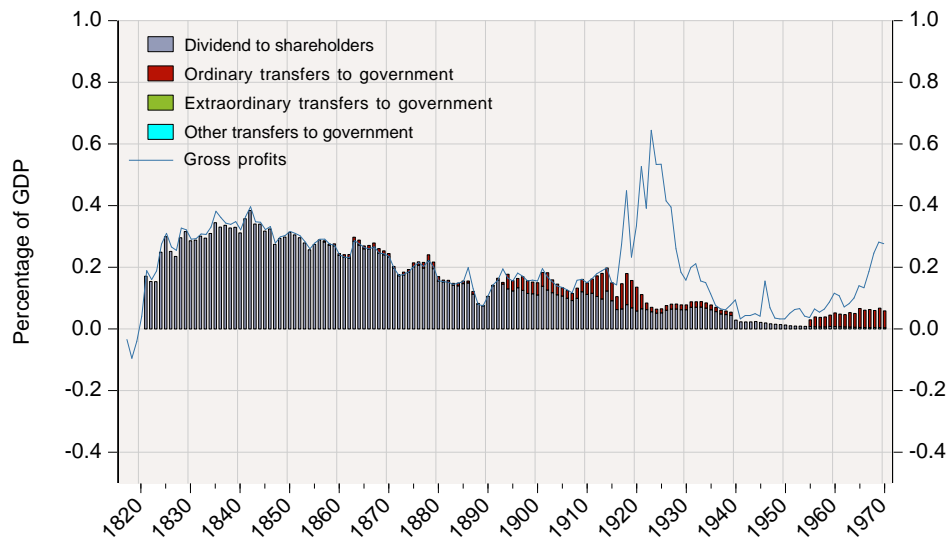
There were also frequent adjustments for changes in securities values and exchange rate changes. Some of these adjustments were made directly on the bank's balance sheet and were not recorded in the bank's accounts for profits and losses. We have pooled these adjustments together as exchange rate and other adjustments (cyan-coloured bars) in Figure 2.9(a) and Figure 2.10(a), respectively.

In this study we have tried to register such adjustments as they were recorded and appeared in the bank's annual report, sometimes in notes to the published accounts for profits and losses and in the balance of the bank's equity funds, such as the *Reserve fund* and the *Adjustment fund*. For some years, however, such as 1920, the text in the bank's annual report indicates that the profit account was recorded net of exchange rate adjustments, but their size remains unknown.

2.2 A long view of Norges Bank's balance sheet



(a) Revenues, expenditures, losses and profits



(b) Distribution of profits

Figure 2.9 Norges Bank's net revenues and distribution of profits (in percentage of GDP), 1817-1970

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Before World War I these adjustments were quite small. This changed during the war. The profit and loss account reported large negative adjustments in 1919 as UK, US and Swedish reserves were recorded at par exchange rates. There were also large negative adjustments during the years with "parity policy" 1924-1928 when the exchange rate appreciated to its pre-war level against gold.¹⁷

During the 1950s and 1960s we observe several years with positive effects from exchange rate and other adjustments. In some years, such as 1956, the bank made large positive adjustments in the recorded valuation of gold and domestic and foreign securities. The Executive Board and the Supervisory Board decided that information about hidden reserves stemming from the bank's gold and securities portfolio in accounts such as "agio from gold and FX trade", which had been accumulated as "other liabilities" since 1931, should be made publicly available. There were also substantial hidden reserves in the bank's recorded holdings of domestic and foreign securities, which were due to conservative bookkeeping of capital gains. But from 1956 onwards securities were reported at current market prices. The changes in accounting principles in 1956 led to significant increases in the bank's equity funds.

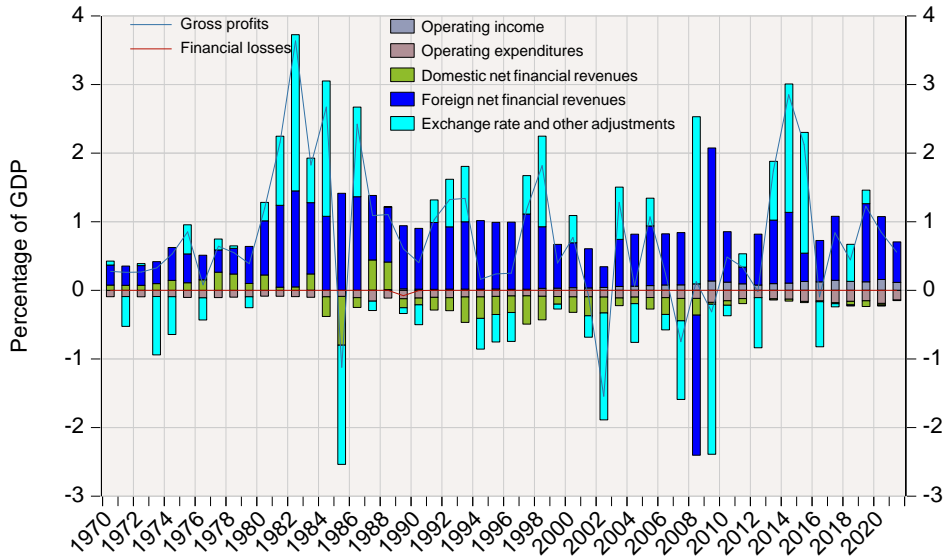
The distribution of profits is shown in Figure 2.9(b) and Figure 2.10(b). The main component of this distribution before World War I was dividend to shareholders. From the late 1850s the government would also receive ordinary transfers as stipulated in amendments to the Norges Bank Act. When the 1892 Norges Bank Act was implemented in 1893 these ordinary transfers increased significantly. Whereas almost all profits were distributed to the shareholders and the government before World War I, this changed during the war when the size of the bank's balance sheet expanded due to increases in domestic credit following large inflows of gold and FX reserves. Gross profits increased significantly during the following years and residual profits after distribution to shareholders and the government was allocated to different equity funds as illustrated in Figure 2.9(b). After the nationalization of Norges Bank in 1949 the bank's share capital was held by different public funds, and these would continue to receive dividends on these shares each year until 1985 when a revised Norges Bank Act was put in effect.

After World War II there were only recorded financial losses of a significant magnitude in 1989, which were due to losses on unsecured loans to a couple of banks in the early phase of the emerging banking crisis (Figure 2.10(a)).

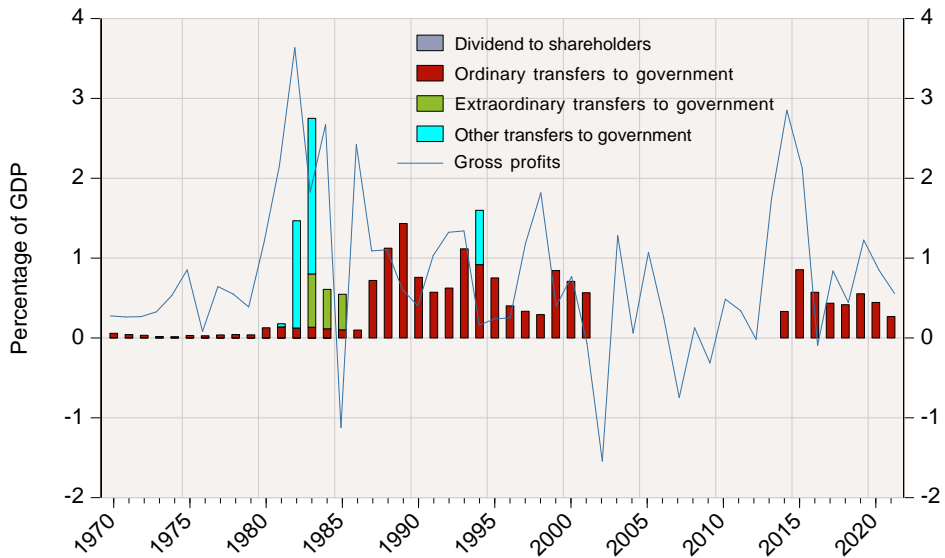
Figure 2.10 shows that transfers to the government increased significantly in the 1980s and hovered around an average level around 0.5 percent of GDP. In the 1970s these were typically ordinary transfers according to similar principles as had been established in the agreement between the bank and the Ministry of Finance in the mid-1950s. In the early 1980s there were also other types of transfers to the government, for example in 1982 when the occupation account was written off against a reduction of the bank's equity funds and in 1983 when the bank financed a downpayment of the government's foreign debt. During 1983-1985 there were also extraordinary transfers to the government. The final extraordinary transfer we have recorded took place in 1995 when Norges Bank and

¹⁷ See Eitheim, Klovland and Øksendal (2016b, Chapter 8.5, pp. 328-340) for a detailed account of this episode and how Norges Bank and the Ministry of Finance made attempts to slow down the currency appreciation by establishing a currency stabilization fund (Valutakonsortiet) which was used for interventions.

2.2 A long view of Norges Bank's balance sheet



(a) Revenues, expenditures, losses and profits



(b) Distribution of profits

Figure 2.10 Distribution of Norges Bank's profits (in percentage of GDP), 1817-2021

Norges Bank's balance sheet, income accounts and profits, 1817-2021

the Ministry of Finance agreed to establish a hedging portfolio (the *immunization portfolio*) with a currency composition and maturity which matched that of the government's foreign debt. Exchange rate losses (gains) on the immunization portfolio were offset by exchange rate gains (losses) on the government debt.

From 1986 onwards there were new guidelines in place regarding the distribution of profits. The maximum size of the adjustment fund was reduced from 25 percent to 20 percent of the bank's foreign exchange reserves and domestic securities. Residual profits after allocation to the adjustment fund were to be allocated to a transfer fund, from which smoothed transfers to the government would be made with a lag. In 2002 it was decided that the adjustment fund should be increased until it reached a new maximum of 40 percent of the bank's foreign exchange reserves plus 5 percent of domestic securities. We see from Figure 2.10 that there were no ordinary transfers to the government during the period 2003-2013. From 2014 onwards, after the new maximum level of the adjustment fund was reached, there have been ordinary transfers to the government each year. The average level has been around 0.5 percent of GDP.

2.3 The beginning. Transition years 1813-1819

The Dano-Norwegian Riksbank had been established as a new bank of issue in 1813 in an attempt to restore the monetary system in Denmark-Norway after the Napoleonic wars. One of its first tasks was to initiate a changeover of banknotes. All the various types of notes which had been issued in the old pre-war currency units, such as *riksdaler courant*, should be exchanged into banknotes issued by the Riksbank in its new currency unit called *riksbankdaler*. After the union was dissolved the Norwegian branch of the common Dano-Norwegian Riksbank was in May 1814 elevated by the Constitutional Assembly at Eidsvoll to become Norway's Temporary Riksbank. The Temporary Riksbank continued to function as Norway's bank of issue until it was terminated short after Norges Bank was established in 1816.¹⁸

We have included a brief description of the termination process of the *Temporary Riksbank* including a more detailed account of the changeover from the old currency unit *riksbankdaler* to the new currency unit *speciedaler*, which were issued by Norges Bank as the country's new bank of issue from 1817 onwards. This has also allowed us to provide new estimates of the total stock of money in circulation in Norway during this period of transition from 1813 to 1818, before Norges Bank became fully operational.

The changeover from riksbankdaler banknotes to speciedaler banknotes

The Temporary Riksbank of Norway played an important part due to its role in the changeover from riksbankdaler to speciedaler during 1818-1819. This changeover was financed by a large interest-

¹⁸ See Section 2.3 below and Section 4.3 in Chapter 4 for more details about the transition process from the Temporary Riksbank to Norges Bank and the changeover of banknotes from riksbankdaler to speciedaler as new currency and unit of account.

2.3 *The beginning. Transition years 1813-1819*

free loan from Norges Bank to the Temporary Riksbank, which was to be amortized through annual installments paid by a special tax over a period of ten years. This redemption loan appeared as an asset on Norges Bank's balance sheets in 1817-1836 with the text "The Temporary Riksbank of Norway: For installments of the loan for the redemption of riksbankdaler banknotes." In the first years the size of the Temporary Riksbank's loan effectively restricted Norges Bank's other loan activities. It took also much longer than ten years before the loan was fully amortized. The bank's silver reserves placed a tight limit of the total amount of speciedaler notes the bank could issue and consequently also limited the amount of new loans the bank could grant for other purposes (Rygg, 1918, p. 163).

In this study we have estimated both the original and the final size of the changeover loan. First, the size of Norges Bank's loan to the Temporary Riksbank is calculated on the basis of the balance sheet of the Temporary Riksbank's accounts, which was reported on the date of its dissolution 24 August 1816.¹⁹ We follow the redemption of this loan over the following 18 years as it appeared on the asset side of Norges Bank's balance sheet. The complete cash flow regarding the redemption loan is shown in Table 2.4.

The Temporary Riksbank originated from the Christiania branch of the Dano-Norwegian Riksbank which was established in January 1813. The bank operated as an independent Norwegian public bank after the Kiel peace treaty in 1814, and was renamed as the Temporary Riksbank by the Constitutional Assembly in May 1814. As the name indicates, it was to be replaced by a new bank at a later stage. Norges Bank was established in 1816.

The Temporary Riksbank issued riksbankdaler for the changeover of the old Danish notes and monetary representatives that were circulating in Norway at the time. This changeover from old pre-war riksdaler courant notes to new riksbankdaler notes took place from 1813 onwards and at the ratio of 6 to 1. When Norges Bank was established in 1816, its first task was to carry out a second changeover from riksbankdaler notes to new speciedaler notes issued by Norges Bank at the ratio of 10 to 1. In accordance with the acts of 14 June 1816, under which the monetary system was to be reconstructed, the operations of the Temporary Riksbank were exclusively limited to conduct this changeover of old riksbankdaler notes (§9) before closing its operations. On top of that §10 stipulated that the circulating amount of riksbankdaler notes should under no circumstances be increased, whereas §13 stated that by the end of 1817 all riksbankdaler notes should have been exchanged for new speciedaler notes. These paragraphs refer to the Act of Monetary Affairs [Lov angaaende Pengevæsenet] of 14 June 1816.

The following estimation of the changeover of banknotes is based on available information, admittedly both incomplete and scattered, in Rygg (1918) and supplemented with information from Norges Bank's accounts and extracts from newspapers. Quarterly estimates of the different types of banknotes which circulated in Norway in the period 1813-1821 are shown in Table 2.5.

Figure 2.11 provides a graphical illustration of the changeover from old types of paper money

¹⁹ The end balance of the Temporary Riksbank on 24 August 1816 was published in a newspaper extract in 1818. See *Den Norske Rigstidende* No. 45, 6 June 1818.

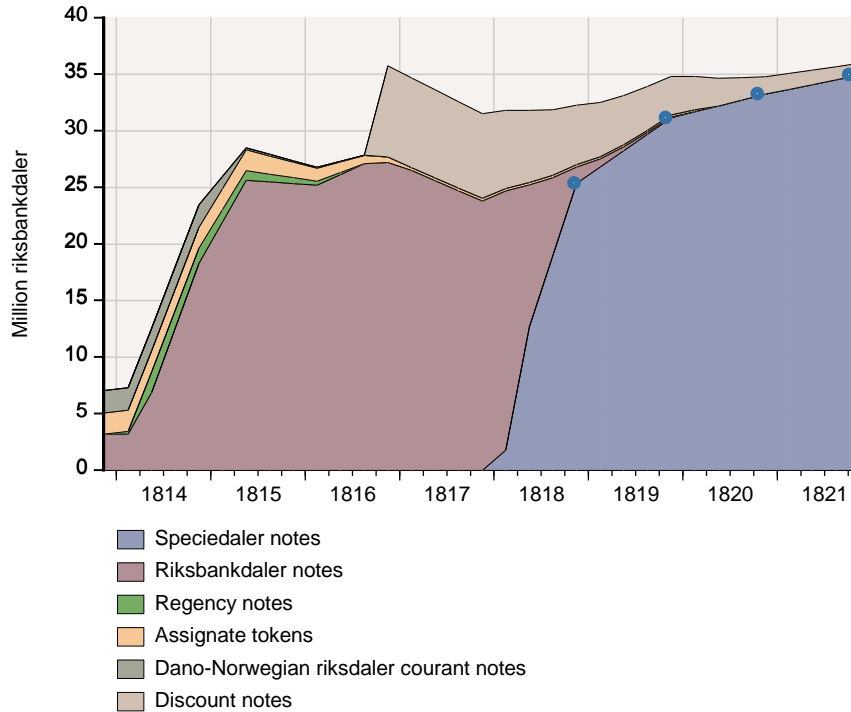


Figure 2.11 Changeover from riksbankdaler to speciedaler, quarterly data 1814-1821 (in million riksbankdaler).

Sources: Rygg (1918, Appendix I, pp. 363-73), The blue dots denote observations of speciedaler banknotes in circulation reported in the annual statements from Norges Bank from 1818 onwards.

to speciedaler banknotes. During the years 1813-1821 the numerous old types of paper notes were gradually eliminated from circulation.

The practical procedure of the changeover was that the Temporary Riksbank received shipments of new speciedaler notes from Norges Bank, which were subsequently recorded as a loan to the Temporary Riksbank on the asset side of Norges Bank's balance sheet. Holders of the old riksbankdaler could then redeem their notes into new speciedaler notes at the location of the Temporary Riksbank. We recall that the redemption loan was to be amortized over ten years by a special tax on income and wealth. We can therefore view the redemption loan from Norges Bank as a loan to the government (Lie, Kobberrød, Thomassen and Rongved, 2016, p. 38).

During the first years of Norges Bank's operation the redemption loan was definitively its largest asset, with a value of up to half its total balance. The books of the Temporary Riksbank were formally closed on 24 August 1816, but it was not until 31 July 1820 that all commercial operations came to a halt. The further closure was conducted by three commission agents for the realisation of the remaining assets. The redemption loan was not fully amortized until 1836, see further details below.

The banknote changeover picked up speed in March/April 1818, after the Temporary Riksbank

2.3 The beginning. Transition years 1813-1819

had received new banknotes worth around 780 000 speciedaler in shipments from Norges Bank (Rygg, 1918, p. 161). We have aligned the estimated changeover data such that it matches Norges Bank's end-of-year balance sheet from 1818 onwards. The bulk of the changeover took place in 1818 and we have assumed as an approximation that it had been completed in 1820 as shown in Figure 2.11.

The dismantling of the Temporary Riksbank

The Norges Bank Act stated in §18 that "... the bank ... should grant to the Temporary Riksbank a sufficiently large loan in banknotes and divisionary coins as required for the redemption of riksbankdaler notes [author's translation]". What was the required size of this redemption loan? It may not be straight forward to see how the size of Norges Bank's loan to the Temporary Riksbank was determined at the time. Our estimate is based on the information given in the audited balance sheet of the Temporary Riksbank at the time of its closure on 24 August 1816 as it appeared when it was published in a newspaper, *Den Norske Rigstidende*, No. 45, 6 June 1818 (Figure 2.12). The balance is reproduced in Table 2.2 below stated in million riksbankdaler.

Figure 2.12 Temporary Riksbank balance sheet 24 August 1816 (in riksbankdaler). Source: Den Norske Rigstidende No 45, 6 June 1818.

Table 2.2: The Temporary Riksbank's balance sheet 24 August 1816 (in million riksbankdaler). Source: Den Norske Rigstidende No 45, 6 June 1818.

<i>Assets</i>		<i>Liabilities</i>	
Claims on the government	19.9	Riksbankdaler banknotes (stock)	31.4
Redeemed older Dano-Norwegian notes	5.9	Miscellaneous creditors	0.1
Claims on the Danish Riksbank (bills of exchange)	0.8	Gains and losses	0.2
Claims on domestic branches and redemption agents	0.4		
Riksbankdaler banknotes in vaults	4.3		
Expenditure account	0.4		
Total	31.7	Total	31.7

2.3 The beginning. Transition years 1813-1819

We estimate the maximum size of the redemption loan to the Temporary Riksbank starting with its debt to the holders of riksbankdaler banknotes in Table 2.2 and deduct holdings of such banknotes in vaults, branches and redemption agents as well as claims on the Danish Riksbank and other good claims that Norges Bank is assumed to have taken over. This amounts to $31.4 + 0.1 - 4.3 - 0.8 - 0.4 = 26.0$ million riksbankdaler.

The counterpart in the accounts to this loan estimate is the Temporary Riksbank's claim on the government, including the nominal value of old withdrawn monetary representatives less the bank's capital (income minus expenditures), which amounts to $19.9 + 5.9 + 0.4 - 0.2 = 26.0$ million riksbankdaler in Table 2.2.

This estimate of the maximum redemption loan is very close to the largest loan amount recorded in Norges Bank's accounts, 2 599 688 speciedaler (≈ 26.0 million riksbankdaler), which was recorded in 1819 (see Table 2.4 below and Table 2.A.1 in appendix 2.A).

Table 2.3: Riksbank balance sheet 30 May 1818 (in million riksbankdaler).
Source: Rygg (1918, p. 371)

<i>Assets</i>		<i>Liabilities</i>	
Claims on the government	18.8	Riksbankdaler banknotes (stock)	24.9
Redeemed Dano-Norwegian notes	6.8	Miscellaneous creditors	0.1
Claims on the Danish Riksbank (bills of exchange)	0.8	Norges Bank	15.4
Domestic branches and redemption agents	0.0	Redemption tax	1.4
Speciedaler banknotes in vault	12.9	Gains and losses	0.2
Misc. claims (incl. Dir. Thrane, 0.9 mill rbd)	1.7		
Riksbankdaler banknotes in vault	0.4		
Expenditure account	0.6		
Total	42.0		42.0

A snap-shot of the changeover by the end of May 1818 is shown in Table 2.3. The table shows the balance of the Temporary Riksbank as this was reported to the parliament by 30 May 1818 (Rygg, 1918, p. 371). We note that the Temporary Riksbank's banknote debt was brought down from 31.4 million riksbankdaler in August 1816 to 24.9 million riksbankdaler by the end of May 1818. In the same time the debt to Norges Bank had increased to 15.4 million riksbankdaler (1.54 million speciedaler), of which 12.9 million riksbankdaler in speciedaler banknotes were still held in the vaults of the Temporary Riksbank.

If we look at this changeover from the perspective of Norges Bank's balance sheet, it could be said that Norges Bank included on the liabilities side of its balance the value of the Temporary Riksbank's net commitments (the riksbankdaler banknotes debt adjusted for claims). These commitments were balanced by an equivalent claim on the government on the asset side.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.4 show the complete cash flow for the *redemption loan*. The data have been reproduced from Norges Bank's annual balance sheet and notes in the annual reports which show Norges Bank's accounts 1817-1836. The final installment of the redemption loan was paid back in 1836.²⁰

Table 2.4: Estimated cash flow (in speciedaler) for Norges Bank's redemption loan to the Temporary Riksbank and its total lending to the government, 1817-1836. Source: Annual balance sheets for Norges Bank 1817-1836

Year	Gross loan to the Riksbank	Installments & claims to/from the Riksbank	Redemption taxes paid	Postage	Net loan to the Riksbank	1828-loan	Total government loans
1817	178 000				178 000		178 000
1818	2 473 784		-98 220	455	2 376 018		2 376 018
1819	2 599 688		-185 359		2 316 109		2 316 109
1820	2 547 415		-212 267	1 271	2 052 840		2 052 840
1821	2 547 415	-83 745	-204 107	1 827	1 765 544		1 765 544
1822	2 463 670	-102 555	-242 363	2 638	1 421 436		1 421 436
1823	2 361 115	-9 019	-233 446	3 328	1 179 662		1 179 662
1824	2 352 096	-5 211	-238 056	3 973	937 040		937 040
1825	2 346 885	-2 331	-245 669	4 456	689 523		689 523
1826	2 344 554	-1 818	-222 958	4 909	465 200		465 200
1827	2 342 736		-199 833	5 320	265 779		265 779
1828	2 342 736		-126 968	5 579	139 068	150 000	289 068
1829	2 342 736		-64 114	5 708	75 085	150 000	225 085
1830	2 342 736	-145	-13 418	5 736	61 549	150 000	211 549
1831	2 342 591		-6 444	5 744	55 113	150 000	205 113
1832	2 342 591	937	-2 403	5 744	53 648	150 000	203 648
1833	2 349 273		-2 961	0	50 686	150 000	200 686
1834	2 349 273	1518	-8 333	0	43 872	150 000	193 872
1835	2 350 791	152	-7	0	44 017		44 017
1836	2 350 942		-45 574	1 557	0		0

²⁰ In the period 1828-1834 the government loan data series also include a secured loan of 150 000 speciedaler in Norges Bank (see Table 2.A.1 in Appendix 2.A). This loan was used by the government as part of their funding of the first state banks in Norway, the government discount commissions (Rygg, 1918, p. 212). A foreign loan had been approved by the parliament in their extraordinary session in 1828. Of this loan 100 000 speciedaler was used to fund the discount commissions and the rest to increase Norges Bank's silver reserves, and its note issuing capacity. This operation also led to an increase in the government's stakes of ownership in the bank as their share capital increased immediately with 168 500 speciedaler in 1828, in partial fulfillment of the parliament's decision from 1827 to increase the bank's equity from 2 million to 2.5 million speciedaler. The emission was not complete until 1835, however, and it turned out that it was the government which purchased more than 83 percent of the new shares in Norges Bank (Rygg, 1918, p. 213). We will come back to the government discount commissions in Chapter 4.

2.3 The beginning. Transition years 1813-1819

Table 2.5: Estimates of notes in circulation 1813-1821, expressed in units of riksbankdaler 1813:4-1816:2 and in speciedaler 1816:3-1821:4. Source: Rygg (1918, Appendix pp. 363-373) and own calculations.

Year	Riksbank notes	Speciedaler notes	Regency notes	Assignat notes	Danish courant notes	Discount notes	Notes in circulation
Unit of account: Riksbankdaler (rbd)							
1813Q4	3 188 705			1 881 975	1 979 358		7 050 038
1814Q1	3 188 705		243 000	1 881 975	1 980 358		7 294 038
1814Q2	6 888 705		1 824 925	1 881 975	1 980 358		12 575 963
1814Q3	12 593 203		1 581 735	1 869 334	1 981 692		18 025 963
1814Q4	18 297 700		1 338 545	1 856 693	1 983 025		23 475 964
1815Q1	21 973 108		1 095 355	1 844 053	1 074 125		25 986 640
1815Q2	25 648 515		852 165	1 831 412	165 225		28 497 317
1815Q3	25 499 010		684 517	1 606 778	137 688		27 927 993
1815Q4	25 349 505		516 869	1 382 144	110 150		27 358 668
1816Q1	25 200 000		349 221	1 157 510	82 613		26 789 344
1816Q2	26 150 912		181 573	932 876	55 075		27 320 436
Unit of account: Speciedaler (1 speciedaler = 10 riksbankdaler)							
1816Q3	2 710 182		1 393	70 824	2 754		2 785 153
1816Q4	2 720 663			48 361	806 900		3 575 924
1817Q1	2 650 843			25 897	792 025		3 468 765
1817Q2	2 560 843			25 099	777 150		3 363 092
1817Q3	2 470 843			24 301	762 275		3 257 418
1817Q4	2 380 843			23 502	747 400		3 151 745
1818Q1	2 290 843	178 000		22 704	691 798		3 183 344
1818Q2	1 256 609	1 266 667		21 905	636 196		3 181 377
1818Q3	685 235	1 901 526		21 107	580 594		3 188 463
1818Q4	145 605	2 536 386		20 309	524 992		3 227 292
1819Q1	72 802	2 681 023		19 510	479 055		3 252 390
1819Q2	36 401	2 825 659		18 712	433 118		3 313 890
1819Q3	18 201	2 970 296		17 913	387 180		3 393 590
1819Q4	9 100	3 114 932		17 115	341 243		3 482 390
1820Q1	4 550	3 167 678		16 316	293 950		3 482 494
1820Q2		3 220 425			246 656		3 467 081
1820Q3		3 273 171			199 363		3 472 533
1820Q4		3 325 917			152 069		3 477 986
1821Q1		3 368 061			140 038		3 508 099
1821Q2		3 410 206			128 007		3 538 212
1821Q3		3 452 350			115 975		3 568 325
1821Q4		3 494 494			103 944		3 598 438

2.4 Consolidation of Norges Bank's funds 1817-1892

Hvidsten (2013) describes the consolidation methods used for the years until 1892. These are mainly concerned with aggregation issues and the integration and consolidation of the data published in the bank's main balance reports and the reported balances of different special funds, which we will describe rather briefly in the following.

In this process some internal items were netted out, primarily between the balance of the bank's main account and the balance sheets of four special funds, which were added to the bank's balance sheet during the 19th century. These were, notably, the Annexed Loan Arrangement ("Den annecterede Laane-Indretning") of 1818, the Reserve Fund of 1827, the Loan Fund of 1842 and the Banknote Fund of 1857. The main sources of the Bank's consolidated balance sheet data for 1817-1892, which we present in this study, are published extracts from Norges Bank's different funds together with their notes and subaccounts. The main sources are listed in Table 2.6 below.

Table 2.6 *Main sources of data for Norges Bank's balance sheet, 1817-1892.*

	First entry	Description of sources
1	1817	Extracts from Norges Bank's main account.
2	1819	Extracts from the balance of the <i>Bank Fund</i> , which is the bank's original silver fund as specified in §2 in the 1816 Norges Bank Act.
3	1819	Extracts from the balance of the <i>Annexed Loan Arrangement</i> (cf. § 13 in the 13 August 1818 revision of the bank act).
4	1827	Extracts from the balance of the <i>Reserve Fund</i> (cf. the 24 July 1827 amendment to the bank act).
5	1842	Extracts from the balance of the <i>Loan Fund</i> of the 8 August 1842 bank act, also known as the <i>Extra Fund</i> .
6	1857	Extracts from the balance of the <i>Banknote Fund</i> of the 28 September 1857 bank act.

Hvidsten (2013) also deals with aggregation issues relating to items in different subaccounts, some of which may change over time. In this chapter we take aggregation one step further and describe some of the main adjustments we have made to the data in Hvidsten (2013) in order to match our selected list of broader categories of assets and liabilities in Table 2.1 above. These adjustments are the basis for the composite consolidated balance sheet data shown in appendix 2A and 2B. Hvidsten (2013) describes in detail how this consolidation of funds was derived for selected years, i.e., for 1823, 1842, 1859 and 1885, respectively.

The main objective for establishing each of these funds was to increase the bank's capacity to issue banknotes. But there were many considerations involved in the design of the structure of these funds, including the balancing of private versus public ownership of the bank. Norges Bank was designed to be a privately owned institution under supervision by Stortinget (the Norwegian parliament). During the 19th century there were changes in legislation in 1818, 1827, 1842, 1857, 1863, 1873 and 1892 which in all cases changed the bank's note issue regulations and the government's ownership and influence over the bank. At the core of these changes were the four special funds mentioned

2.4 Consolidation of Norges Bank's funds 1817-1892

above and their effect on Norges Bank's capacity to issue banknotes. We have summarized the main changes in the note issue regulations in Table 2.7 below.

Table 2.7 *Norges Bank's note issue regulations 1816-1892. Years with changes in the regulations and/or in ratios of banknotes to holdings of silver/gold reserves in the different funds are indicated*

Fund	Separate accounting	Main changes in legislation	Ratio of banknotes to metal holdings in fund				
			1818	1827	1842	1857	1873
Bank Fund (main account)	1817-1892	1816, 1842	2:1	2:1	5:2	5:2	5:2
Annexed Loan Arrangement	1818-1885	1818	2:1	2:1	2:1	2:1	2:1
Reserve Fund	1827-1842	1827, 1857		1:1	1:1	3:2	3:2
Loan Fund	1842-1862	1842, 1857, 1863			1:1	3:2	3:2
Extra Fund		1842, 1857, 1873			1:1	3:2	1:1
Banknote Fund	1857-1892	1857				3:2	3:2

The Annexed Loan Arrangement (*ALA*) was established in 1818 as a mechanism that gave depositors of silver the right to borrow an amount of banknotes equal to the double amount of their silver deposit. The mechanism stimulated the supply of banknotes in the early 1820s and reached its peak level of lending in 1832. In 1827 the parliament decided to increase the silver deposits in the Bank Fund with additional 500 000 speciedaler through an emission of new shares in order to promote the bank's lending capacity. As specified in the 1827 act the *ALA* stopped granting new loans when the Bank Fund had reached its new targeted level in 1835, although the *ALA* remained in the bank's accounting framework until 1885.

The published accounts for 1817 and 1818 were rudimentary and incomplete. The first year for which the bank published a consistent overview of the account of the *Bank Fund*, its main account and the account for the *ALA* was for 1819. This explains why previous studies like Klovland (2004) started the data series in 1819. In the following paragraph we show how we have reconstructed the balance sheet for 1818 according to the items in Table 2.1 based on available information.

The 1818 main account did not contain any information about silver reserves on the asset side. However, since other sources contain some scattered information about the progress in the collection of the silver deposits for the bank's silver fund, we have made a rough estimate on the total amount of silver at year end of 1818.²¹ This silver estimate also takes into account the amount of silver which had been deposited in 1818 under the *ALA* mentioned above. A similar amount has been recorded as government deposits on the liability side. We also adjusted the size of the redemption loan in 1818 to be in line with the reporting in the following years, which was net of redemption taxes paid.²²

The total amount of speciedaler notes in circulation by the end of 1818 is ready available from the main account. The size of equity share capital in 1818 is estimated to 1.5 million speciedaler, which is 75 % of the required goal stated in the Norges Bank Act. This estimate is based on the mentioned silver estimate by year end of 1818 plus the contributions to the bank's silver fund, which had been

²¹ Rygg (1918, p. 140).

²² The cash flow of the redemption loan is shown in Table 2.4.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

paid in riksbankdaler notes and copper, pursuant to the royal decree of 3 February 1817. This royal decree made it possible to pay the mandatory silver deposits in riksbankdaler notes at the rate of 25:1 (Rygg, 1918, p. 129). We recall that the stated par rate between riksbankdaler and speciedaler was 10:1. It was expensive to pay the bank deposit in this way, on the other hand the rate of 25:1, stipulated in the royal decree, created a backstop for the depreciation of riksbankdaler notes in the early months of 1817. A few months later in the summer of 1817 the exchange rate had appreciated significantly and was quite close to the par rate.

A Reserve Fund was established in 1827 to serve as a buffer against future losses. The entries into this fund were the bank's residual profits after dividend payments to its shareholders. The Reserve Fund served as an additional source of expansion of Norges Bank's capacity to issue banknotes, on a 1:1 basis per speciedaler silver in the fund.

After the convertibility of banknotes at par had been reintroduced in April 1842 the parliament made a series of changes in the bank act which increased Norges Bank's capacity to issue banknotes. The government would receive 75 percent of the revenues from this expansion and accumulate these in a new fund called the "*Loan Fund of 8 August 1842*". This fund was built up during the next two decades until it reached its targeted level of 625 000 speciedaler, at which time (in 1863) the fund was converted to equity owned by the government. From 1842 onwards the maximum ratio of notes to silver in the Bank Fund was increased from 2:1 to 5:2 and the bank would also be required to receive any amounts of silver deposits delivered to it for exchange with banknotes on a 1:1 basis. This silver exchange mechanism created an extra source of expansion of the note stock, which would from 1842 on be demand determined in a way it had not been before. This exchange mechanism was later denoted as the *Extra Fund*.

From September 1857 onwards Norges Bank's capacity to issue notes was increased again as the parliament decided that additional banknotes could be issued on both the Reserve Fund and the Loan Fund of 1842 on a 3:2 basis. A new "*Banknote Fund of 28 September 1857*" was also established in which the revenues from this latest addition to the bank's note issuing capacity were accumulated. The bank was allowed to issue notes on a 3:2 basis on this fund too. Thus, from 1857 to 1873 Norges Bank could issue more banknotes than it had silver reserves in all of its funds. The government would receive 75 percent of the revenues from the 1857 expansion of the bank's capacity to issue banknotes. One important difference from the arrangement of the *Loan Fund* of 1842 was, however, that the government's share of the extra revenues from the *Banknote Fund* were to be paid out immediately each year, together with dividends, instead of being put aside and accumulated in a fund such as in the case of the *Loan Fund* of 1842.

However, in both cases, i.e. for the *Loan Fund* of 1842 and the *Banknote Fund* of 1857, respectively, the accounting framework secured a distinct separation between revenues which were created on the basis of the original Bank Fund as specified in the 1816 legislation and revenues which originated from later decisions by Stortinget to expand the bank's capacity to issue banknotes and harvest additional seignorage revenues. Whereas the former revenues were distributed as dividends

2.4 Consolidation of Norges Bank's funds 1817-1892

to the bank's shareholders, the government took a 75 percent direct share of all additional revenues stemming from the later expansions of Norges Bank's note issuing privilege.

From 1874 onwards a gold standard regime replaced the old silver standard regime. Norges Bank changed all its silver reserves to gold reserves in a short time during 1873-1874 and at the same time the krone was introduced as new currency unit with a fixed rate of convertibility between kroner and speciedaler (1 speciedaler = 4 kroner). In 1875 Norway also entered into the Scandinavian Currency Union (SCU), which had been established in 1873. A changeover from old speciedaler banknotes to new banknotes in kroner, and from silver coins to gold coins, took place in the following years and from 1877 onwards Norges Bank's accounts have used kroner as a unit of account. The 1873 legislation also tightened the note issue regulations as the maximal ratio of banknotes to the metal holdings in the Extra Fund was decreased from 3:2 to 1:1 in order to curb the massive increase in the supply of banknotes observed during the boom of the early 1870s. In order to facilitate the reading of the composite balance sheet data presented in the chapter we have constructed separate sets of tables using speciedaler as accounting units for the period 1817-1876 (appendix 2A) and million kroner as accounting units for the complete period 1817-2020 (appendix 2B).

The consolidated representation of Norges Bank's balance sheet which we present in this chapter may be compared with a set of consolidated data which Norges Bank published in an "Extract table" in their annual reports. These tables were produced on the basis of the extracts from the different funds that were included in the annual statements. This extract table appeared for the first time in the 1824 statement and it was included on a regular basis from 1827 onwards. The extract table provided a consolidated view of the bank's main assets and liabilities as well as its net wealth. Norges Bank also published a table with an "Overview of Norges Bank's State and Operations", which appeared for the first time in 1832 with an overview of consolidated data from 1823 onwards. The overview table was updated with the three additional years in 1835 but was then discontinued and did not reappear again until 1850. The overview table provided a summary of the bank's total balance, its net wealth and a small selection of consolidated asset and liability items. Overall, we find that our consolidated data matches the data in the published "Extract" and "Overview" tables with a high degree of precision. Discrepancies are typically due to the elimination of instances of double accounting of items belonging to the Reserve Fund and the Loan Fund of 1842, respectively (Hvidsten, 2013). We have also removed a few minor discrepancies we observed between items in the "Extract" "Overview" tables and the underlying sources.

2.5 Consolidation of Norges Bank's activities during World War II 1940-1944

Balance sheets for Norges Bank during the World War II were presented, in two distinct parts, one for the operations of the Norges Bank headquarters in Oslo during the occupation and one for "The Operations in free Norway and London" during 1940-1944.²³

In this book we have consolidated these two accounts. Norges Bank in London brought with it the gold and the foreign exchange reserves. The evacuation of 49 tons of gold from the head office in Oslo in the morning hours of 9 April 1940 was dramatic.²⁴ In addition the London office functioned as a "think tank" for the exile government in London during the war years. Norges Bank in Norway continued its operations under different forms of cooperation with the German occupation authorities.²⁵

Activities in London

The head office of Norges Bank was moved several times during the first months of German occupation in 1940. From 7 June 1940 until 13 July 1945 the main office was located in London with a newly appointed Executive Board headed by governor Arnold Ræstad and with Wilhelm Keilhau, a professor from the University of Oslo, as an influential member of the Executive Board. Ole Colbjørnsen also exerted significant influence from his position as representative for the Norwegian government in Washington DC. In 1944 Colbjørnsen and Keilhau represented the Norwegian interests in the Bretton Woods negotiations which led to the establishment of the IMF and the IBRD (The World Bank). They were also instrumental in putting forward the proposal that the Bank for International Settlements in Basel should be dismantled after the war. The proposition received a plurality of votes but was never implemented.

Soon after its arrival in London the exile government made the decision to revalue Norges Bank's gold reserve from 2480 kroner per kilo to 4960 kroner per kilo.²⁶ This gold agio amounted to 120

²³ The Norwegian government decided 22 April 1940 that Norges Bank's head office should be located in the free Norway, out of reach of the German occupants. Dr. Arnold Ræstad was appointed as director and chairman of the executive board of Norges Bank in free Norway. The former chairman of the executive board, Nicolai Rygg, returned to Oslo 14 April 1940 and continued as director of Norges Bank in Oslo during the German occupation. From 7 June 1940 Norges Bank in free Norway was relocated in London. Detailed accounts of the two main offices of Norges Bank during World War II were documented right after the war in two reports, *Norges Bank, Oslo (1940-1945)* and *Norges Bank, London (1940-1945)*, respectively. These and other sources are listed below:

Norges Bank (1817-1939), "Norges Bank's accounts for the years 1817-1939. Norges Bank's annual report."

Norges Bank Oslo (1940-1945), "Norges Bank's balances for the activity in Oslo during the occupation. Excerpts from Norges Bank's books on 31 December 1940-1944". Norges Bank's annual report.

Norges Bank (1945), "Norges Bank during the occupation".

Norges Bank London (1940-1945), "Norges Bank's annual statements for 1940-1944 and the first half of 1945", tables in "Report from Norges Bank's Executive Board about Norges Bank's activities in the free Norway and in London from 22 April 1940 until 13 July 1945" (in Norwegian only).

Ministry of Finance (1948), Report from the public commission who reviewed Norges Bank's activities during the occupation [Innstilling fra komiteen til gransking av Norges Banks virksomhet under okkupasjonen]

²⁴ The events have been described in detail in the postwar literature and are known under monikers such as the *Gold transport* and the *Heavy cargo project*. The events were also an inspiration for fiction already during World War II. A children's version of the evacuation of the Norwegian gold appeared in USA already in 1942, cf. Marie McSwigan's book *Snow Treasure*, see McSwigan (1942); Øksendal (1974); Pearson (2010); Jaklin (2021) in the list of references.

²⁵ See Espeli (2012, 2014), Lie (2020, Chapter 9) and Eitrheim et al. (2016b, Chapter 10) for more details about Norges Bank during the German occupation in some recent contributions (in English) to this literature.

²⁶ Provisionary Act of 6 July 1940.

2.5 Consolidation of Norges Bank's activities during World War II 1940-1944

million kroner and was distributed between the government and Norges Bank in a ratio of 4:1. When the books were settled after the war the government decided in 1949 that this gold agio should be used to reduce the Occupation account with a similar amount (120 million kroner).²⁷

The evacuation of Norges Bank's gold out of occupied Norway had been successful. But was the gold stock safe in exile? In October 1940 Norges Bank's gold- and FX reserves in the US were transferred from Norges Bank to the Norwegian government.²⁸ This was a defensive measure against potential German lawsuits filed at US courts against Norges Bank as a privately owned institution. A repurchase agreement regulated the terms on which the gold should be returned and on the interest compensation in this period. The reserves were not returned to Norges Bank until December 1946, more than a full year after the war has ended, together with a complete settlement of the income account between the government and Norges Bank, which appeared in the bank's Annual Report for 1946. Under the repurchase agreement the gold stock remained in the bank's balance sheet. A corresponding amount was registered as a loan to the government on the asset side in 1941.²⁹

Norges Bank established its first foreign office of representation in New York in 1942 (Supervisory Council decision 6 July 1942). The purpose of the office was to reinforce contacts with US banks and US authorities.³⁰

Activities in Norway

After chaotic first days following the German occupation 9 April 1940 the former governor Nicolai Rygg returned to the head office in Oslo where he continued his role as executive director of Norges Bank in Norway during the following five war years on a mandate which was given by the Council of Administration, a body that was established in April 1940 to conduct the necessary coordination of civil administrative affairs during the German occupation. The Council of Administration was in operation until it was dissolved by the German occupation authorities on 25 September 1940. From 25 September 1940 to 31 January 1942 the bank negotiated with the Acting Finance Minister (Erling Sandberg) who reported to Reichskommissar Joseph Terboven and from 1 February 1942 with the Finance Minister (Frederik Prytz) from the Norwegian Nazi party in Vidkun Quisling's second government (1 February 1942 - 8 May 1945).

The discussion of who was responsible for the *occupation account* started already in early June 1940 and it was stated that this was a national responsibility. This view was confirmed by the Ministry of Finance in 1941 after the Council of Administration had been dissolved.³¹

²⁷ Parliamentary proposition 86, 1949, decided 25 July 1949.

²⁸ Royal decree of 29 October 1940. The decision was later confirmed by Norges Bank's Executive Board and Supervisory Committee.

²⁹ Table 2.9 below shows that government loans from the London branch of Norges Bank increased from 83 million kroner in 1940 to 310 million kroner in 1941. At the same time loans to the government from the Oslo branch increased from 1366 million kroner in 1940 to 3574 million kroner in 1941. In total government loans increased from 1449 million kroner in 1940 to 3884 million kroner in 1941, hence the transactions over the *occupation account* in Oslo dominated the consolidated balance sheet.

³⁰ Alf Eriksen, a former director at Norges Bank, explains that the New York office was established to keep the Executive Board informed about US developments, and it should serve as liaison with Norges Bank's business partners in New York. Hallvard Hillestad headed the New York office from the start and the office continued its activities after the war.

³¹ The Council of Administration's response to governor Rygg's letter of 3 June 1940 and letter from Ministry of Finance of 14 February 1941.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.8 *Norges Bank's income accounts during World War II, yield on the occupation account, net earnings including government transfers, profits and dividends to share holders.*

	Occupation account (net) (mill. NOK)	Yield (%)	Govt. contrib. (mill. NOK) ^a	Net earnings (mill. NOK)	Profits (mill. NOK)	Dividends 6 % (mill. NOK)
1940	1449			11.9	6.9	2.1
1941	3884	2.5	5.51	8.0	3.0	2.1
1942	5086	2.0	7.43	9.4	4.0	2.1
1943	6768	1.5	7.95	9.5	4.0	2.1
1944	8978	1.35	9.05	10.3	4.4	2.1
1945	8412		8.12	9.3	4.1	2.1

^a Source: St.prp. nr. 1 (1945-46) Forskottet i Norges Bank (The advances account in Norges Bank).

The return on the occupation account were subject to negotiations with the Ministry of Finance during the war. Norges Bank made inquiries in letters to the Ministry of Finance on 10 June and 4 November 1941. The compensation for 1941 through 1944 which came out of these talks is shown in Table 2.8. Norges Bank paid out dividends to its shareholders in the amount of 6 percent of its share capital (35 million kroner) during the war years. This was a reduction from 8 percent for the last prewar-year 1939. Table 2.8 shows that this compensation makes up the lion's share of the bank's revenues in all years during the war and amounted to 88 percent of gross revenues in 1944. Late in 1945 the new Minister of Finance of the Labour party government, who took office on 5 November 1945, Erik Brofoss, made it clear that the government did not accept the occupation account as a part of government debt for which it assumed responsibility to make interest payments. Instead the Ministry of Finance made a financial contribution to the bank to cover its operational expenses in a situation when the bank had no earnings.

Construction of an adjusted balance sheet for activities in London and Norway

Norges Bank's activities during the war years have been described in numerous reports and documents which emerged after the war ended in 1945, including separate reports for the bank's activities in London and Norway, respectively.³² The starting point is the balance sheets published in these reports, which are shown in the upper part of the following two tables.³³ We have shown the different adjustments we have made in the two sets of reports for Norges Bank, Oslo and Norges Bank, London, respectively, in tables 2.9 and 2.10. The areas marked in red denote items where we have made adjustments, for example adjusting for double counting of the banks's reported equity in the form

³² Detailed accounts of the main offices of Norges Bank during the war can be found in Norges Bank, Oslo (1940-1945) and Norges Bank, London (1940-1945), respectively.

³³ See also Hvidsten (2013) for a brief overview of the reported balance sheets for the bank's activities in London and Norway.

2.5 Consolidation of Norges Bank's activities during World War II 1940-1944

of share capital and other equity funds.³⁴ We made a corresponding downward adjustment in *other assets* to counter the reduction in the equity items recorded at the Oslo office.

Let us recapitulate. Norges Bank's gold and FX reserves were rescued from the German occupiers and remained under control from London during all war years. The gold stock was written up from 120 million kroner to 240 million kroner in July 1940 and the gold agio was split 4:1 between the government and the bank on the liability side of the bank's balance sheet. A loan agreement for the gold was recorded in the London accounts as an increase in *government loans* on the asset side in 1941.

The gold reserves were reported on the balance sheet of the London branch. The gold reserves remained, however, also on the balance of the Oslo accounts, at 120 million kroner, although they were recorded as *non-disposable items*. We have recorded these as part of *other assets* in the Oslo report. This clearly represents a form of double accounting since the gold reserves were recorded both in London and Oslo. Furthermore, a note in the London statement explains that one item recorded there, as part of *other liabilities*, represent items which needed to be aligned with items recorded in Oslo after the war. In light of this we have netted out 300 million kroner from *other assets* in Oslo and *other liabilities* in London, respectively. A consolidated view on Norges Bank's assets and liabilities during World War II is provided in Table 2.9 and Table 2.10, respectively. These items are marked with a yellow colour in these tables.

³⁴ We have removed double counted items from the Oslo report, acknowledging the London office as the official head office as it continued its operations outside occupied territories. Norges Bank's part of the gold agio, as this was recorded in the statement from the London office has been moved from *equity funds* to *other liabilities*. This item was later written off completely from the bank's balance sheet in 1949.

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.9: Norges Bank's assets, 1940–1944. Million kroner

Year	Total assets	Claims on int'l. org.	Metal reserves	FX reserves	Dom FX claims	Loans, private	Loans, government	Loans, fin.inst.	Dom. sec.	Other assets
London, reported										
1940	596989	2500	329005	99944			82926		81838	776
1941	625578	2500	253253	42015			310075		17630	105
1942	542115	2500	253267	42953			227582		15675	138
1943	540118	2500	253267	36356			233123		14292	580
1944	542621	2500	253267	34764			238300		12794	996
Oslo, reported										
1940	1912331		1586	2696		89215	1365878	680	15606	436669
1941	4051253		982	3478		40362	3574385	219	6189	425638
1942	5319061		538	2512		26542	4858264	219	5155	425831
1943	6989489		480	2720		18363	6535264	4311	3857	424495
1944	9193594		263	2401		23187	8739939	636	3546	423622
London, adjusted										
1940	596989	2500	329005	99944			82926		81838	776
1941	625578	2500	253253	42015			310075		17630	105
1942	542115	2500	253267	42953			227582		15675	138
1943	540118	2500	253267	36356			233123		14292	580
1944	542621	2500	253267	34764			238300		12794	996
Oslo, adjusted										
1940	1853993		1586	2696		89215	1365878	680	15606	378419
1941	3989515		982	3478		40362	3574385	219	6189	367388
1942	5257323		538	2512		26542	4858264	219	5155	367581
1943	6927751		480	2720		18363	6535264	4311	3857	366245
1944	9131857		263	2401		23187	8739939	636	3546	365372
Norges Bank, summed										
1940	2451070	2500	330591	102640		89215	1448804	680	97444	379195
1941	4618581	2500	254235	45493		40362	3884460	219	23819	367493
1942	5802926	2500	253805	45465		26542	5085846	219	20830	367719
1943	7471357	2500	253747	39076		18363	6768387	4311	18149	366825
1944	9677965	2500	253530	37165		23187	8978239	636	16340	366368
Norges Bank, consolidated										
1940	2151070	2500	330591	102640		89215	1448804	680	97444	79195
1941	4318581	2500	254235	45493		40362	3884460	219	23819	67493
1942	5502926	2500	253805	45465		26542	5085846	219	20830	67719
1943	7171357	2500	253747	39076		18363	6768387	4311	18149	66825
1944	9377965	2500	253530	37165		23187	8978239	636	16340	66368

Sources: Norges Bank Oslo (1940-1945); Norges Bank London (1940-1945), Hvidsten (2013). The items in the reports from London and Oslo are given in the two top rows of the table. The fields marked in red have been adjusted for double counting of the bank's equity. We have made a corresponding downward adjustment in *other assets* on the asset side. The two bottom rows show aggregates for Norges Bank. The fields marked in yellow show how we have adjusted for double counting in *other assets* and *other liabilities*, based on items identified as *non-disposable* in the Oslo report, in total 300 million kroner in reserve items such as gold and foreign securities.

2.5 Consolidation of Norges Bank's activities during World War II 1940-1944

Table 2.10: Norges Bank's liabilities, 1940-1944. Million kroner

Year	Total liabilities & equity	Liabilities to int. org.	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
London, reported									
1940	596988				104	99271	416424	35000	46189
1941	625579				2731	100733	434164	35000	52951
1942	542112				4617	6460	438758	35000	57277
1943	540116				942	4621	438047	35000	61506
1944	542620				2058	1676	438232	35000	65654
Oslo, reported									
1940	1912331		1043900	361000	340130	93000	9055	35000	30246
1941	4051253		1550841	623000	700709	1095000	16728	35000	29975
1942	5319061		2165358	640000	855638	1575000	16665	35000	31399
1943	6989489		2609897	1070000	1151226	2074000	17607	35000	31759
1944	9193594		3048577	1205000	959429	3885000	27553	35000	33034
London, adjusted									
1940	596988				104	99271	440373	35000	22240
1941	625579				2731	100733	458113	35000	29002
1942	542112				4617	6460	462707	35000	33328
1943	540116				942	4621	461996	35000	37557
1944	542620				2058	1676	462181	35000	41705
Oslo, adjusted									
1940	1853993		1043900	361000	340130	93000	9055		6996
1941	3989515		1550841	623000	700709	1095000	16728		6725
1942	5257323		2165358	640000	855638	1575000	16665		8149
1943	6927751		2609897	1070000	1151226	2074000	17607		8509
1944	9131857		3048577	1205000	959429	3885000	27553		9784
Norges Bank, summed									
1940	2451069		1043900	361000	340130	192271	449428	35000	29236
1941	4618582		1550841	623000	703440	1195733	474841	35000	35727
1942	5802923		2165358	640000	860255	1581460	479372	35000	41477
1943	7471355		2609897	1070000	1152168	2078621	479603	35000	46066
1944	9677964		3048577	1205000	961487	3886676	489734	35000	51489
Norges Bank, consolidated									
1940	2151069		1043900	361000	340130	192271	149428	35000	29236
1941	4318582		1550841	623000	703440	1195733	174841	35000	35727
1942	5502923		2165358	640000	860255	1581460	179372	35000	41477
1943	7171355		2609897	1070000	1152168	2078621	179603	35000	46066
1944	9377964		3048577	1205000	961487	3886676	189734	35000	51489

Sources: Norges Bank Oslo (1940-1945); Norges Bank London (1940-1945), Hvidsten (2013). The reported items in the reports from London and Oslo are given in the two top rows of the table. The fields marked in red have been adjusted for double counting of the bank's equity. We have made a corresponding downward adjustment in *other assets* on the asset side. The two bottom rows show aggregates for Norges Bank. The fields marked in yellow show how we have adjusted for double counting in *other assets* and *other liabilities*, based on items identified as *non-disposable* in the Oslo report, in total 300 million kroner in reserve items such as gold and foreign securities.

2.6 The post-war treatment of the occupation account 1945-1982

During the five years of occupation a balance equivalent to 11.4 billion kroner, which corresponds to 115 percent of GDP in 1945, was accumulated in the occupation account (Figure 2.13). The balance of the occupation account was reduced by around 3 billion kroner through contributions over the government budget. Its net balance of 8.3 billion kroner in 1945 was further reduced by another 2.9 billion kroner, including around 2 billion kroner through the Marshall relief fund, leaving a net balance of 5.4 billion kroner on Norges Bank's balance sheet (Figure 2.14).

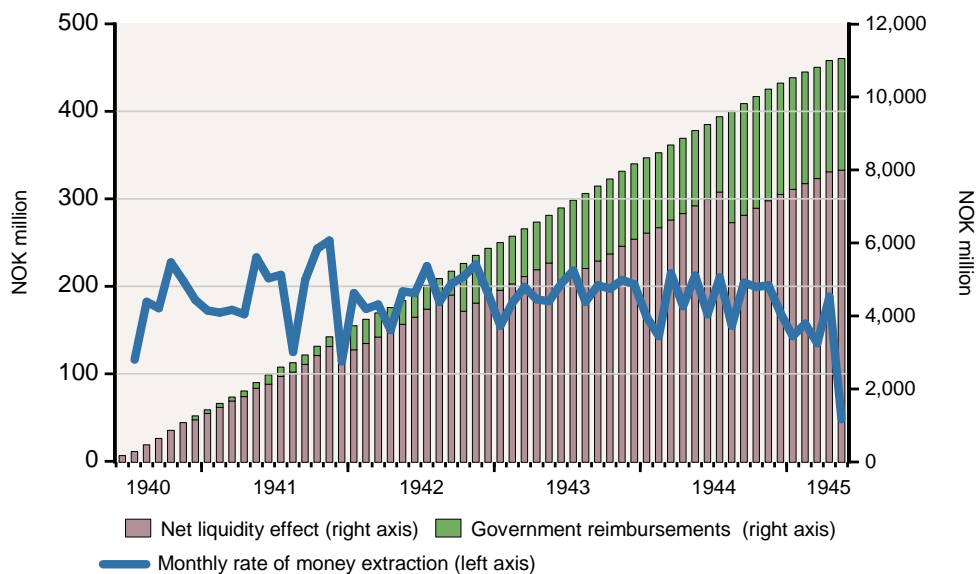


Figure 2.13 Money printing during World War II. The accumulation of the occupation account in Norges Bank from May 1940 through May 1945.

When the war ended in 1945 it was clear that this balance item had only illusory value as an asset. It was less clear whether the occupation account should be treated as government debt or not. Given its magnitude the item dominated Norges Banks balance sheet in nominal terms. In real terms the item was worthless, there was no responsible debtor counterpart who would repay the loan and no interest were earned for the bank. The loan was seen, at least partly, as a government responsibility. This was stated already in 1941 in an agreement between the bank and the Ministry of Finance, which was at that time led by Acting Minister of Finance, Erling Sandberg. But would the peacetime government see this differently? This issue was subject to intense public debate for many years and was not resolved until 1958. Then the government changed its capital accounts and included the remaining 5.4 billion kroner in the occupation account at that time as a part of government debt.³⁵

³⁵ The government capital accounts were also revised back to 1945. The occupation account was included in the item "Other government debt" and labelled as *The government's consolidated account in Norges Bank*.

2.6 The post-war treatment of the occupation account 1945-1982

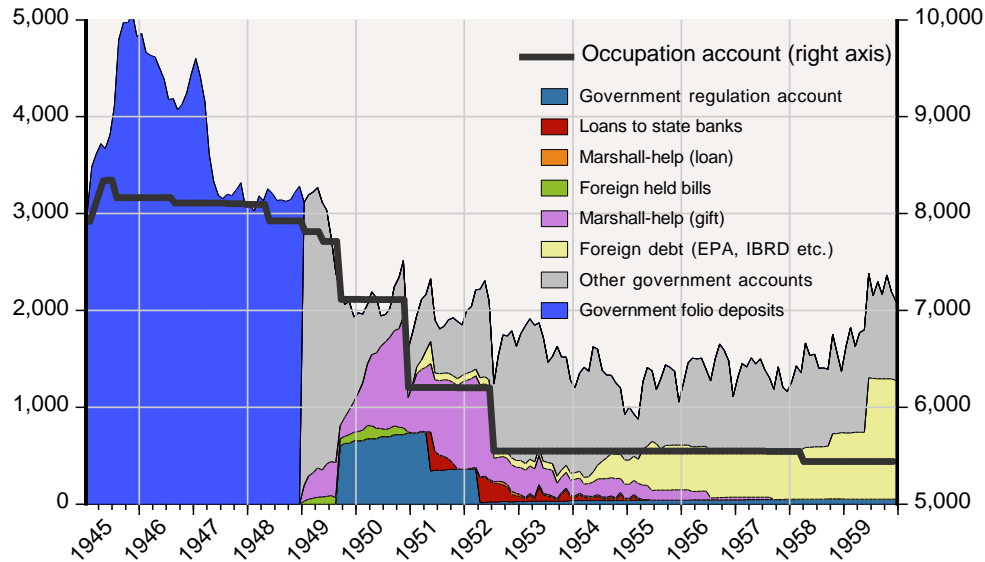


Figure 2.14 Some items in Norges Bank's monthly balances 1945-1949. The occupation account and selected government folio accounts ("counter items") on the liability side.

Formally the occupation account was included on the asset side of the government's capital account as "Equity deficit" but here we have instead used the term net equity and made a corresponding adjustment on both sides of the government's balance sheet. On the liability side the item was listed as, respectively correction item 7 and "The government's consolidated account in Norges Bank", a sub-item under the label "Other debt" (Statistics Norway, 1966, Table 8, p. 46).³⁶

On the asset side of Norges Bank's balance sheet the occupation account was relabelled in a similar way as *The government's consolidated account in Norges Bank*. The terms stated that the item was non-redeemable and non-interest bearing and it would remain in the bank's balance sheet until it was formally written off against a corresponding reduction in Norges Bank's equity in 1982. Norges Bank had been nationalized in 1949, and, since the government had taken over all shares previously owned by the private sector, the discussion of how the occupation account should be treated was by many observers seen as a trivial matter of internal book-keeping.

In hindsight we know that the balance of this war account on Norges Bank's and the government's balance sheet was basically eliminated by waves of inflation, the first one following the devaluation in 1949 and the Korean war in the early 1950s and later during the periods with high inflation in the 1970s and early 1980s.

A substantial reduction of the money stock was brought in effect in September 1945. Old banknotes were hastily changed into new ones in the weeks of late September and early October 1945 and

³⁶ See also Section 6.4 in Chapter 6.

excess holdings of old banknotes above the individual quotas which were set for redemption were put in special deposit accounts in private banks or in blocked national deposit accounts (*riksinnskudd*) in Norges Bank.

2.7 Other break adjustments

The complex fund structure of the bank was discontinued when the 1892-legislation became effective from January 1893. In a previous subsection (2.4) we saw how the fund structure gradually became more complicated, not only in terms of the note issue regulations, with its different multipliers attached to different funds (Table 2.7), but also in terms of the mechanism of distribution of revenues to shareholders and the government, respectively.

All this was greatly simplified by the 1892-legislation when the proportional/hybrid system of note regulation, which had been practised under the fund structure, was replaced and the rules of revenue distribution were clarified.

From 1893 onwards Norway adopted a system, similar to that in England since the Peel act of 1844, labelled a *differential system*. Above a certain legally stipulated fiduciary sum, banknotes had from 1893 to be backed on a 1:1 basis by gold. This fiduciary sum was set initially at 24 million kroner.³⁷ The new system was more flexible and the banknote limit was no longer absolute. However, a penalty was introduced. For the duration of the time when the banknote limit was superseded Norges Bank would have to pay a six percent annual fee on the excess to the government, which would effectively reduce the bank's seignorage.

The numerous changes in note issue regulations can also be traced in the published statements from the bank, which are the main sources of the data we present here. The changes in the recording of banknotes also shed light on the transformation which takes place from the printing process, producing the banknotes, through the distribution and storage of new banknotes in the bank's vaults, and the final logistics involved in putting new banknotes into circulation while removing old and worn out ones for destruction. The book-keeping of the banknotes has from the beginning served the dual purpose of recording the whereabouts of the entire stock of produced notes as well as recording the amount of *banknotes in circulation* outside the bank measured against the legal foundation of the banknotes, which we denote as the *banknote limit* here. Like Klovland (2004) we have focused on the level of *banknotes in circulation* outside Norges Bank in Table 2.1 above.

During most of the 19th century, i.e. from 1817 to 1886, banknotes was recorded in a *banknote account* on the liability side. This showed the stock of banknotes that had been produced and was either in circulation outside the bank or resided in one of the cashier account in one of the bank's funds. Each year the net nominal value of new banknotes less the amount of old and worn out ones which were delivered to the bank for destruction were added to the previous year's balance of the

³⁷ The fiduciary sum, initially set at 24 million kroner from 1893 onwards, was later changed by the parliament on several occasions. In 1900 to 35 million kroner, in 1912 to 45 million kroner, in 1916 to 70 million kroner, in 1920 to 250 million kroner, in 1936 to 325 million kroner and in 1939 to 425 million kroner with a possibility of temporary additions.

2.7 Other break adjustments

banknote account on the liability side. The amount of banknotes in cashier accounts were recorded on the asset side of each of the bank's funds. From 1887 until 1920 it was the *banknote limit* which was recorded on the liability side of the bank's balance sheet, which consisted of two components, the *banknotes in circulation* outside the bank and the *unused banknote capacity*, the latter was recorded on the asset side of the bank's balance sheet. From 1921 onwards the bank have reported *banknotes in circulation* outside the bank on the liability side of their annual statement.

The following list details break-adjustments we have made to the balance sheet data which are not covered in the previous subsections.

- In some instances the historical data which had been collected in the late 2000s contained aggregated items which were broader than the ones we have defined in Table 2.1
- For example, in some subperiods we have split aggregated reserves between *vault silver and gold* and *deposits held at Norges Bank's correspondents abroad* (from 1840 onwards). Some items were also misclassified as *domestic securities* and have been reclassified as *FX assets*.
- In a few cases in the years 1857-1859 we have reclassified items from *metal* into *FX assets* (bills of exchange).
- We have removed instances of double counting of *deposits held abroad* (in 1840-1841).
- For the years 1922-1925 some items have been reclassified from *other assets* into *FX assets*.
- Following the suspension of the gold standard in 1931 an item which appeared under the label temporary gold held abroad has been reclassified from *FX assets* into *metal* 1931-1939.
- Adjustments in foreign reserve allocation were some times made in two steps to implement our chosen accounting principles.
 - In the first step, from 1893 onwards, items wrongly classified as *domestic securities* were reclassified as foreign exchange reserves and put into *FX assets*. For some years these adjustments, in order to align definitions, contributed to shrink the asset balance (in 1916 and 1917), and a corresponding decrease was made in *other liabilities* on the liability side.
 - In the second step, we implemented a gross accounting principle for Norges Bank's position relative to Sveriges Riksbank and Danmarks Nationalbank. In some periods, notably between 1889-1904 and 1915-1917, respectively, this involved upwards adjustment in *FX assets* on the asset side and in *other foreign liabilities* on the liability side. We have put these clearing deposits in Sveriges Riksbank and Danmarks Nationalbank together with FX deposits in correspondent banks abroad in *FX assets*.
- In a similar way, we have implemented gross accounting of folio deposits. In a few years during and after World War I there were overdrafts of the government's folio account. In these years we have reclassified the overdraft as a loan on the asset side and increased the item *other loans* in the years 1915, 1919 and 1920. On the liability side the folio deposit account is adjusted upwards accordingly. A similar adjustment of loans from Norges Bank to the government was made in Skånland (1967, p. 213).

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- From 1877 to 1951 we have split the *total folio deposits* into deposits held by the government, financial institutions and private, respectively.³⁸
- When we have found reliable sources, we have also moved folio deposits from private deposits into government deposits during 1820-1876.
- We have also applied gross accounting as a principle for the recording of IMF-related items on both the asset side and the liability side of the balance sheet. This is also consistent with current international accounting standards (IFRS), which Norges Bank implemented from 2012 onwards. For previous years back to 1969, when IMF items first appeared on Norges Bank's balance sheet, we have made upwards adjustments to *claims on international organizations* and reported total IMF-quotas instead of the net IMF reserve positions. Correspondingly, we have added IMF's holding of NOK-deposits to the bank's *liabilities to international organizations* on the liability side.
- One major goal of our adjustments from 1892 onwards have been to distinguish correctly between the bank's holdings of foreign and domestic securities, respectively. In addition we have made a separate item which records foreign exchange claims on domestic residents. These are denoted as *domestic FX* in the following.³⁹

2.8 Overview of changes in accounting principles

The previous sections have explained in some detail the sources and methods we have used in order to construct composite data series for the different assets and liabilities on the balance sheet. The accounting principles which have been followed for the bank's balance sheet and its income accounts and profit and losses statements have changed over time. We end this section with a brief summary of these changes.

1817 For 1817 and 1818 data the statement consisted of extracts from Norges Banks main account. The currency unit is speciedaler.

1819 From 1819 onwards data were reported in three separate extracts, i) from the balance of the *Bank Fund* (for the collection of the silver fund), ii) from the general balance of the main account and iii) from the balance of the *Annexed Loan Arrangement* (see Section 2.4 for more details on Norges Bank's different funds 1817-1892).

1827 From 1827 onwards extracts from the balance of the *Reserve Fund* were included and a consolidated overview on sources and uses of funds was added to the annual statement.

³⁸ This redistribution is based on detailed information in Skånland (1967) including a letter Hermod Skånland wrote to one of the editors of this volume (Jan Tore Klovland) dated 25 June 1976, with estimates (*inter alia*) for government deposits 1893-1895 and financial institutions' deposits (savings banks and commercial banks) in 1897-1898 based on information in White Paper No. 1, 1896-1898.

³⁹ Note that the bank's holdings of *domestic FX* is *not* part of the bank's international reserves according to IMF's definition.

2.8 Overview of changes in accounting principles

- 1832 A new table, Overview of Norges Bank's State and Operations, appeared in the statement for the first time and showed data for 1823-1832. The overview was updated in 1835 but was then discontinued and did not reappear until 1850, now with updated versions every third year. The overview table provided a summary of the bank's total balance, its net wealth and a small selection of consolidated asset and liability items for the past two or three years. From 1861 onwards this table was included in the annual statement each year. From 1861 onwards this table was included in the annual statement each year.
- 1842 Extracts from the balance of the *Loan Fund* of the 8 August 1842 bank act, also known as the *Extra Fund* were added to the statement.
- 1857 Extracts from the balance of the *Banknote Fund* of the 28 September 1857 bank act were added to the statement.
- 1877 Norges Bank's statement is recorded using kroner as currency unit.
- 1893 A consolidated balance sheet and profits and losses account for Norges Bank is reported in the annual statement, which replaces the previous extracts from the different funds after the 1892 Norges Bank Act is put in effect.
- 1927 Norges Bank's Annual Report for 1927 accounts for the activities and the balance sheet of a currency stabilization fund (Valutakonsortiet), which had been established in secrecy in 1926 (Eitrheim et al., 2016b, Chapter 8.5, p. 332).
- 1940 Norges Bank is divided between Oslo and London. The gold reserves and FX reserves held in US is transferred to the government. The transaction is organized as a loan with a repurchase agreement and the final settlement between the government and Norges Bank took place in 1946.
- 1941 After negotiations, first with the Administrative Council and thereafter with the Ministry of Finance, Norges Bank received compensation from the German installed government in the form of a small yield for the German loan which was accumulated during the war years in the *occupation account* (see Table 2.8 in Section 2.5). The compensation sufficed to cover the bank's expenses including dividend to shareholders.
- 1945 The Ministry of Finance provided a grant which covered Norges Bank's expenses for 1945.
- 1946 The gold and FX reserves are returned to Norges Bank and the economic affairs between the government and the bank during the five war years are settled. There is no further need for a government grant to cover the bank's expenses.
- 1955 Revised guidelines for the distribution of profits were implemented, which increased the annual transfers to the government significantly.
- 1956 Previously hidden reserves were made visible in the bank's balance sheet (Norges Bank, 1957, Annual Report for 1956, pp. 42-44). The operation led to substantial increases in the bank's equity funds and amounted to a doubling of the bank's equity.^a

^a These were previously hidden reserves in the form of agio from the trading of gold and foreign exchange (69 mill kroner), undervalued domestic and international securities, which had been written down when market prices declined but never written up in the opposite case (38 million kroner), and entries on previously recorded losses (12 million kroner).

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- 1958 The occupation account is formally accepted as government debt and the balance sheet of the government is changed accordingly (more about this in Chapter 6). On Norges Bank's balance sheet the account is from 1958 onwards referred to as *the government's consolidated account in Norges Bank*.
- 1961 Exchange rate changes, which were previously recorded as net agio surplus in the income account, are from 1961 recorded directly towards the *equity adjustment fund*. This practice is continued throughout the period 1961-1977.
- 1962 The balance of the Royal Mint is transferred from the Ministry of Finance to Norges Bank.
- 1969 Norges Bank takes over the accounts vis-à-vis the IMF from the Ministry of Finance. The banknote gold is written up and merged with the exchange gold. The accounts for temporary gold abroad is terminated.
- 1973 A more detailed breakdown of items in the published balance sheet was made available.
- 1978 Exchange rate changes (agio) from FX interventions are recorded in the income account. End-of-year regulations are still recorded directly to the *equity adjustment fund*.
- 1981 The government folio deposits in excess of "agreed level of working accounts" becomes interest bearing with an interest rate equivalent to the rate on government bills with three months maturity.
- 1984 All government folio deposits becomes interest bearing with an interest rate equivalent to the rate on government bills with three months maturity. The compensation to the government for their holdings of "working accounts" is terminated.
- 1985 The accrual principle of accounting replaces the cash principle. FX reserves are converted into kroner at current exchange rates. Exchange rate revaluations are recorded in the profit and loss account. Interest revenues and expenses are recorded as they accrue periodically.
- 1989 The detailed balance sheet in the annual report is replaced by a more aggregated table, supplemented with a more comprehensive set of notes for further breakdown of the numbers.
- 1991 Separate gains/losses are reported on foreign and domestic financial instruments.
- 1996 The first capital transfer to Norway's sovereign wealth fund, which is managed by Norges Bank on behalf of the government. This fund is today called the *Government Pension Fund Global (GPF)* and is managed by the *Norges Bank Investment Management (NBIM)* division in Norges Bank.
- 1999 Securities are valued at market prices rather than at either market prices or average purchase price, whichever was lowest.
- 1999 Gold is valued at real value, defined as 20 % below market prices rather than at historical purchase prices.
- 2002 Gold is valued at market prices.
- 2003 A more aggregated income statement is presented in the annual report. Where necessary, supplementary details have been added from information in notes.

2.8 Overview of changes in accounting principles

- 2004 Gold reserves at Norges Bank are removed from international reserves when most of the bank's stock of gold was sold. The remaining gold stock, a gold collection valued at the prevailing market prices of gold at the time the purpose of the collection was redefined as long-term ownership, is reclassified from *metal* to *other assets*.
- 2005 Up to January 2005, Norges Bank's results were broken down into expenses, valuation changes and income. From February 2005, the cumulative profit/loss is shown separately in the monthly balance.
- 2008 Cash collateral received is recorded on the balance sheet. Collateral in the form of securities is recorded on the balance sheet if reinvested.
- 2011 Transition to International Financial Reporting Standards (IFRS). The balance sheet and income account for 2010 was revised accordingly.

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2.A Appendix, Norges Bank's balance sheet, 1817-1876. Historical data (in speciedaler)

2.A Appendix, Norges Bank's balance sheet, 1817-1876. Historical data (in speciedaler)

Table 2.A.1: Norges Bank's assets, 1817–1876 (in speciedaler)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1817	182 413							178 000		4 413
1818	4 068 292		1 233 078			77 900	299 571	2 376 018		81 725
1819	5 020 716		1 571 144			121 749	998 429	2 316 109		13 285
1820	5 409 114		1 825 625			122 964	1 303 231	2 052 840		104 454
1821	5 655 536		1 893 977			124 634	1 851 356	1 765 544		20 025
1822	5 692 831		1 852 755			128 475	2 147 449	1 421 436		142 716
1823	5 763 625		1 853 642			185 700	2 426 727	1 179 662		117 894
1824	5 988 785		1 985 285			266 325	2 747 007	937 040		53 128
1825	6 674 284		2 154 569			355 205	3 429 285	689 523		45 702
1826	6 901 250		2 126 389			426 920	3 843 195	465 200		39 546
1827	7 088 592		2 147 547			432 230	4 081 650	265 779		161 386
1828	7 537 604		2 302 922			432 305	4 342 120	289 068		171 189
1829	7 607 160		2 333 409			434 467	4 439 621	225 085		174 578
1830	7 853 564		2 569 344			424 565	4 455 330	211 549		192 776
1831	8 060 325		2 618 170			433 022	4 600 270	205 113		203 750
1832	8 177 866		2 670 473			427 455	4 668 714	203 648		207 576
1833	8 164 527		2 684 117			457 333	4 606 181	200 686		216 210
1834	8 512 228		3 005 199			500 871	4 724 595	193 872		87 691
1835	8 727 215		3 057 398			640 035	4 896 232	44 017		89 533
1836	8 855 314		3 054 217			711 564	5 013 387			76 146
1837	9 087 857		3 038 069			744 791	5 238 933			66 064
1838	9 012 997		2 760 815			793 774	5 399 585			58 823
1839	9 547 386		3 047 098			994 717	5 450 212			55 359
1840	9 510 319		2 927 210	114 947		977 973	5 430 404			59 785
1841	9 428 283		2 787 563	289 062		930 725	5 355 413			65 520
1842	9 625 302		2 878 571	173 079		993 075	5 503 043			77 534
1843	9 923 249		2 432 503	406 017		967 672	6 039 056			78 001
1844	9 985 535		2 178 066	644 269		1 183 973	5 896 237			82 990
1845	10 689 609		2 216 528	830 608		1 340 628	6 216 683			85 162
1846	10 926 040		2 206 820	677 548		1 413 517	6 537 051			91 104
1847	10 200 784		2 152 690	207 625		1 354 323	6 462 121			24 025
1848	9 615 544		1 337 790	796 055		1 164 446	6 296 876			20 377
1849	9 295 692		1 833 972	424 714		946 281	6 071 123			19 602
1850	9 812 454		1 936 743	430 086		1 487 617	5 933 448			24 560
1851	10 436 041		2 021 280	453 955		2 044 339	5 891 558			24 909
1852	10 117 971		1 952 580	379 115		2 059 623	5 719 968			6 685
1853	12 170 069		2 430 729	1 592 494		2 584 971	5 557 228			4 647

Table 2.A.1: Norges Bank's assets, 1817–1876 (in speciedaler)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1854	13 457 703		2 192 096	2 732 053		3 045 592	5 485 213			2 749
1855	13 122 495		2 204 047	2 386 957		3 174 485	5 353 705			3 301
1856	12 444 791		2 963 922	1 121 857		3 150 510	5 206 820			1 682
1857	12 212 025		2 086 778	877 720		3 895 741	5 070 695			281 091
1858	13 173 605		2 985 864	1 223 080		3 935 911	4 943 600			85 150
1859	11 687 190		2 490 820	828 665		3 406 560	4 873 585			87 560
1860	11 742 814		2 480 359	1 134 918		3 097 736	4 875 005			154 796
1861	11 477 479		2 188 948	1 133 511		3 253 398	4 780 745			120 877
1862	12 143 869		2 544 587	1 050 298		3 842 135	4 610 745			96 104
1863	12 309 887		2 961 195	678 630		4 215 779	4 368 070			86 213
1864	11 727 759		3 075 051	752 842		3 709 735	4 095 047			95 083
1865	13 496 348		4 143 900	861 253		4 201 447	4 195 008			94 741
1866	12 563 782		3 180 059	668 140		4 472 184	4 127 330			116 069
1867	13 114 329		3 706 895	755 999		4 389 039	4 151 810			110 586
1868	12 091 030		2 971 322	401 568		4 426 762	4 173 180			118 198
1869	12 286 756		2 965 305	782 872		4 270 088	4 113 800			154 691
1870	12 683 919		3 101 394	1 050 716		4 305 606	4 085 256			140 947
1871	14 727 120		4 498 336	2 186 665		3 761 256	4 110 781			170 081
1872	15 770 270		5 162 726	2 398 583		4 131 095	3 921 089			156 776
1873	17 747 360		4 866 934	3 810 833		5 313 604	3 641 633			114 356
1874	17 590 639		5 220 244	3 528 832		5 262 071	3 471 318			108 173
1875	15 951 877		3 689 958	2 625 599		6 150 775	3 434 303			51 243
1876	17 222 271		5 620 763	2 526 082		5 552 737	3 454 358			68 331

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.A.2: Norges Bank's liabilities and equity, 1817–1876 (in speciedaler)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1817	182 413						29 883	181 393		-28 863
1818	4 068 293			2 536 386		67 673	40 797	1 465	1 500 000	-78 028
1819	5 020 714			3 114 931		134 220	38 309	873	1 752 921	-20 540
1820	5 409 115			3 325 917		140 475	2 000	108 974	1 813 709	18 040
1821	5 655 537			3 494 494		103 515	5 000	77 043	1 891 890	83 595
1822	5 692 830			3 508 519		102 411	7 000	82 308	1 913 286	79 306
1823	5 763 625			3 508 732		148 471	3 000	66 803	1 942 436	94 183
1824	5 988 784			3 618 423		80 827	107 000	74 185	1 977 643	130 706
1825	6 674 283			3 969 064		226 442	228 000	109 213	1 988 884	152 680
1826	6 901 252			4 018 263		230 869	355 000	156 136	1 994 132	146 852
1827	7 088 592			4 081 278		326 083	285 333	93 670	1 996 205	306 023
1828	7 537 605			4 262 651		407 401	219 667	131 683	2 166 841	349 362
1829	7 607 159			4 417 269		394 533	153 000	111 314	2 167 678	363 365
1830	7 853 565			4 826 335		414 124	53 000	36 134	2 168 474	355 498
1831	8 060 327			4 836 513		483 454	102 000	91 683	2 168 852	377 825
1832	8 177 866			4 748 282		481 760	103 000	285 518	2 169 420	389 886
1833	8 164 526			4 975 862		440 153	7 000	57 244	2 270 403	413 864
1834	8 512 227			5 102 164		470 357	7 000	64 188	2 437 783	430 735
1835	8 727 215			5 211 784		440 196	8 000	115 177	2 501 418	450 640
1836	8 855 313			5 393 698		362 735	10 000	119 199	2 501 496	468 185
1837	9 087 858			5 256 019		362 399	409 000	77 372	2 501 528	481 540
1838	9 012 997			5 069 915		366 141	459 000	115 615	2 501 576	500 750
1839	9 547 384			5 562 186		346 943	560 000	65 543	2 501 608	511 104
1840	9 510 320			5 535 688		329 845	563 000	70 815	2 501 641	509 331
1841	9 428 283			5 621 045		332 158	360 000	99 996	2 501 681	513 403
1842	9 625 304			5 820 656		500 858	186 000	71 832	2 501 699	544 259
1843	9 923 249			5 626 282		963 001	197 000	57 588	2 501 730	577 648
1844	9 985 533			5 572 045		1 000 403	250 000	44 765	2 501 760	616 560
1845	10 689 610			5 790 678		1 015 960	674 000	51 625	2 501 786	655 561
1846	10 926 040			5 822 517		1 443 456	409 000	35 992	2 501 806	713 269
1847	10 200 782			5 523 890		1 014 824	365 000	51 562	2 501 830	743 676
1848	9 615 544			4 722 747		1 305 947	279 000	41 073	2 501 843	764 934
1849	9 295 690			4 707 503		987 366	265 000	40 591	2 501 866	793 364
1850	9 812 454			4 932 267		1 273 260	235 000	32 470	2 501 880	837 577
1851	10 436 041			5 183 847		1 257 966	578 000	34 955	2 501 891	879 382
1852	10 117 971			5 270 806		1 224 085	131 000	37 591	2 501 905	952 584
1853	12 170 069			6 796 892		1 626 417	194 000	42 325	2 501 934	1 008 501

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.A.2: Norges Bank's liabilities and equity, 1817–1876 (in speciedaler)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1854	13 457 703			7 677 356		1 983 881	145 000	52 676	2 501 950	1 096 840
1855	13 122 498			7 740 266		1 525 394	53 000	115 211	2 501 971	1 186 656
1856	12 444 793			7 305 333		1 032 994	256 000	83 063	2 502 000	1 265 403
1857	12 212 026			6 669 445		1 548 855	109 702	78 064	2 502 021	1 303 939
1858	13 173 605			6 580 838		1 732 108	916 071	108 774	2 502 038	1 333 776
1859	11 687 190			6 051 747		1 424 997	219 826	104 827	2 502 043	1 383 750
1860	11 742 815			6 461 760		1 154 474	84 552	110 177	2 502 062	1 429 790
1861	11 477 480			6 298 393		928 261	163 285	95 187	2 502 083	1 490 271
1862	12 143 871			6 738 679		1 150 126	116 675	72 292	2 502 094	1 564 005
1863	12 309 889			6 660 836		1 166 553	237 520	118 229	3 127 112	999 639
1864	11 727 759			6 399 160		722 152	323 440	148 556	3 127 120	1 007 331
1865	13 496 347			7 131 056		1 368 644	739 354	109 860	3 127 143	1 020 290
1866	12 563 783			6 986 210		873 090	444 457	96 566	3 127 167	1 036 293
1867	13 114 330			7 273 638		1 294 531	167 849	210 618	3 127 188	1 040 506
1868	12 091 029			6 609 220		1 073 748	134 787	114 377	3 127 203	1 031 694
1869	12 286 757			6 790 643		1 122 018	131 404	70 949	3 127 222	1 044 521
1870	12 683 918			7 096 986		1 210 955	123 537	66 505	3 127 239	1 058 696
1871	14 727 122			8 495 545		1 862 511	111 674	78 906	3 127 254	1 051 232
1872	15 770 268			9 628 973		1 720 451	139 747	64 368	3 127 268	1 089 461
1873	17 747 358			11 794 633		1 450 013	106 072	110 072	3 127 287	1 159 281
1874	17 590 640			11 467 421		1 277 860	350 134	83 208	3 127 296	1 284 721
1875	15 951 878			9 307 384		1 563 948	387 418	177 553	3 127 309	1 388 266
1876	17 222 272			9 917 228		1 850 948	659 947	203 353	3 127 335	1 463 461

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.A.3: Norges Bank's equity, 1817–1876 (in speciedaler)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1817	-28 863		-28 863						-28 863	
1818	1 421 972	1 500 000	-78 028						-78 028	
1819	1 732 381	1 752 921	-20 540						-20 540	
1820	1 831 749	1 813 709	18 040						18 040	
1821	1 975 485	1 891 890	83 595						83 595	
1822	1 992 592	1 913 286	79 306						79 306	
1823	2 036 619	1 942 436	94 183						94 183	
1824	2 108 349	1 977 643	130 706						130 706	
1825	2 141 564	1 988 884	152 680						152 680	
1826	2 140 984	1 994 132	146 852						146 852	
1827	2 302 228	1 996 205	306 023	176 432					129 591	
1828	2 516 203	2 166 841	349 362	194 865					154 497	
1829	2 531 043	2 167 678	363 365	209 420					153 945	
1830	2 523 972	2 168 474	355 498	208 370					147 128	
1831	2 546 677	2 168 852	377 825	223 520					154 305	
1832	2 559 306	2 169 420	389 886	234 664					155 222	
1833	2 684 267	2 270 403	413 864	255 898					157 966	
1834	2 868 518	2 437 783	430 735	268 937					161 798	
1835	2 952 058	2 501 418	450 640	278 124					172 516	
1836	2 969 681	2 501 496	468 185	287 148					181 037	
1837	2 983 068	2 501 528	481 540	294 520					187 020	
1838	3 002 326	2 501 576	500 750	306 513					194 237	
1839	3 012 712	2 501 608	511 104	308 630					202 474	
1840	3 010 972	2 501 641	509 331	315 725					193 606	
1841	3 015 084	2 501 681	513 403	317 856					195 547	
1842	3 045 958	2 501 699	544 259	332 618	5 093				206 548	
1843	3 079 378	2 501 730	577 648	359 381	26 680				191 587	
1844	3 118 320	2 501 760	616 560	366 039	51 046				199 475	
1845	3 157 347	2 501 786	655 561	375 450	81 266				198 845	
1846	3 215 075	2 501 806	713 269	382 992	112 421				217 856	
1847	3 245 506	2 501 830	743 676	391 294	145 012				207 370	
1848	3 266 777	2 501 843	764 934	397 749	176 490				190 695	
1849	3 295 230	2 501 866	793 364	398 867	203 602				190 895	
1850	3 339 457	2 501 880	837 577	403 307	228 126				206 144	
1851	3 381 273	2 501 891	879 382	409 188	254 078				216 116	
1852	3 454 489	2 501 905	952 584	448 359	282 608				221 617	
1853	3 510 435	2 501 934	1 008 501	465 106	314 862				228 533	

Table 2.A.3: Norges Bank's equity, 1817–1876 (in speciealer)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1854	3 598 790	2 501 950	1 096 840	499 334	348 598				248 908	
1855	3 688 627	2 501 971	1 186 656	515 156	383 007				288 493	
1856	3 767 403	2 502 000	1 265 403	532 268	417 928				315 207	
1857	3 805 960	2 502 021	1 303 939	556 024	455 390				292 525	
1858	3 835 814	2 502 038	1 333 776	574 101	493 952				265 723	
1859	3 885 793	2 502 043	1 383 750	594 001	529 879				259 870	
1860	3 931 852	2 502 062	1 429 790	607 048	566 577				256 165	
1861	3 992 354	2 502 083	1 490 271	626 712	604 384				259 175	
1862	4 066 099	2 502 094	1 564 005	653 146	625 000				285 859	
1863	4 126 751	3 127 112	999 639	673 553					326 086	
1864	4 134 451	3 127 120	1 007 331	685 680					321 651	
1865	4 147 433	3 127 143	1 020 290	697 703					322 587	
1866	4 163 460	3 127 167	1 036 293	711 969					324 324	
1867	4 167 694	3 127 188	1 040 506	694 164					346 342	
1868	4 158 897	3 127 203	1 031 694	702 013					329 681	
1869	4 171 743	3 127 222	1 044 521	711 970					332 551	
1870	4 185 935	3 127 239	1 058 696	727 702					330 994	
1871	4 178 486	3 127 254	1 051 232	758 189					293 043	
1872	4 216 729	3 127 268	1 089 461	806 701					282 760	
1873	4 286 568	3 127 287	1 159 281	843 752					315 529	
1874	4 412 017	3 127 296	1 284 721	939 168					345 553	
1875	4 515 575	3 127 309	1 388 266	1 010 476					377 790	
1876	4 590 796	3 127 335	1 463 461	1 057 432					406 029	

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.A.4: Norges Banks income accounts, 1817–1876. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in speciedaler)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1817					-28 863	-28 863				
1818	5 768			12	-54 934	-49 165				
1819	51 680			156	-72 220	-20 540				
1820	63 047			219	-23 936	18 572				
1821	88 690			245	-24 876	82 386		74 501		4.00
1822	108 180			675	-36 726	78 087		75 127		4.00
1823	123 629			205	-32 675	92 859		75 680		4.00
1824	143 941			295	-32 332	127 272		115 088		6.00
1825	167 223			10	-39 233	139 182		134 320		7.00
1826	160 809			16	-44 314	120 444		113 930		6.00
1827	153 072			35	-29 867	129 719		119 746		6.00
1828	190 297				-29 029	154 695	-577	139 845		7.00
1829	178 030			5	-32 281	154 003	-1 357	151 265		7.00
1830	176 232			44	-31 256	147 183	-250	144 577		6.67
1831	183 037			4	-27 912	154 393	-307	151 814		7.00
1832	184 704			3 115	-31 741	155 357	-184	151 827		7.00
1833	185 679			9	-30 940	158 077	-192	151 871		7.00
1834	195 404			23	-34 700	161 884	-1 607	151 582		6.67
1835	216 463			7	-35 360	191 406		172 724		7.00
1836	218 735			1 563	-36 830	191 158	-3 520	174 916		7.00
1837	225 793			3 964	-35 995	187 182	-13 358	183 453		7.33
1838	228 175			408	-37 109	194 354	-440	187 627		7.50
1839	237 662			315	-37 792	202 484	-2 114	191 792		7.67
1840	243 487			251	-56 817	193 614	-748	187 630		7.50
1841	238 928			6	-46 197	195 555	-661	191 797		7.67
1842	245 943			1 529	-42 179	206 556	-967	200 142		8.00
1843	227 369	5 401		20	-42 305	191 595	-1 284	187 636		7.50
1844	231 161	6 952		41	-42 140	199 483	-448	195 970		7.83
1845	231 791	12 104		29	-41 497	198 845	-6 066	195 972		7.83
1846	237 418	21 810		3	-43 793	217 856	-451	212 651		8.50
1847	238 080	9 183		4	-41 739	207 370	-1 360	204 321		8.17
1848	233 219				-45 428	190 695	-145	187 644		7.50
1849	232 641				-42 991	190 895	-1 806	187 645		7.50
1850	242 615	5 625			-44 858	206 144	-488	204 324		8.17
1851	249 650	7 509			-42 503	216 116	-361	212 658		8.50

Table 2.A.4: Norges Banks income accounts, 1817–1876. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in speciedaler)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1852	251 851	8 283			-41 698	221 617	-277	216 829		8.67
1853	264 920	5 933			-46 708	228 533	-400	225 175		9.00
1854	274 704	28 243		25	-53 762	248 908	-3 635	246 028		9.83
1855	284 828	54 793		123	-53 759	288 493	-250	283 560		11.33
1856	301 848	63 586		344	-53 498	315 207	-1 661	312 747		12.50
1857	320 514	25 499			-55 692	292 525	-255	283 566	3 700	11.33
1858	317 914	1 380			-62 531	265 723		262 716	3 300	10.50
1859	303 561	6 956			-53 654	259 870		258 540	5 800	10.33
1860	297 487	11 294			-53 946	256 165		254 374	6 600	10.17
1861	301 497	17 292		90	-56 871	259 175	-4 535	258 545	9 300	10.33
1862	295 554	27 526			-54 555	269 156		266 891	14 700	10.67
1863	359 757	27 936		570	-63 872	326 086		323 131	15 500	10.33
1864	372 253	10 415		52	-63 972	321 651		317 922	18 400	10.17
1865	366 002	20 315		107	-67 460	322 587		317 923	11 400	10.17
1866	381 208	22 635			-81 182	324 324	-3 001	323 136	15 500	10.33
1867	405 105	15 035			-71 023	346 342	-3 962	343 990	18 800	11.00
1868	393 157	10 639		47	-75 104	329 681	-1 363	328 358	20 800	10.50
1869	390 160	12 080		1	-70 059	332 551	-953	328 360	17 400	10.50
1870	388 273	19 892		16 000	-64 944	330 994	-16 418	328 362	15 500	10.50
1871	328 715	37 474		13 211	-62 513	293 043	-13 266	291 875	9 700	9.33
1872	294 378	56 038		4 022	-64 221	282 760	-4 602	281 454	5 700	9.00
1873	313 934	77 238		1 340	-71 398	315 529	-5 551	312 729	16 100	10.00
1874	325 466	97 358			-78 281	345 553	-1 791	344 002	15 100	11.00
1875	432 879	61 710		2 223	-114 121	377 790	-4 228	375 276	23 400	12.00
1876	444 205	53 560		72	-93 480	406 029	-771	390 917	19 900	12.50

Norges Bank's balance sheet, income accounts and profits, 1817-2021

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1817	0.730							0.712		0.018
1818	16.273		4.932			0.312	1.198	9.504		0.327
1819	20.083		6.285			0.487	3.994	9.264		0.053
1820	21.636		7.303			0.492	5.213	8.211		0.418
1821	22.622		7.576			0.499	7.405	7.062		0.080
1822	22.771		7.411			0.514	8.590	5.686		0.571
1823	23.055		7.415			0.743	9.707	4.719		0.472
1824	23.955		7.941			1.065	10.988	3.748		0.213
1825	26.697		8.618			1.421	13.717	2.758		0.183
1826	27.605		8.506			1.708	15.373	1.861		0.158
1827	28.354		8.590			1.729	16.327	1.063		0.646
1828	30.150		9.212			1.729	17.368	1.156		0.685
1829	30.429		9.334			1.738	17.758	0.900		0.698
1830	31.414		10.277			1.698	17.821	0.846		0.771
1831	32.241		10.473			1.732	18.401	0.820		0.815
1832	32.711		10.682			1.710	18.675	0.815		0.830
1833	32.658		10.736			1.829	18.425	0.803		0.865
1834	34.049		12.021			2.003	18.898	0.775		0.351
1835	34.909		12.230			2.560	19.585	0.176		0.358
1836	35.421		12.217			2.846	20.054			0.305
1837	36.351		12.152			2.979	20.956			0.264
1838	36.052		11.043			3.175	21.598			0.235
1839	38.190		12.188			3.979	21.801			0.221
1840	38.041		11.709	0.460		3.912	21.722			0.239
1841	37.713		11.150	1.156		3.723	21.422			0.262
1842	38.501		11.514	0.692		3.972	22.012			0.310
1843	39.693		9.730	1.624		3.871	24.156			0.312
1844	39.942		8.712	2.577		4.736	23.585			0.332
1845	42.758		8.866	3.322		5.363	24.867			0.341
1846	43.704		8.827	2.710		5.654	26.148			0.364
1847	40.803		8.611	0.830		5.417	25.848			0.096
1848	38.462		5.351	3.184		4.658	25.188			0.082
1849	37.183		7.336	1.699		3.785	24.284			0.078
1850	39.250		7.747	1.720		5.950	23.734			0.098
1851	41.744		8.085	1.816		8.177	23.566			0.100
1852	40.472		7.810	1.516		8.238	22.880			0.027
1853	48.680		9.723	6.370		10.340	22.229			0.019

2.B Appendix, Norges Bank's balance sheet, 1817–2021. Historical data (in million kroner)

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1854	53.831		8.768	10.928		12.182	21.941			0.011
1855	52.490		8.816	9.548		12.698	21.415			0.013
1856	49.779		11.856	4.487		12.602	20.827			0.007
1857	48.848		8.347	3.511		15.583	20.283			1.124
1858	52.694		11.943	4.892		15.744	19.774			0.341
1859	46.749		9.963	3.315		13.626	19.494			0.350
1860	46.971		9.921	4.540		12.391	19.500			0.619
1861	45.910		8.756	4.534		13.014	19.123			0.484
1862	48.575		10.178	4.201		15.369	18.443			0.384
1863	49.240		11.845	2.715		16.863	17.472			0.345
1864	46.911		12.300	3.011		14.839	16.380			0.380
1865	53.985		16.576	3.445		16.806	16.780			0.379
1866	50.255		12.720	2.673		17.889	16.509			0.464
1867	52.457		14.828	3.024		17.556	16.607			0.442
1868	48.364		11.885	1.606		17.707	16.693			0.473
1869	49.147		11.861	3.131		17.080	16.455			0.619
1870	50.736		12.406	4.203		17.222	16.341			0.564
1871	58.908		17.993	8.747		15.045	16.443			0.680
1872	63.081		20.651	9.594		16.524	15.684			0.627
1873	70.989		19.468	15.243		21.254	14.567			0.457
1874	70.363		20.881	14.115		21.048	13.885			0.433
1875	63.808		14.760	10.502		24.603	13.737			0.205
1876	68.889		22.483	10.104		22.211	13.817			0.273
1877	61.524		14.813	6.887		25.512	13.614			0.698
1878	56.595		13.220	5.995		23.355	13.165			0.859
1879	64.353		17.976	8.374		23.443	13.341			1.219
1880	68.477		23.391	10.331		20.125	12.918			1.713
1881	64.981		21.362	8.771		20.718	12.215			1.915
1882	66.008		22.606	10.461		19.057	11.649			2.235
1883	68.613		23.291	11.774		20.020	11.272			2.256
1884	65.735		23.403	11.077		18.653	10.451			2.151
1885	63.682		19.408	9.268		23.275	9.727			2.003
1886	65.406		20.176	10.080		24.562	8.414			2.174
1887	68.846		28.012	12.234		18.107	7.426			3.067
1888	71.520		28.689	16.273		17.353	6.539			2.666
1889	75.901		31.894	15.938		19.392	7.282			1.394
1890	78.531		30.161	13.224		25.979	8.238			0.929

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1891	78.360		26.938	12.158		31.757	6.991			0.515
1892	74.214		27.022	13.566		26.167	6.792			0.667
1893	78.290		27.268	14.405		28.204	7.565		0.558	0.290
1894	79.442		27.628	15.217		27.270	7.864		1.140	0.323
1895	83.568		28.096	16.890		29.585	7.608		1.125	0.264
1896	84.572		28.542	16.007		31.553	7.200		1.117	0.153
1897	88.310		28.979	20.704		30.812	6.624		1.117	0.074
1898	94.763		32.155	18.493		36.642	6.312		1.094	0.067
1899	104.906		32.222	16.705		47.523	7.261		1.049	0.146
1900	100.126		29.087	17.932		44.709	7.407		0.983	0.009
1901	102.847		30.543	22.256		40.260	8.850		0.855	0.084
1902	108.202		30.760	24.178		42.239	9.814			1.211
1903	99.722		24.986	20.005		38.175	8.424			8.133
1904	99.067		25.279	22.417		33.983	7.985			9.402
1905	106.546		28.274	25.303		35.425	7.465			10.079
1906	107.361		31.059	29.276		31.865	7.233			7.928
1907	110.540		27.368	38.059		31.310	6.237			7.566
1908	115.310		29.332	35.482		34.577	5.437			10.482
1909	119.665		30.294	38.445		38.275	4.564		0.468	7.619
1910	126.015		34.163	34.663		44.730	4.541		0.467	7.451
1911	136.046		38.268	31.939		53.595	6.354		0.456	5.434
1912	144.488		38.572	34.376		57.971	8.114		0.446	5.009
1913	165.858		44.374	41.682		65.318	8.964		0.427	5.093
1914	214.454		38.394	40.147		112.813	9.476		0.830	12.794
1915	232.850		51.630	86.595	2.615	75.331	8.386		3.656	4.636
1916	380.626		123.236	89.387	2.615	121.289	32.971		4.285	6.843
1917	621.447		116.393	87.510	2.152	174.864	229.885		4.379	6.264
1918	643.416		121.980	80.058	2.000	253.547	175.754		4.420	5.657
1919	647.654		147.724	81.588	1.535	349.839	57.805		3.748	5.415
1920	734.238		147.284	63.275	1.412	449.349	58.438		2.724	11.756
1921	671.615		147.292	47.354	1.600	419.674	37.356		3.610	14.729
1922	678.855		147.291	57.854	1.732	363.862	47.636		3.141	57.339
1923	651.455		147.285	31.801	1.600	323.497	102.989		3.128	41.155
1924	619.167		147.226	50.751	1.564	244.262	128.269		3.256	43.839
1925	531.933		147.225	69.823	1.564	165.895	130.210		3.513	13.703
1926	704.984		147.227	303.238	4.374	120.732	99.558		3.196	26.659
1927	484.132		147.232	82.492	3.837	105.889	115.260		8.561	20.861

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1928	469.862		146.875	41.264	1.132	123.616	133.304		7.855	15.816
1929	469.267		146.654	66.157	1.132	114.545	106.812		18.321	15.646
1930	434.644		146.427	71.223	0.985	106.748	76.225		15.253	17.783
1931	461.584		155.082	22.422	1.730	117.998	126.008		28.605	9.739
1932	453.946		144.242	31.243	1.380	214.182	31.161		25.134	6.604
1933	449.651	0.816	143.357	5.338	1.155	235.367	30.173		26.953	6.492
1934	469.971	0.924	134.861	40.810	1.212	226.473	29.080		30.831	5.780
1935	485.465	1.285	185.130	46.249	1.212	196.848	20.673		26.114	7.954
1936	591.671	1.838	215.067	106.417	21.175	195.269	22.118		20.363	9.424
1937	609.839		180.180	233.140	57.027	91.056	28.453		9.427	10.556
1938	706.840		206.314	216.739	89.662	83.704	29.115		21.133	60.173
1939	778.961		206.697	98.804	72.255	230.024	72.284		30.389	68.508
1940	2 151.070	2.500	330.591	102.640	81.838	0.680	89.215	1 448.804	15.606	79.195
1941	4 318.581	2.500	254.235	45.493	17.630	0.219	40.362	3 884.460	6.189	67.493
1942	5 502.926	2.500	253.805	45.465	15.675	0.219	26.542	5 085.846	5.155	67.719
1943	7 171.357	2.500	253.747	39.076	14.292	4.311	18.363	6 768.387	3.857	66.825
1944	9 377.965	2.500	253.530	37.165	12.794	0.636	23.187	8 978.239	3.546	66.368
1945	8 941.261		356.135	94.773	0.249	6.563	22.695	8 411.564	7.058	42.224
1946	9 460.110		406.063	753.073		3.179	81.012	8 108.569	78.841	29.373
1947	9 121.487		332.542	422.241	66.095	9.482	93.916	8 094.686	72.373	30.152
1948	8 805.437		232.833	436.158		7.290	72.278	7 923.973	53.807	79.098
1949	7 932.042		252.603	356.998		9.213	85.196	7 114.306	47.756	65.970
1950	7 124.823		243.160	517.176		13.381	43.441	6 203.567	46.557	57.541
1951	7 413.337		242.265	720.389		30.400	48.512	6 203.698	45.840	122.233
1952	6 652.544		242.613	720.164		15.322	58.369	5 547.716	44.835	23.525
1953	6 687.499		255.305	648.172		16.755	73.694	5 547.389	127.396	18.788
1954	6 550.346		202.889	666.308		14.511	54.176	5 547.682	38.072	26.708
1955	6 869.016		208.655	858.172		23.150	119.820	5 547.621	93.259	18.339
1956	6 986.049		244.443	917.766		31.516	115.721	5 547.450	106.576	22.577
1957	7 013.052		206.431	995.283		58.408	82.708	5 546.969	100.112	23.141
1958	7 394.474		191.579	1 431.233		6.936	98.967	5 441.797	196.322	27.640
1959	7 573.003		136.554	1 613.074		69.232	99.589	5 443.639	189.056	21.859
1960	7 659.934		135.651	1 803.536		4.718	74.545	5 433.191	185.800	22.493
1961	7 678.906		136.573	1 771.343		5.344	106.379	5 432.937	199.342	26.988
1962	7 829.224		137.191	1 775.146		5.386	113.237	5 574.211	196.592	27.461
1963	8 205.646		137.869	2 131.578		5.000	113.665	5 574.211	224.874	18.449
1964	8 514.337		138.532	2 365.916		5.251	170.015	5 574.211	231.537	28.875

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
1965	9 072.388		139.206	2 999.088	25.679	5.853	80.424	5 574.211	217.401	30.526
1966	9 472.344		84.190	3 332.303	16.341	7.418	201.725	5 574.211	232.404	23.752
1967	10 696.742		84.240	4 340.730	78.528	13.759	283.086	5 574.211	272.032	50.156
1968	10 576.960		123.543	4 337.474	73.130	8.418	163.205	5 574.211	277.736	19.243
1969	12 348.003	1 071.429	180.637	4 270.178	69.218	269.007	328.554	5 574.189	409.390	175.401
1970	13 937.048	1 908.570	167.441	4 583.352	66.203	25.400	125.406	5 574.189	1 257.236	229.251
1971	16 272.835	2 127.755	239.249	6 596.878		205.226	209.292	5 574.189	912.750	407.496
1972	18 315.552	2 365.414	247.225	7 426.156		130.876	1 007.270	5 574.189	938.402	626.020
1973	19 254.168	2 253.735	235.390	7 745.038		1 356.687	66.975	5 429.965	1 143.863	1 022.515
1974	20 369.215	2 116.761	235.390	8 771.645		1 963.204	126.163	5 429.965	1 077.213	648.874
1975	23 852.178	2 337.948	235.390	10 983.088		1 267.287	141.395	5 429.965	2 616.464	840.641
1976	24 458.939	2 580.965	235.390	9 360.994		1 432.389	113.581	5 429.965	4 324.423	981.232
1977	32 124.513	2 685.915	260.090	9 274.995		5 577.581	155.383	5 429.965	7 676.164	1 064.420
1978	32 209.944	3 102.262	272.000	12 377.682		2 360.000	244.000	5 430.000	7 832.000	592.000
1979	39 729.304	3 249.304	285.000	18 610.000		1 540.000	225.000	5 430.000	9 532.000	858.000
1980	45 331.779	4 303.436	285.000	28 793.343		1 013.000	239.000	5 430.000	4 552.000	716.000
1981	53 573.719	4 525.158	285.000	33 666.561		3 012.000	270.000	5 430.000	5 812.000	573.000
1982	60 045.602	5 719.200	285.000	44 470.402		2 855.000	434.000		5 758.000	524.000
1983	71 226.000	7 711.000	285.000	45 711.000		4 679.000	376.000		11 843.000	621.000
1984	98 657.100	8 561.100	285.000	78 724.000		2 237.000	380.000		7 735.000	735.000
1985	141 382.400	7 962.400	285.000	103 751.000	3 735.000	4 575.000	366.000		19 267.000	1 441.000
1986	219 411.500	9 246.500	285.000	87 479.000	837.000	70 341.000	370.000		48 264.000	2 589.000
1987	197 461.200	8 927.200	285.000	83 903.000		76 400.000	406.000		24 859.000	2 681.000
1988	194 853.000	9 604.000	285.000	81 579.000		77 552.000	468.000		20 574.000	4 791.000
1989	194 485.213	9 140.497	284.788	86 207.747		62 696.313	349.985		32 150.585	3 655.298
1990	179 739.724	8 645.264	284.788	85 867.381		58 462.342	178.261		23 403.648	2 898.040
1991	162 422.679	8 791.797	284.788	73 922.609		62 456.400	152.498		14 219.276	2 595.311
1992	161 051.088	12 096.065	284.788	78 169.317		55 641.246	658.341		12 584.085	1 617.246
1993	210 631.984	14 804.468	284.821	146 598.469		16 904.619	636.602		29 251.865	2 151.140
1994	176 912.096	14 268.094	284.822	139 312.176		5 279.715	616.229		13 691.393	3 459.667
1995	183 995.092	13 999.448	284.874	137 196.135		10 098.670	594.471		18 057.336	3 764.158
1996	203 863.929	13 280.622	285.049	173 982.830		366.533	528.039		12 413.161	3 007.695
1997	204 654.037	14 411.674	283.621	168 496.948		7 504.916	515.328		10 645.722	2 795.828
1998	186 239.841	16 514.690	284.778	137 438.682		12 137.296	7 681.791		9 426.245	2 756.359
1999	244 945.357	23 039.377	2 206.904	179 928.178		25 629.572	566.512		10 771.925	2 802.889
2000	299 367.968	23 279.211	2 275.089	234 439.671		22 115.067	575.482		13 519.082	3 164.366
2001	254 772.067	23 296.914	2 932.674	198 301.847		15 182.975	603.002		11 523.342	2 931.313

Table 2.B.1: Norges Bank's assets, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total assets	Claims on int'l. org.	Metal reserves	FX assets	Domestic FX claims	Short term loans	Other loans	Government loans	Domestic securities	Other assets
2002	250 752.966	18 852.966	2 808.093	211 375.456		1 066.387	661.572		13 443.492	2 545.000
2003	301 765.549	19 563.297	3 276.949	239 730.684		12 924.890	544.855		23 281.000	2 443.874
2004	284 382.781	18 457.000		261 930.783		708.080	494.412			2 792.506
2005	360 846	18 740		313 703		24 937	487			2 979
2006	428 735	18 624		349 857		55 191	477			4 586
2007	423 115	16 472		327 447		75 196	451			3 549
2008	587 078	21 203		423 687	57 811	79 688	496			4 193
2009	379 833	30 437		264 927	16	75 480	487			8 486
2010	397 370	32 406		294 766		60 097	486			9 615
2011	342 836	36 184		272 469		25 318	494			8 371
2012	323 142	34 515		268 157		12 083	594			7 793
2013	379 644	38 630		332 515		856	729			6 914
2014	513 707	44 241		463 026		105	763			5 572
2015	541 893	49 996		483 943		883	544			6 527
2016	574 611	66 515		501 094		132	408			6 462
2017	595 969	68 165		519 600		407	337			7 460
2018	599 694	68 215		523 747		174	285			7 273
2019	643 107	69 275		559 465		7 001	258			7 108
2020	771 002	71 281		611 333		80 465	183			7 740
2021	831 928	117 525		666 341		45 434	167			2 461

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1817	0.730						0.120	0.726		-0.115
1818	16.273			10.146		0.271	0.163	0.006	6.000	-0.312
1819	20.083			12.460		0.537	0.153	0.003	7.012	-0.082
1820	21.636			13.304		0.562	0.008	0.436	7.255	0.072
1821	22.622			13.978		0.414	0.020	0.308	7.568	0.334
1822	22.771			14.034		0.410	0.028	0.329	7.653	0.317
1823	23.055			14.035		0.594	0.012	0.267	7.770	0.377
1824	23.955			14.474		0.323	0.428	0.297	7.911	0.523
1825	26.697			15.876		0.906	0.912	0.437	7.956	0.611
1826	27.605			16.073		0.923	1.420	0.625	7.977	0.587
1827	28.354			16.325		1.304	1.141	0.375	7.985	1.224
1828	30.150			17.051		1.630	0.879	0.527	8.667	1.397
1829	30.429			17.669		1.578	0.612	0.445	8.671	1.453
1830	31.414			19.305		1.656	0.212	0.145	8.674	1.422
1831	32.241			19.346		1.934	0.408	0.367	8.675	1.511
1832	32.711			18.993		1.927	0.412	1.142	8.678	1.560
1833	32.658			19.903		1.761	0.028	0.229	9.082	1.655
1834	34.049			20.409		1.881	0.028	0.257	9.751	1.723
1835	34.909			20.847		1.761	0.032	0.461	10.006	1.803
1836	35.421			21.575		1.451	0.040	0.477	10.006	1.873
1837	36.351			21.024		1.450	1.636	0.309	10.006	1.926
1838	36.052			20.280		1.465	1.836	0.462	10.006	2.003
1839	38.190			22.249		1.388	2.240	0.262	10.006	2.044
1840	38.041			22.143		1.319	2.252	0.283	10.007	2.037
1841	37.713			22.484		1.329	1.440	0.400	10.007	2.054
1842	38.501			23.283		2.003	0.744	0.287	10.007	2.177
1843	39.693			22.505		3.852	0.788	0.230	10.007	2.311
1844	39.942			22.288		4.002	1.000	0.179	10.007	2.466
1845	42.758			23.163		4.064	2.696	0.207	10.007	2.622
1846	43.704			23.290		5.774	1.636	0.144	10.007	2.853
1847	40.803			22.096		4.059	1.460	0.206	10.007	2.975
1848	38.462			18.891		5.224	1.116	0.164	10.007	3.060
1849	37.183			18.830		3.949	1.060	0.162	10.007	3.173
1850	39.250			19.729		5.093	0.940	0.130	10.008	3.350
1851	41.744			20.735		5.032	2.312	0.140	10.008	3.518
1852	40.472			21.083		4.896	0.524	0.150	10.008	3.810
1853	48.680			27.188		6.506	0.776	0.169	10.008	4.034

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1854	53.831			30.709		7.936	0.580	0.211	10.008	4.387
1855	52.490			30.961		6.102	0.212	0.461	10.008	4.747
1856	49.779			29.221		4.132	1.024	0.332	10.008	5.062
1857	48.848			26.678		6.195	0.439	0.312	10.008	5.216
1858	52.694			26.323		6.928	3.664	0.435	10.008	5.335
1859	46.749			24.207		5.700	0.879	0.419	10.008	5.535
1860	46.971			25.847		4.618	0.338	0.441	10.008	5.719
1861	45.910			25.194		3.713	0.653	0.381	10.008	5.961
1862	48.575			26.955		4.601	0.467	0.289	10.008	6.256
1863	49.240			26.643		4.666	0.950	0.473	12.508	3.999
1864	46.911			25.597		2.889	1.294	0.594	12.508	4.029
1865	53.985			28.524		5.475	2.957	0.439	12.509	4.081
1866	50.255			27.945		3.492	1.778	0.386	12.509	4.145
1867	52.457			29.095		5.178	0.671	0.842	12.509	4.162
1868	48.364			26.437		4.295	0.539	0.458	12.509	4.127
1869	49.147			27.163		4.488	0.526	0.284	12.509	4.178
1870	50.736			28.388		4.844	0.494	0.266	12.509	4.235
1871	58.908			33.982		7.450	0.447	0.316	12.509	4.205
1872	63.081			38.516		6.882	0.559	0.257	12.509	4.358
1873	70.989			47.179		5.800	0.424	0.440	12.509	4.637
1874	70.363			45.870		5.111	1.401	0.333	12.509	5.139
1875	63.808			37.230		6.256	1.550	0.710	12.509	5.553
1876	68.889			39.669		7.404	2.640	0.813	12.509	5.854
1877	61.524			36.309		5.663	0.416	0.669	12.509	5.958
1878	56.595			30.968		5.823	0.667	0.550	12.509	6.078
1879	64.353			32.720		11.482	1.179	0.408	12.509	6.055
1880	68.477			38.714		9.100	1.585	0.547	12.509	6.022
1881	64.981			37.654		6.986	0.994	0.633	12.510	6.204
1882	66.008			40.579		5.534	0.286	0.645	12.510	6.455
1883	68.613			40.956		7.452	0.541	0.540	12.510	6.614
1884	65.735			38.984		5.840	1.248	0.348	12.510	6.805
1885	63.682			37.147		6.533	0.330	0.205	12.510	6.957
1886	65.406			38.842		5.133	0.518	0.982	12.510	7.420
1887	68.846			40.037		9.021	0.958	0.678	12.510	5.642
1888	71.520			43.588		8.298	0.580	0.941	12.510	5.604
1889	75.901		0.421	49.418		6.132	1.961	0.334	12.510	5.126
1890	78.531		3.239	49.671		5.549	1.344	0.447	12.510	5.771

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1891	78.360		2.151	47.586		6.923	2.509	0.316	12.510	6.365
1892	74.214		0.591	45.115		6.165	2.406	0.758	12.510	6.669
1893	78.291		4.572	47.200		4.030	2.500	0.554	12.510	6.925
1894	79.443		5.224	47.785		4.098	2.600	0.508	12.510	6.718
1895	83.568		3.566	50.970		6.645	2.700	0.484	12.510	6.693
1896	84.571		5.637	52.484		3.558	2.882	0.506	12.510	6.994
1897	88.311			59.312		5.701	3.192	0.589	12.510	7.007
1898	94.764		1.843	63.416		5.674	3.626	0.722	12.510	6.973
1899	104.906		3.595	62.452	4.300	1.451	11.900	1.615	12.510	7.083
1900	100.128		5.323	65.612	2.700	1.521	1.900	2.602	15.104	5.366
1901	102.848		3.631	62.536	4.500	1.532	2.400	2.696	15.495	10.058
1902	108.203		9.700	62.916	4.400	1.960	2.300	1.678	15.500	9.749
1903	99.724		4.565	61.394	4.200	0.764	2.400	1.590	15.500	9.311
1904	99.067		2.247	60.171	5.400	2.661	2.000	1.958	15.500	9.130
1905	106.545		3.937	65.665	5.200	3.181	1.600	2.305	15.500	9.157
1906	107.360		0.923	68.935	5.700	2.223	2.500	2.664	15.500	8.915
1907	110.541			73.483	4.800	2.681	2.000	3.422	15.500	8.655
1908	115.310			72.813	5.000	1.863	1.600	3.041	19.000	11.993
1909	119.665			77.494	4.400	2.127	1.500	2.877	19.000	12.267
1910	126.015			84.282	3.200	2.563	2.100	2.768	19.000	12.102
1911	136.044			92.873	4.700	2.448	2.200	2.498	19.000	12.325
1912	144.488			99.276	4.900	2.622	2.900	3.071	19.000	12.719
1913	165.858			107.612	6.700	2.382	3.500	2.927	25.000	17.737
1914	214.454		0.100	134.182	12.200	4.540	4.300	15.360	25.000	18.772
1915	232.850		0.484	162.211	16.100	9.800	0.700	5.793	25.000	12.762
1916	380.625		11.310	251.453	57.400	10.845	3.700	7.694	25.000	13.223
1917	621.450		40.130	326.319	96.800	16.101	73.000	10.009	35.000	24.091
1918	643.415		9.100	436.212	92.200	23.155	2.600	7.549	35.000	37.599
1919	647.654		6.400	454.280	63.000	37.098	0.600	10.092	35.000	41.184
1920	734.239		6.600	491.916	101.200	31.300	0.900	13.127	35.000	54.196
1921	671.615		11.600	418.991	86.900	40.462	4.300	10.443	35.000	63.919
1922	678.857		11.000	394.341	88.800	43.729	21.300	21.279	35.000	63.408
1923	651.453		11.300	406.440	63.200	38.434	3.000	43.752	35.000	50.327
1924	619.165		12.500	401.739	60.600	24.889	10.000	32.377	35.000	42.060
1925	531.932		9.100	365.511	53.300	31.124	6.500	4.712	35.000	26.685
1926	704.985		46.000	337.199	238.900	6.446	15.500	4.331	35.000	21.609
1927	484.133		5.300	330.896	61.100	18.445	10.300	4.188	35.000	18.904

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1928	469.862		2.400	315.539	56.800	14.563	19.800	6.774	35.000	18.986
1929	469.267		2.200	317.720	45.000	13.420	29.100	7.596	35.000	19.231
1930	434.644		1.300	311.563	39.100	6.691	18.100	3.380	35.000	19.510
1931	461.585		2.200	334.422	44.100	10.912	10.300	6.816	35.000	17.835
1932	453.946		2.400	314.500	52.900	13.108	8.300	9.265	35.000	18.473
1933	449.651		1.400	327.214	43.900	7.698	10.800	5.529	35.000	18.110
1934	469.973		7.352	333.068	52.900	9.300	9.200	4.876	35.000	18.277
1935	485.466		3.194	347.870	44.300	8.300	24.200	4.238	35.000	18.364
1936	591.671		1.505	428.601	41.900	11.800	50.500	3.842	35.000	18.523
1937	609.839		2.097	448.942	49.600	9.600	41.200	4.629	35.000	18.771
1938	706.841		13.143	477.432	48.300	4.500	64.700	44.586	35.000	19.180
1939	778.961		11.091	574.714	29.000	24.200	31.000	50.706	35.000	23.250
1940	2 151.069			1 043.900	361.000	340.130	192.271	149.428	35.000	29.236
1941	4 318.582			1 550.841	623.000	703.440	1 195.733	174.841	35.000	35.727
1942	5 502.923			2 165.358	640.000	860.255	1 581.460	179.372	35.000	41.477
1943	7 171.355			2 609.897	1 070.000	1 152.168	2 078.621	179.603	35.000	46.066
1944	9 377.964			3 048.577	1 205.000	961.487	3 886.676	189.734	35.000	51.489
1945	8 941.263		65.373	1 500.062	684.130	832.247	5 396.983	377.578	35.000	49.890
1946	9 460.112		71.735	1 953.064	741.857	1 311.950	5 044.656	242.760	35.000	59.090
1947	9 121.489		129.841	2 111.100	1 315.138	1 466.596	3 769.362	231.862	35.000	62.590
1948	8 805.439		259.918	2 190.855	819.016	1 135.653	4 042.368	259.120	35.000	63.509
1949	7 932.042		458.201	2 334.315	1 325.719	787.621	2 728.042	198.635	35.000	64.509
1950	7 124.824		459.329	2 415.669	739.834	672.137	2 403.920	334.426	35.000	64.509
1951	7 413.336	12.514	431.884	2 666.754	1 038.645	181.082	2 679.773	300.432	35.000	67.252
1952	6 652.546	60.457	202.060	2 916.482	732.338	150.367	2 334.591	147.398	35.000	73.853
1953	6 687.502	505.436	195.356	3 128.043	720.780	86.203	1 792.320	141.722	35.000	82.642
1954	6 550.347	672.572	306.122	3 320.898	557.330	29.024	1 404.533	137.139	35.000	87.729
1955	6 869.013	801.243	184.923	3 305.019	640.443	45.002	1 628.941	140.692	35.000	87.750
1956	6 986.051	645.586	141.740	3 501.974	608.105	128.221	1 662.134	59.635	35.000	203.656
1957	7 013.050	546.043	190.300	3 468.665	638.035	162.684	1 703.930	52.214	35.000	216.179
1958	7 394.474	609.929	189.002	3 511.405	632.759	106.239	2 047.644	53.759	35.000	208.737
1959	7 573.004		90.459	3 675.175	706.938	62.074	2 695.646	62.125	35.000	245.587
1960	7 659.935		76.285	3 822.886	703.378	17.231	2 634.988	62.345	35.000	307.822
1961	7 678.907		65.276	4 043.492	643.035	16.093	2 486.071	61.658	35.000	328.282
1962	7 829.224		87.467	4 437.032	551.674	16.219	2 309.109	64.617	35.000	328.106
1963	8 205.645		80.465	4 674.900	626.812	77.668	2 306.097	75.107	35.000	329.596
1964	8 514.337		40.238	4 973.293	661.339	168.151	2 173.968	100.952	35.000	361.396

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
1965	9 072.389		59.880	5 354.920	806.183	282.009	2 049.601	92.350	35.000	392.446
1966	9 472.347		54.081	5 753.175	833.758	385.042	1 847.265	90.766	35.000	473.260
1967	10 696.742		222.377	6 184.553	690.898	475.205	2 441.912	96.976	35.000	549.821
1968	10 576.960		126.640	6 538.423	760.387	451.435	1 854.868	120.563	35.000	689.644
1969	12 348.003	450.267	186.645	6 946.796	474.275	829.562	2 431.792	121.172	35.000	872.494
1970	13 937.048	1 045.893	147.421	7 689.353	351.299	1 177.797	2 217.273	153.934	35.000	1 119.078
1971	16 272.834	1 654.252	127.960	8 423.252	480.289	1 534.002	2 976.569	142.326	35.000	899.184
1972	18 315.553	1 785.851	143.012	9 180.232	257.880	1 280.148	4 281.510	156.601	35.000	1 195.319
1973	19 254.167	1 737.732	149.269	9 942.738	74.697	1 083.514	5 594.599	155.039	35.000	481.579
1974	20 369.213	1 595.383	314.672	11 313.835	128.608	797.445	5 609.935	176.797	35.000	397.538
1975	23 852.176	1 525.206	187.505	12 969.175	471.667	406.490	6 312.975	140.383	35.000	1 803.775
1976	24 458.936	1 015.365	181.763	14 849.843	304.156	262.656	5 727.719	175.566	35.000	1 906.868
1977	32 124.511	1 117.889	2 894.744	16 725.181	277.224	241.426	7 208.129	472.831	35.000	3 152.087
1978	32 210.000	1 625.000	197.000	17 756.000	855.000	887.000	6 071.000	692.000	35.000	4 092.000
1979	39 729.000	1 816.000	308.000	18 620.000	1 941.000	726.000	8 337.000	2 909.000	35.000	5 037.000
1980	45 332.000	2 842.000	263.000	19 814.000	2 208.000	1 077.000	10 181.000	197.000	35.000	8 715.000
1981	53 573.000	2 894.000	236.000	21 134.000	635.000	1 166.000	11 458.000	95.000	35.000	15 920.000
1982	60 044.000	2 894.000	459.000	22 008.000	1 011.000	1 411.000	8 028.000	138.000	35.000	24 060.000
1983	71 226.000	3 675.000	753.000	23 014.000	1 199.000	1 828.000	19 450.000	1 614.000	35.000	19 658.000
1984	98 656.000	3 530.000	386.000	24 534.000	1 888.000	4 257.000	35 422.000	162.000	35.000	28 442.000
1985	141 382.000	3 322.000	352.000	27 196.000	1 281.000	4 474.000	81 383.000	251.000		23 123.000
1986	219 412.000	3 500.000	523.000	28 980.000	954.000	2 705.000	144 470.000	307.000		37 973.000
1987	197 462.000	3 259.000	423.000	30 832.000	1 011.000	2 991.000	119 272.000	111.000		39 563.000
1988	194 852.000	3 671.000	830.000	30 938.000	359.000	2 246.000	116 753.000	46.000		40 009.000
1989	194 485.213	3 682.823	431.043	31 605.819	2 128.979	1 510.535	121 094.250	130.622		33 901.142
1990	179 739.724	3 857.076	220.588	32 682.390	862.413	1 152.146	109 011.495	550.946		31 402.670
1991	162 422.679	3 996.408	265.587	34 303.921	2 077.067	644.322	84 997.499	546.084		35 591.791
1992	161 051.088	7 626.363	4 902.873	34 688.591	3 547.121	387.803	67 322.674	755.563		41 820.100
1993	210 631.984	8 744.421	5 372.307	38 002.815	4 195.099	501.863	106 823.925	350.523		46 641.031
1994	176 912.096	8 239.809	6 427.572	40 454.014	3 251.480	205.692	87 448.763	454.141		30 430.625
1995	183 995.092	5 976.118	4 226.636	42 068.706	4 135.179	141.176	98 456.198	200.504		28 790.575
1996	203 863.929	6 059.431	13 680.206	43 323.734	27 436.133	149.329	83 775.690	440.316		28 999.090
1997	204 654.037	5 397.597	8 982.380	46 014.345	16 522.926	124.753	87 983.489	379.523		39 249.024
1998	186 239.842	4 372.214	10 748.599	46 070.239	9 715.400	117.513	55 085.974	771.248		59 358.655
1999	244 945.357	13 407.422	27 363.967	48 020.171	35 825.292	110.785	67 901.661	1 677.457		50 638.602
2000	299 367.968	16 041.188	60 891.094	46 951.653	23 235.774	101.068	96 375.939	2 096.162		53 675.090
2001	254 772.067	14 281.498	43 828.149	46 633.235	23 019.720	95.463	83 547.611	2 696.139		40 670.252

Table 2.B.2: Norges Bank's liabilities and equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Total liabilities & equity	Liabilities to int. org.	Other foreign liabilities	Currency in circulation	Deposits, fin. inst.	Deposits, private	Deposits, govt.	Other liabilities	Equity, shares	Equity, funds
2002	250 752.916	10 470.338	53 785.856	44 954.570	59 152.622	56.231	52 913.820	3 980.885		25 438.594
2003	301 765.488	11 604.568	50 298.935	46 249.000	28 116.504	226.702	108 586.000	8 815.000		46 213.000
2004	284 382.781	12 017.904	49 591.965	47 595.000	37 062.390	95.338	88 816.000	356.000		47 302.000
2005	360 846	15 729	61 713	51 910	42 653	46	109 627	10 488		68 622
2006	428 735	15 973	99 837	54 838	23 956	74	159 679	254		74 124
2007	423 115	14 721	89 036	55 685	53 467	50	148 494	5 114		56 548
2008	587 076	17 221	189 458	55 159	100 858	92	147 359	17 042		59 887
2009	379 833	26 354	28 136	54 303	80 215	93	138 036	415		52 281
2010	397 368	25 791	35 391	53 928	79 810	84	136 851	582		64 931
2011	342 836	26 720	10 056	54 766	92 030	104	81 673	4 922		72 565
2012	323 143	24 845	3 629	53 755	35 220	116	131 796	444		73 338
2013	379 644	28 413	4 192	54 060	74 528	144	90 742	868		126 697
2014	513 707	34 434	14 398	53 016	77 662	138	126 051	2 532		205 476
2015	541 894	39 864	15 761	53 136	58 192	226	127 182	2 177		245 356
2016	574 611	58 912	20 954	50 495	52 654	192	164 918	1 807		224 679
2017	595 969	59 221	7 205	48 420	62 480	1 488	176 720	2 436		237 999
2018	599 694	58 713	11 975	44 803	40 069	365	202 451	2 231		239 087
2019	643 107	57 235	13 141	41 613	58 147	741	207 433	1 633		263 164
2020	771 002	53 925	15 448	41 006	52 578	229	328 300	2 697		276 819
2021	831 928	98 044	23 741	39 745	23 011	361	355 250	3 072		288 704

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1817	-0.115		-0.115						-0.115	
1818	5.688	6.000	-0.312						-0.312	
1819	6.930	7.012	-0.082						-0.082	
1820	7.327	7.255	0.072						0.072	
1821	7.902	7.568	0.334						0.334	
1822	7.970	7.653	0.317						0.317	
1823	8.146	7.770	0.377						0.377	
1824	8.433	7.911	0.523						0.523	
1825	8.566	7.956	0.611						0.611	
1826	8.564	7.977	0.587						0.587	
1827	9.209	7.985	1.224	0.706					0.518	
1828	10.065	8.667	1.397	0.779					0.618	
1829	10.124	8.671	1.453	0.838					0.616	
1830	10.096	8.674	1.422	0.833					0.589	
1831	10.187	8.675	1.511	0.894					0.617	
1832	10.237	8.678	1.560	0.939					0.621	
1833	10.737	9.082	1.655	1.024					0.632	
1834	11.474	9.751	1.723	1.076					0.647	
1835	11.808	10.006	1.803	1.112					0.690	
1836	11.879	10.006	1.873	1.149					0.724	
1837	11.932	10.006	1.926	1.178					0.748	
1838	12.009	10.006	2.003	1.226					0.777	
1839	12.051	10.006	2.044	1.235					0.810	
1840	12.044	10.007	2.037	1.263					0.774	
1841	12.060	10.007	2.054	1.271					0.782	
1842	12.184	10.007	2.177	1.330	0.020				0.826	
1843	12.318	10.007	2.311	1.438	0.107				0.766	
1844	12.473	10.007	2.466	1.464	0.204				0.798	
1845	12.629	10.007	2.622	1.502	0.325				0.795	
1846	12.860	10.007	2.853	1.532	0.450				0.871	
1847	12.982	10.007	2.975	1.565	0.580				0.829	
1848	13.067	10.007	3.060	1.591	0.706				0.763	
1849	13.181	10.007	3.173	1.595	0.814				0.764	
1850	13.358	10.008	3.350	1.613	0.913				0.825	
1851	13.525	10.008	3.518	1.637	1.016				0.864	
1852	13.818	10.008	3.810	1.793	1.130				0.886	
1853	14.042	10.008	4.034	1.860	1.259				0.914	

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1854	14.395	10.008	4.387	1.997	1.394				0.996	
1855	14.755	10.008	4.747	2.061	1.532				1.154	
1856	15.070	10.008	5.062	2.129	1.672				1.261	
1857	15.224	10.008	5.216	2.224	1.822				1.170	
1858	15.343	10.008	5.335	2.296	1.976				1.063	
1859	15.543	10.008	5.535	2.376	2.120				1.039	
1860	15.727	10.008	5.719	2.428	2.266				1.025	
1861	15.969	10.008	5.961	2.507	2.418				1.037	
1862	16.264	10.008	6.256	2.613	2.500				1.143	
1863	16.507	12.508	3.999	2.694					1.304	
1864	16.538	12.508	4.029	2.743					1.287	
1865	16.590	12.509	4.081	2.791					1.290	
1866	16.654	12.509	4.145	2.848					1.297	
1867	16.671	12.509	4.162	2.777					1.385	
1868	16.636	12.509	4.127	2.808					1.319	
1869	16.687	12.509	4.178	2.848					1.330	
1870	16.744	12.509	4.235	2.911					1.324	
1871	16.714	12.509	4.205	3.033					1.172	
1872	16.867	12.509	4.358	3.227					1.131	
1873	17.146	12.509	4.637	3.375					1.262	
1874	17.648	12.509	5.139	3.757					1.382	
1875	18.062	12.509	5.553	4.042					1.511	
1876	18.363	12.509	5.854	4.230					1.624	
1877	18.468	12.509	5.958	4.421					1.537	
1878	18.587	12.509	6.078	4.562					1.516	
1879	18.564	12.509	6.055	4.701					1.354	
1880	18.531	12.509	6.022	4.888					1.133	
1881	18.714	12.510	6.204	5.104					1.101	
1882	18.965	12.510	6.455	5.325					1.130	
1883	19.124	12.510	6.614	5.534					1.080	
1884	19.315	12.510	6.805	5.738					1.067	
1885	19.467	12.510	6.957	5.917					1.040	
1886	19.930	12.510	7.420	6.085					1.336	
1887	18.152	12.510	5.642	4.777					0.866	
1888	18.114	12.510	5.604	5.039					0.564	
1889	17.635	12.510	5.126	4.549					0.577	
1890	18.281	12.510	5.771	4.934					0.838	

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1891	18.875	12.510	6.365	5.220					1.146	
1892	19.179	12.510	6.669	5.416					1.253	
1893	19.435	12.510	6.925	5.416					1.509	
1894	19.228	12.510	6.718	5.416					1.302	
1895	19.203	12.510	6.693	5.416					1.277	
1896	19.504	12.510	6.994	5.416					1.578	
1897	19.517	12.510	7.007	5.416					1.591	
1898	19.483	12.510	6.973	5.416					1.557	
1899	19.593	12.510	7.083	5.416					1.667	
1900	20.470	15.104	5.366	3.602					1.764	
1901	25.553	15.495	10.058	7.868					2.190	
1902	25.249	15.500	9.749	7.880					1.869	
1903	24.811	15.500	9.311	7.598					1.713	
1904	24.630	15.500	9.130	7.576					1.554	
1905	24.657	15.500	9.157	7.592					1.565	
1906	24.415	15.500	8.915	7.335					1.580	
1907	24.155	15.500	8.655	7.077					1.578	
1908	30.993	19.000	11.993	9.910				0.200	1.883	
1909	31.267	19.000	12.267	9.855				0.130	2.282	
1910	31.102	19.000	12.102	9.635				0.181	2.286	
1911	31.325	19.000	12.325	9.436				0.221	2.668	
1912	31.719	19.000	12.719	9.188				0.304	3.227	
1913	42.737	25.000	17.737	13.609				0.323	3.805	
1914	43.772	25.000	18.772	13.362			0.500	0.607	4.303	
1915	37.762	25.000	12.762	11.944				0.497	0.321	
1916	38.223	25.000	13.223	11.453			0.500	0.931	0.339	
1917	59.091	35.000	24.091	17.366		4.000		2.378	0.347	
1918	72.599	35.000	37.599	17.048		17.000		3.170	0.381	
1919	76.184	35.000	41.184	15.374		21.658		3.620	0.532	
1920	89.196	35.000	54.196	14.000		35.341		4.108	0.747	
1921	98.919	35.000	63.919	15.342		43.142		4.553	0.882	
1922	98.408	35.000	63.408	15.343		42.739		4.515	0.811	
1923	85.327	35.000	50.327	15.127		30.139		4.313	0.748	
1924	77.060	35.000	42.060	15.044		22.090		4.165	0.761	
1925	61.685	35.000	26.685	15.148		7.038		3.886	0.613	
1926	56.609	35.000	21.609	15.169		5.338		0.548	0.554	
1927	53.904	35.000	18.904	15.230		2.838		0.282	0.554	

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1928	53.986	35.000	18.986	15.342		2.838		0.252	0.554	
1929	54.231	35.000	19.231	15.337		2.838		0.502	0.554	
1930	54.510	35.000	19.510	15.432		2.838		0.690	0.550	
1931	52.835	35.000	17.835	14.018		2.838		0.429	0.550	
1932	53.473	35.000	18.473	14.056		2.838		1.029	0.550	
1933	53.110	35.000	18.110	14.140		2.838		0.582	0.550	
1934	53.277	35.000	18.277	14.344		2.838		0.545	0.550	
1935	53.364	35.000	18.364	14.716		2.838		0.260	0.550	
1936	53.523	35.000	18.523	14.716		2.838	0.296	0.123	0.550	
1937	53.771	35.000	18.771	14.716		2.838	0.544	0.123	0.550	
1938	54.180	35.000	19.180	14.750		2.838	0.731	0.311	0.550	
1939	58.250	35.000	23.250	14.750		5.000	2.174	0.776	0.550	
1940	64.236	35.000	29.236	14.750		5.000	2.264	0.776	6.446	
1941	70.727	35.000	35.727	14.750		8.400	2.262	1.042	9.273	
1942	76.477	35.000	41.477	14.750		8.400	2.262	1.413	14.653	
1943	81.066	35.000	46.066	14.750		8.400	2.262	1.788	18.866	
1944	86.489	35.000	51.489	14.750		8.400	2.262	2.697	23.380	
1945	84.890	35.000	49.890	14.750		8.400	21.243	4.947	0.550	
1946	94.090	35.000	59.090	14.750		8.400	23.443	11.947	0.550	
1947	97.590	35.000	62.590	14.750		10.000	23.443	13.847	0.550	
1948	98.509	35.000	63.509	14.750		10.000	23.463	14.746	0.550	
1949	99.509	35.000	64.509	14.750		10.000	23.463	15.746	0.550	
1950	99.509	35.000	64.509	14.750		10.000	23.463	15.746	0.550	
1951	102.252	35.000	67.252	14.750		10.000	26.463	15.489	0.550	
1952	108.853	35.000	73.853	15.950		10.000	30.913	16.990		
1953	117.642	35.000	82.642	15.950		14.000	34.913	17.779		
1954	122.729	35.000	87.729	15.950		15.000	39.000	17.779		
1955	122.750	35.000	87.750	15.950		15.000	39.000	17.800		
1956	238.656	35.000	203.656	27.000		25.000	133.922	17.734		
1957	251.179	35.000	216.179	29.000		25.000	144.588	17.591		
1958	243.737	35.000	208.737	35.000		22.000	134.146	17.591		
1959	280.587	35.000	245.587	35.000		22.000	165.683	22.904		
1960	342.822	35.000	307.822	35.000		22.000	221.418	29.404		
1961	363.282	35.000	328.282	35.000		26.000	233.551	33.731		
1962	363.106	35.000	328.106	35.000		26.000	249.328	17.778		
1963	364.596	35.000	329.596	35.000		26.000	250.218	18.378		
1964	396.396	35.000	361.396	35.000		28.000	277.918	20.478		

Norges Bank's balance sheet, income accounts and profits, 1817-2021

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
1965	427.446	35.000	392.446	35.000		28.000	304.221	25.225		
1966	508.260	35.000	473.260	35.000		28.000	385.435	24.825		
1967	584.821	35.000	549.821	35.000		33.000	456.994	24.827		
1968	724.644	35.000	689.644	35.000		35.000	582.652	36.992		
1969	907.494	35.000	872.494	35.000		35.000	745.467	57.027		
1970	1154.078	35.000	1119.078	35.000		35.000	972.018	77.060		
1971	934.184	35.000	899.184	35.000		35.000	721.948	107.236		
1972	1230.319	35.000	1195.319	35.000		35.000	986.428	138.891		
1973	516.579	35.000	481.579	35.000		35.000	248.430	163.149		
1974	432.538	35.000	397.538	35.000		35.000	161.274	166.264		
1975	1838.775	35.000	1803.775	35.000		35.000	1507.713		226.062	
1976	1941.868	35.000	1906.868	35.000		35.000	1531.168		305.700	
1977	3187.087	35.000	3152.087	35.000		35.000	2748.720		333.367	
1978	4127.000	35.000	4092.000	35.000		35.000	2834.130		1187.870	
1979	5072.000	35.000	5037.000	35.000		35.000	2916.681		2050.319	
1980	8750.000	35.000	8715.000	35.000		35.000	5003.442		3641.558	
1981	15955.000	35.000	15920.000	35.000		35.000	9697.199		6152.801	
1982	24095.000	35.000	24060.000	35.000		35.000	12915.551		2311.964	8763.000
1983	19693.000	35.000	19658.000	35.000		35.000	15241.094		2614.428	1732.557
1984	28477.000	35.000	28442.000	35.000		35.000	25028.059		2189.364	1155.038
1985	23123.000		23123.000				21602.998		942.554	577.519
1986	37973.000		37973.000				24251.800		2.194	13719.198
1987	39563.000		39563.000				21740.177			17823.337
1988	40009.000		40009.000				21588.127			18420.836
1989	33901.142		33901.142				25301.795			8599.347
1990	31402.670		31402.670				23314.399			8088.271
1991	35591.791		35591.791				22299.308			13292.483
1992	41820.100		41820.100				19880.825			21939.275
1993	46641.031		46641.031				32970.441			13670.590
1994	30430.625		30430.625				15974.774		2314.811	12141.040
1995	28790.575		28790.575				16974.432		2195.890	9620.253
1996	28999.090		28999.090				21521.723		2093.566	5383.801
1997	39249.024		39249.024				30193.039		1999.689	7056.296
1998	59358.655		59358.655				27215.090		6996.106	30227.555
1999	50638.602		50638.602				27339.238		3756.936	19542.428
2000	53675.090		53675.090				41072.933		3744.856	8857.301
2001	40670.252		40670.252				36347.164		3736.554	

2.B Appendix, Norges Bank's balance sheet, 1817–2021. Historical data (in million kroner)

Table 2.B.3: Norges Bank's equity, 1817–2021 (in million kroner, 1 speciedaler = 4 kroner)

Year	Equity Total	Equity Shares	Equity funds	Reserve Fund	Loan Fund of 1842	General provisions	Adjustment Fund	Building Fund	Other equity funds	Transfer Fund
2002	25438.594		25438.594				21512.972		3925.622	
2003	46213.000		46213.000				41923.579		4289.611	
2004	47302		47302				46096		1206	
2005	68622		68622				67488		1134	
2006	74124		74124				73027		1097	
2007	56548		56548				55488		1060	
2008	59887		59887				58864		1023	
2009	52281		52281				51298		983	
2010	64931		64931				63984		205	
2011	72565		72565				72565			
2012	73338		73338				73338			
2013	126697		126697				126697			
2014	205476		205476				184637			20839
2015	245356		245356				192178			53178
2016	224679		224679				189227			35452
2017	237999		237999				209334			28665
2018	239087		239087				209490			29597
2019	263164		263164				223751			39413
2020	276819		276819				246481			30338
2021	288704		288704				266488			22216

Note: The balance sheet for 1818 has been reconstructed as explained in Section 2.4 (page 61). *Emphasized* items are estimated.

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1817					-0.1155	-0.1155				
1818	0.0231			0.0000	-0.2197	-0.1967				
1819	0.2067			0.0006	-0.2889	-0.0822				
1820	0.2522			0.0009	-0.0957	0.0743				
1821	0.3548			0.0010	-0.0995	0.3295		0.2980		4.00
1822	0.4327			0.0027	-0.1469	0.3123		0.3005		4.00
1823	0.4945			0.0008	-0.1307	0.3714		0.3027		4.00
1824	0.5758			0.0012	-0.1293	0.5091		0.4604		6.00
1825	0.6689			0.0000	-0.1569	0.5567		0.5373		7.00
1826	0.6432			0.0001	-0.1773	0.4818		0.4557		6.00
1827	0.6123			0.0001	-0.1195	0.5189		0.4790		6.00
1828	0.7612				-0.1161	0.6188	-0.0023	0.5594		7.00
1829	0.7121			0.0000	-0.1291	0.6160	-0.0054	0.6051		7.00
1830	0.7049			0.0002	-0.1250	0.5887	-0.0010	0.5783		6.67
1831	0.7321			0.0000	-0.1116	0.6176	-0.0012	0.6073		7.00
1832	0.7388			0.0125	-0.1270	0.6214	-0.0007	0.6073		7.00
1833	0.7427			0.0000	-0.1238	0.6323	-0.0008	0.6075		7.00
1834	0.7816			0.0001	-0.1388	0.6475	-0.0064	0.6063		6.67
1835	0.8659			0.0000	-0.1414	0.7656		0.6909		7.00
1836	0.8749			0.0063	-0.1473	0.7646	-0.0141	0.6997		7.00
1837	0.9032			0.0159	-0.1440	0.7487	-0.0534	0.7338		7.33
1838	0.9127			0.0016	-0.1484	0.7774	-0.0018	0.7505		7.50
1839	0.9506			0.0013	-0.1512	0.8099	-0.0085	0.7672		7.67
1840	0.9739			0.0010	-0.2273	0.7745	-0.0030	0.7505		7.50
1841	0.9557			0.0000	-0.1848	0.7822	-0.0026	0.7672		7.67
1842	0.9838			0.0061	-0.1687	0.8262	-0.0039	0.8006		8.00
1843	0.9095	0.0216		0.0001	-0.1692	0.7664	-0.0051	0.7505		7.50
1844	0.9246	0.0278		0.0002	-0.1686	0.7979	-0.0018	0.7839		7.83
1845	0.9272	0.0484		0.0001	-0.1660	0.7954	-0.0243	0.7839		7.83
1846	0.9497	0.0872		0.0000	-0.1752	0.8714	-0.0018	0.8506		8.50
1847	0.9523	0.0367		0.0000	-0.1670	0.8295	-0.0054	0.8173		8.17
1848	0.9329				-0.1817	0.7628	-0.0006	0.7506		7.50
1849	0.9306				-0.1720	0.7636	-0.0072	0.7506		7.50
1850	0.9705	0.0225			-0.1794	0.8246	-0.0020	0.8173		8.17
1851	0.9986	0.0300			-0.1700	0.8645	-0.0014	0.8506		8.50

2.B Appendix, Norges Bank's balance sheet, 1817-2021. Historical data (in million kroner)

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1852	1.0074	0.0331			-0.1668	0.8865	-0.0011	0.8673		8.67
1853	1.0597	0.0237			-0.1868	0.9141	-0.0016	0.9007		9.00
1854	1.0988	0.1130		0.0001	-0.2150	0.9956	-0.0145	0.9841		9.83
1855	1.1393	0.2192		0.0005	-0.2150	1.1540	-0.0010	1.1342		11.33
1856	1.2074	0.2543		0.0014	-0.2140	1.2608	-0.0066	1.2510		12.50
1857	1.2821	0.1020			-0.2228	1.1701	-0.0010	1.1343	0.0148	11.33
1858	1.2717	0.0055			-0.2501	1.0629		1.0509	0.0132	10.50
1859	1.2142	0.0278			-0.2146	1.0395		1.0342	0.0232	10.33
1860	1.1899	0.0452			-0.2158	1.0247		1.0175	0.0264	10.17
1861	1.2060	0.0692		0.0004	-0.2275	1.0367	-0.0181	1.0342	0.0372	10.33
1862	1.1822	0.1101			-0.2182	1.0766		1.0676	0.0588	10.67
1863	1.4390	0.1117		0.0023	-0.2555	1.3043		1.2925	0.0620	10.33
1864	1.4890	0.0417		0.0002	-0.2559	1.2866		1.2717	0.0736	10.17
1865	1.4640	0.0813		0.0004	-0.2698	1.2903		1.2717	0.0456	10.17
1866	1.5248	0.0905			-0.3247	1.2973	-0.0120	1.2925	0.0620	10.33
1867	1.6204	0.0601			-0.2841	1.3854	-0.0158	1.3760	0.0752	11.00
1868	1.5726	0.0426		0.0002	-0.3004	1.3187	-0.0055	1.3134	0.0832	10.50
1869	1.5606	0.0483		0.0000	-0.2802	1.3302	-0.0038	1.3134	0.0696	10.50
1870	1.5531	0.0796		0.0640	-0.2598	1.3240	-0.0657	1.3134	0.0620	10.50
1871	1.3149	0.1499		0.0528	-0.2501	1.1722	-0.0531	1.1675	0.0388	9.33
1872	1.1775	0.2242		0.0161	-0.2569	1.1310	-0.0184	1.1258	0.0228	9.00
1873	1.2557	0.3090		0.0054	-0.2856	1.2621	-0.0222	1.2509	0.0644	10.00
1874	1.3019	0.3894			-0.3131	1.3822	-0.0072	1.3760	0.0604	11.00
1875	1.7315	0.2468		0.0089	-0.4565	1.5112	-0.0169	1.5011	0.0936	12.00
1876	1.7768	0.2142		0.0003	-0.3739	1.6241	-0.0031	1.5637	0.0796	12.50
1877	1.7484	0.1803		0.0095	-0.4408	1.5370	-0.0113	1.5011	0.1381	12.00
1878	1.8036	0.1704		0.0001	-0.4928	1.5156	-0.0015	1.5011	0.1410	12.00
1879	1.6324	0.1204		0.0002	-0.3814	1.3538	-0.0321	1.3135	0.1438	10.50
1880	1.3161	0.1904			-0.3976	1.1333	-0.0159	1.1259	0.1050	9.00
1881	1.2072	0.2342		0.0003	-0.3473	1.1009	-0.0008	1.0946	0.0433	8.75
1882	1.2779	0.2485			-0.3738	1.1299	-0.0290	1.1259	0.0501	9.00
1883	1.2531	0.2431		0.0700	-0.3489	1.0800	-0.0713	1.0633	0.0440	8.50
1884	1.2106	0.2331		0.0435	-0.3770	1.0675	-0.0159	1.0008	0.0613	8.00
1885	1.3170	0.1968		0.0307	-0.4174	1.0403	-0.1228	1.0008	0.0572	8.00
1886	1.5287	0.1952		0.1551	-0.3884	1.3358	-0.0393	1.0008	0.0428	8.00

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1887	1.1017	0.2330		0.0171	-0.4390	0.8657	-1.8650	0.7506	0.0592	6.00
1888	0.7994	0.2962		0.0223	-0.4251	0.5645	-0.2211	0.5629	0.0240	4.50
1889	0.7284	0.3767		0.0220	-0.4372	0.5769	-1.4325	0.5755	0.0129	4.60
1890	0.8794	0.4090		0.0258	-0.4299	0.8375	-0.0225	0.8256	0.0058	6.60
1891	1.4221	0.2969		0.0153	-0.4782	1.1456	-0.1071	1.1259	0.0139	9.00
1892	1.6990	0.2378		0.0612	-0.4848	1.2528	-0.1610	1.2510	0.0499	10.00
1893	1.8743	0.2672		0.0362	-0.5588	1.5089	-0.0756	1.1259	0.0442	9.00
1894	1.7621	0.2167		0.0085	-0.5015	1.3024	-0.1325	1.0258	0.3753	8.20
1895	1.6322	0.2393	0.0005	0.0067	-0.4979	1.2768	-0.0483	1.0133	0.2752	8.10
1896	1.7361	0.2910	0.2001	0.0278	-0.5799	1.5782	-0.0698	1.1634	0.2627	9.30
1897	1.8677	0.3295	0.1251	0.0053	-0.5829	1.5908	-0.0835	1.1634	0.4128	9.30
1898	1.8382	0.4846	0.0009	0.0057	-0.5129	1.5574	-0.0529	1.1509	0.4128	9.20
1899	2.9507	0.5675	0.1079	0.0507	-0.7961	1.6675	-0.8666	1.2010	0.4003	9.60
1900	3.1812	0.5485	-0.0981	0.0064	-0.7889	1.7639	-0.2230	1.2510	0.4504	10.00
1901	2.9472	0.4832	0.0123	0.0026	-0.8080	2.1896	-0.3420	1.5495	0.5004	10.00
1902	2.5420	0.3725	-0.0004	0.0433	-0.5684	1.8692	-0.4734	1.3950	0.6198	9.00
1903	2.9080	0.3551	-0.2924	0.0058	-0.8066	1.7128	-0.5529	1.3175	0.4650	8.50
1904	2.7073	0.3321	-0.0210	0.0123	-0.7176	1.5535	-0.4764	1.2400	0.3875	8.00
1905	2.7377	0.3776	0.0161	0.0064	-0.7035	1.5646	-0.2306	1.2400	0.3100	8.00
1906	2.4191	0.6616	-0.2573	0.0023	-0.7618	1.5799	-0.1936	1.2400	0.3100	8.00
1907	2.1956	1.0204	-0.2580	0.0123	-0.8243	1.5776	-0.6234	1.2400	0.3100	8.00
1908	2.3990	0.8280	0.0717	0.0061	-0.7233	2.2178	-0.3135	1.3950	0.4650	9.00
1909	2.3417	0.7515	-0.0535	0.0026	-0.7400	2.2815	-0.0910	1.7100	0.5700	9.00
1910	2.5105	0.8079	-0.1902	0.0058	-0.7995	2.2856	-0.1549	1.7100	0.5700	9.00
1911	2.8069	0.8029	-0.2004	0.0026	-0.8044	2.6683	-0.0628	1.9000	0.7600	10.00
1912	3.5784	0.8518	-0.2490	0.0031	-0.8879	3.2273	-0.0732	1.9000	1.2028	10.00
1913	4.1154	1.1866	-0.3085	0.0032	-0.9495	3.6806	-0.1470	1.9000	1.6204	10.00
1914	5.2457	0.9207	-0.2595	0.0348	-1.0150	4.0184	-0.2830	2.5000	1.5138	10.00
1915	4.6270	1.8714	-1.4202	0.0160	-1.1346	4.1276	-1.2363	2.5000	1.5957	10.00
1916	6.2818	0.7353	-0.4924	0.0105	-1.3275	5.6896		2.5000	1.6719	10.00
1917	14.5239		-1.0650	0.0064	-1.8304	12.6935		3.0000	3.7848	12.00
1918	26.2116		-0.3179	0.0091	-2.2934	23.9182		4.2000	5.3845	12.00
1919	28.0549		-12.9653	0.0223	-2.4590	14.3046		4.2000	5.4537	12.00
1920	27.3135		-1.4218	0.0075	-3.2221	24.0914	-0.0336	4.2000	5.5646	12.00
1921	31.6513		1.3415	0.0203	-3.4018	28.2495	-12.6250	3.5000	2.4696	10.00

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1922	24.0006			0.0253	-3.3549	19.6883	-16.4130	3.1500	1.0762	9.00
1923	23.4204		-0.2149	0.0329	-3.2125	32.3381	-28.5697	2.8000	0.7191	8.00
1924	24.529		-7.066	0.029	-3.412	29.167	-18.566	2.800	0.709	8.00
1925	16.739		-14.948	0.651	-3.223	28.655	-10.053	2.800	0.700	8.00
1926	16.064		-4.585	0.427	-3.069	19.194	-11.038	2.800	0.700	8.00
1927	17.656		-8.928	0.021	-2.945	17.211	-4.672	2.800	0.700	8.00
1928	11.492	2.015	-5.650	0.016	-3.046	11.270	-1.732	2.800	0.700	8.00
1929	8.890	1.807	-0.013	0.016	-2.973	8.265	-4.515	2.800	0.700	8.00
1930	7.721	0.756	0.204	0.109	-3.081	7.102	-3.302	2.800	0.700	8.00
1931	8.044	0.526	-1.414	0.026	-3.013	7.932	-4.232	2.800	0.700	8.00
1932	9.282	0.132	0.199	0.048	-2.952	8.408	-4.308	2.800	0.700	8.00
1933	7.248	0.075	0.084	0.014	-3.151	6.142	-2.242	2.800	0.700	8.00
1934	7.232	0.081	0.204	0.017	-2.995	6.222	-1.977	2.800	0.700	8.00
1935	6.208	0.246	0.372	0.017	-3.169	5.127	-1.327	2.800	0.700	8.00
1936	5.564	0.375		0.017	-3.360	3.796	-0.074	2.800	0.700	8.00
1937	4.633	0.834		0.017	-3.521	3.748	-0.055	2.800	0.700	8.00
1938	3.094	1.556	0.034	0.036	-3.806	3.721	-0.400	2.800	0.700	8.00
1939	6.669	0.772		0.137	-4.073	4.943	-0.195	2.800	0.700	8.00
1940	11.904	0.406		0.210	-5.404	6.906		2.100		6.00
1941	7.972	0.073	0.500	0.200	-5.573	2.971		2.100		6.00
1942	9.370	0.068		0.179	-5.412	4.025		2.100		6.00
1943	9.488	0.062		0.182	-5.541	4.009		2.100		6.00
1944	10.245	0.066		0.159	-5.935	4.376		2.100		6.00
1945	9.308	0.351	1.759	0.155	-7.319	4.100		2.100		6.00
1946	2.869	22.243		2.080	-8.342	16.770		2.100		6.00
1947	10.902	5.380	2.412	4.979	-10.026	8.668		2.100		6.00
1948	9.820	4.545	1.863	5.333	-11.372	4.855		2.100		6.00
1949	9.426	4.663	2.429	5.306	-11.695	4.822		2.100		6.00
1950	9.761	4.675	2.155	5.492	-11.236	5.354		2.100		6.00
1951	12.371	7.955	3.592	7.664	-13.575	10.342		2.100		6.00
1952	12.354	8.778	7.938	7.681	-14.228	14.291		2.100		6.00
1953	11.889	10.949	7.088	6.670	-14.693	15.233		2.100		6.00
1954	7.979	14.980	2.191	3.697	-14.690	10.461		2.100		6.00
1955	12.237	12.085	1.767	6.036	-16.237	9.853		2.100	5.809	6.00
1956	15.762	20.704	94.403	6.411	-18.225	19.721		2.100	9.735	6.00

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1957	13.977	26.339	10.289	6.536	-20.289	17.650	-4.000	2.100	10.101	6.00
1958	14.369	27.973	-10.755	5.586	-23.007	21.022		2.100	10.585	6.00
1959	16.132	38.829	27.889	5.156	-26.276	30.038		2.800	12.753	8.00
1960	14.748	53.761	44.012	3.734	-26.284	42.920	-1.083	2.800	16.464	8.00
1961	13.075	59.782	1.133	1.664	-29.324	43.533		2.800	16.691	8.00
1962	14.459	51.987	10.784	1.611	-35.254	31.199		2.800	17.547	8.00
1963	14.862	63.798	-8.106	1.713	-39.989	38.675		2.800	22.159	8.00
1964	14.736	80.677	7.700	1.233	-43.380	52.033		2.800	23.212	8.00
1965	16.860	107.506	-7.151	0.832	-44.094	80.317		2.800	35.200	8.00
1966	16.779	118.028	36.143	1.158	-51.996	82.812		2.800	34.900	8.00
1967	23.939	165.036	-6.962	1.119	-62.637	126.342		2.800	40.000	8.00
1968	35.510	205.230	6.530	0.590	-62.112	178.730		3.500	40.000	10.00
1969	44.176	249.267	65.571	0.871	-69.799	223.675		3.500	50.000	10.00
1970	69.632	267.661	52.034	0.878	-84.276	253.026		3.500	50.000	10.00
1971	75.022	288.317	-446.748	0.960	-93.161	270.178		3.500	40.000	10.00
1972	83.012	328.506	33.062	1.271	-106.599	304.918		3.500	35.000	10.00
1973	126.645	415.495	-1 104.724	1.433	-116.914	425.226		3.500	20.000	10.00
1974	217.983	720.616	-827.991	1.211	-139.265	799.335		3.500	20.000	10.00
1975	191.043	722.003	728.730		-176.838	1 464.939		3.500	50.000	10.00
1976	301.784	702.358	-632.152		-214.034	157.955		3.500	50.000	10.00
1977	586.048	716.337	350.681		-232.015	1 421.051		3.500	80.000	10.00
1978	581.740	914.179	85.356		-241.395	1 339.880		3.500	100.000	10.00
1979	270.90	1 451.80	-426.75		-252.35	1 043.60		3.50	100.00	10.00
1980	713.99	2 510.99	855.43		-268.79	3 811.62		4.20	400.00	12.00
1981	169.17	4 356.14	3 675.03		-313.44	7 886.90		4.20	644.22	12.00
1982	204.39	5 657.46	9 205.80		-368.68	14 698.97		4.20	5 929.97	12.00
1983	1 062.13	4 672.75	2 917.70	14.17	-452.34	8 214.41		4.20	12 363.00	12.00
1984	-1 448.99	5 453.93	9 988.61	13.70	-476.36	13 530.89		4.20	3 077.52	12.00
1985	-3 998.25	7 940.04	-9 771.20	15.41	-494.85	-6 308.85			3 077.52	
1986	-829.28	7 926.19	7 601.26	16.55	-618.11	14 096.60			577.52	
1987	2 788.83	5 965.89	-864.27	26.82	-999.32	6 917.95			4 573.07	
1988	2 663.49	5 333.50	4.18	78.84	-742.22	7 337.79			7 465.47	
1989	-927.90	6 515.43	-594.54	160.00	-868.49	4 284.49	-550.00		10 153.12	
1990	-741.39	6 638.64	-2 166.99	133.31	-840.18	3 023.40	-23.50		5 690.60	
1991	-1 460.16	7 698.78	2 592.83	121.45	-804.41	8 148.49			4 524.71	

Table 2.B.4: Norges Banks income accounts, 1817–2021. Net domestic and foreign earnings, operational income and expenses, gross profits, dividends, transfers and losses (in million kroner, 1 speciedaler = 4 kroner)

Year	Net earnings, domestic	Net earnings, foreign	Net FX rate depreciation	Operational income	Operational expenses	Gross profits	Losses	Dividend to share holders	Transfer to government	Dividend in % of share-capital
1992	-1 533.76	7 379.72	5 634.93	149.60	-871.02	10 759.48	-0.57		5 080.03	
1993	-3 164.79	8 394.35	6 902.58	158.16	-826.01	11 464.28	-0.09		9 545.09	
1994	-2 809.59	8 959.87	-4 016.63	161.52	-853.93	1 441.24	-0.10		14 340.05	
1995	-2 540.88	9 350.60	-3 853.90	192.68	-846.56	2 301.94	0.07		7 239.24	
1996	-2 536.78	10 315.77	-4 443.33	169.03	-863.57	2 641.12	-0.68		4 236.45	
1997	-4 697.55	12 502.66	6 390.81	194.48	-912.67	13 477.73	-0.01		3 810.98	
1998	-3 991.39	10 442.90	15 351.66	345.75	-1 005.99	21 142.94	-0.01		3 400.64	
1999	-1 408.87	8 070.16	-887.33	408.33	-1 142.17	5 040.11	-0.36		10 685.10	
2000	-3 389.04	9 866.43	5 988.15	585.11	-1 435.95	11 614.71	0.04		10 685.10	
2001	-4 336.80	8 936.73	-4 877.14	554.28	-1 461.71	-1 048.25	-0.07		8 857.40	
2002	-3 615	4 703	-24 316	672	-1 533	-24 089				
2003	-1 807	11 116	12 337	928	-1 799	20 775				
2004	-1 704	13 511	-10 053	1 092	-1 756	1 090				
2005	-3 339	17 299	8 051	1 384	-2 075	21 320				
2006	-5 422	16 514	-4 985	1 750	-2 355	5 502				
2007	-7 659	17 901	-26 935	1 887	-2 770	-17 576				
2008	-6 369	-53 220	63 522	2 460	-3 054	3 339				
2009	-664	47 070	-53 089	3 332	-4 256	-7 607				
2010	-1 702	19 049	-3 951	3 110	-3 930	12 576				
2011	-2 031	6 803	5 416	2 668	-3 352	9 504				
2012	-29	21 979	-21 644	2 306	-3 119	-507				
2013	-524	28 447	26 309	3 014	-3 789	53 457				
2014	-856	32 382	58 766	3 330	-4 050	89 572			10 419	
2015	-533	12 821	54 749	4 059	-5 007	66 089			26 589	
2016	-359	18 665	-20 321	3 859	-4 792	-2 948			17 726	
2017	-487	30 714	-1 488	4 852	-5 935	27 656			14 334	
2018	-1 829	-550	19 182	4 669	-5 696	15 776			14 798	
2019	-2 962	40 591	7 007	4 451	-5 419	43 668			19 706	
2020	-798	31 241	-499	5 426	-6 481	28 889			15 169	
2021	71	24 439	-303	4 760	-5 859	23 108			11 108	

Norges Bank's balance sheet, income accounts and profits, 1817-2021

2.C Appendix, Previous work on historical balance sheet data

Balance sheet data available from Norges Bank's web'site

Norges Bank started in the late 2000s to collect historical data from the bank's published balance sheets from 1817 onwards in conjunction with research for *Norges Bank's bicentenary project 1816-2016*. The work was primarily conducted by staff in the bank's Data Management unit.

This section provides a brief overview of the scope and magnitude of this data collection exercise. We have used these data as a key reference and starting point for the construction of the consolidated and break-adjusted historical data for the balance sheet items we present in this study, for an overview see Table 2.1 on page 30.

Data have been collected from 1817 onwards, primarily from printed sources such as the bank's published annual reports, from the subaccounts of the main ledger, and from the bank's various funds and lending mechanisms, which were introduced through the 19th century. The article Hvidsten (2013) "Norges Bank's balance sheets 1817-1945: consolidation of subaccounts, [Norges Banks balanse 1817-1945: Konsolidering av delregnskapene (in Norwegian)]" (Staff Memo 11/2013 with English summary) provides an overview of this preparatory work. This article contains also a couple of examples which illustrates the sources and methods used when calculating consolidated annual balance sheet data for Norges Bank for the period 1817-1945. For the postwar period data were collected from monthly balance sheet statements and annual reports. The level of detail and granularity of the items reported in these balance sheet statements show substantial variation across different subperiods after 1945.

The following list provides some details pertaining to the main subperiods covered by this work:

- Annual balance sheets are presented in speciedaler for the period 1817-1876 and in thousands of NOK for the period 1877-1939.
- For World War II (1940-1945) there are separate balance sheets for Norges Bank in Oslo and for Norges Bank's operations in free Norway and London. Annual balance sheets are provided for the Bank's operations in free Norway and London (in thousands of NOK).
- For the period May 1945 to December 1949 monthly specifications of the main items are shown.
- Complete monthly balance sheets are shown for the period from 1950 onwards.
- Norges Bank's published annual balance sheets (in thousands of NOK) are shown for the period 1893-1939.
- Annual balance sheets (in NOK) and monthly balance sheet extracts (in millions of NOK) are shown for the Bank's operations in Oslo during World War II, and
- For the period from World War II onwards, the monthly balance sheets are shown as presented in Norges Bank's annual reports and the published monthly balance sheets.
- Since the monthly balance sheets up to the end of 1977 were published in thousands of NOK, the data are presented with three decimal places of precision.
- As publication formats and the level of granularity in the monthly balance sheet statements have changed over time, the collected data were organized in files which match these formats. The data were consequently organized in separate spreadsheets for the subperiods 1945-1949, 1950-1972, 1973-1988, 1989-1991, 1992-2002, 2003-2011 and from 2012 onwards.
- Table texts and footnotes in these spreadsheets have been presented as far as possible as they appeared in the original monthly balance sheet statements.

Norges Bank's foreign exchange reserves, 1818-2021

Øyvind Eitrheim and Mats Bay Fevolden

3.1 Introduction

This chapter provides an overview of data for Norges Bank's foreign exchange reserves (*FX reserves*) over the past 200 years. *FX reserves* include both silver and gold reserves as well as *FX assets*. The latter include both *FX deposits* in foreign banks and holdings of *FX securities* (bills of exchange, bonds and equities), which are held to serve needs for liquidity, safety and return. The role of silver and gold reserves as basis for Norges Bank's circulating banknotes has been discussed in detail in Chapter 2.

With this strict focus on Norges Bank's foreign exchange reserves we should inform readers that similar to in Chapter 2 we have excluded the foreign exchange reserves in the Norwegian sovereign wealth fund, Government Pension Fund Global (GPF), frequently denoted as the *oil fund*. These are foreign reserves which Norges Bank manages on behalf of the government. We will return to the *oil fund* in Chapter 6, which provides an overview of historical data on government revenues, expenditures and debt since 1815.

A primary purpose of holding liquid FX reserves has traditionally been to cover payments for imports in a situation when there is a sudden shortfall of export revenues. Central banks have also used liquid FX reserves for intervention purposes. When liquid FX reserves are considered sufficient for such purposes, available additional (excess) FX reserves may be allocated to less liquid foreign assets with higher expected return.¹

International payments related to trade in goods and services with other countries are facilitated by the private banking system. In normal times they manage these operations without the central bank.² In not so normal times central bank reserves are of good use. Then it is important that these reserves are liquid and safe. Historically, when we had a fixed exchange rate system, foreign exchange reserves were used frequently by central banks for intervention purposes in order to limit fluctuations in the exchange rate. Also in those cases, liquidity and safety of reserves were of importance. In more recent years, however, there has been a trend in many countries that they hold larger foreign exchange reserves than before (Borio et al., 2008b; Bjorheim, 2020; Stella, 2020). For excess reserves, beyond what is determined as necessary to be held in liquid assets, more weight has been given to return. In light of this we have seen that central banks' management of foreign exchange reserves has become more similar to that of wealth management in the private sector (Eichengreen and Flandreau, 2016, p. 312).³

Section 3.2 provides a broad overview of Norges Bank's FX reserves across 200 years. Section 3.3 present briefly the three dimensions along which we have organized the historical data. These

¹ The purpose of Norges Bank's foreign exchange reserves has recently been discussed in an Official Norwegian Report (NOU, 2017, Section 19.2), which was produced by a government appointed commission who reconsidered the legal framework relating to the organisation of Norges Bank and the management of the Government Pension Fund Global.

² This is of course a stylized simplification of the international payment system and its interactions between central banks and private banks. For more details see Kahn et al. (2016) who discuss the evolving tradeoffs between cost and risk in the payment system in a historical perspective. They focus in particular on interactions between central banks and private payment systems.

³ In extreme cases of war, a normal payment system may cease to exist. Foreign exchange reserves then take the role of a war chest. Access to foreign reserves and gold becomes important if one need to pay for oil, weapons and ammunition.

3.2 An overview of foreign exchange reserves across 200 years

are i) along different types of financial instruments, ii) along different currencies and iii) along different portfolios. Data sources are presented in Section 3.4. This section describes how the data sources have been combined to construct composite historical time series for different subitems of FX reserves, including silver and gold reserves. This section is the main academic contribution of this study for an international audience who are interested in sources and methods regarding the construction of historical data series for FX reserves.⁴

Section 3.5 describe developments in Norges Bank's foreign exchange reserves in five different subperiods. During the first three subperiods (1817-1945) the reserves were predominantly metal reserves. This changed after World War II and metal reserves soon played only a negligible role during the two subperiods from 1945 onwards where the bank's FX reserves to a larger extent have been held as bank deposits, fixed-income securities and equities.

3.2 An overview of foreign exchange reserves across 200 years

Ownership and management of foreign reserves

Institutional arrangements regarding ownership and management of national foreign exchange reserves vary considerably across different countries. These arrangements may also change over time within a country when we take a long view of foreign exchange reserves across 200 years as in this study. Over time reserve management also reflects shifts between the three motives of holding reserves mentioned above, namely for the purposes of liquidity, safety and return (Borio et al., 2008b; Eichengreen and Flandreau, 2016).

In countries like Canada, Japan and the UK foreign exchange reserves are held on the government's balance sheet. This is, however, the exception. BIS (2009) reports that more than 75 percent of the central banks who participated in an unpublished 2008 BIS survey, own the national foreign reserves, and that more than 75 percent of the central banks also have full responsibility for specifying objectives and formulating and implementing policies for managing them.

When Norges Bank was established in 1816 it was organized as an incorporated institution with predominantly private shareholders. The bank was, however, in reality a private bank under state control. The bank's basic capital in the form of silver reserves was scrambled together from the country's inhabitants through a special wealth tax. Formally Norges Bank was controlled by the Storting (Parliament) who decided its framework of operation and appointed members of its Executive and Supervisory Board (Lie, 2020, p. 4-5). The silver reserves were initially held in domestic vaults and although the stated goal was that banknotes should be convertible already from 1 January 1819 this promise was not fulfilled until 23 years later in 1842.

Safety first was the key guiding principle regarding the bank's silver reserves until 1842. From

⁴ Thanks to Leif Alendal for his tireless efforts to collect historical data on the currency distribution of Norges Bank's foreign exchange reserves in an early phase of this project. Thanks also to our colleagues Brit Fjogstad Selnes and Odd Anders Willand for helpful assistance in identifying and retrieving data for the late 1990s and early 2000s, a period for which data turned out to be surprisingly difficult to find.

Norges Bank's foreign exchange reserves, 1818-2021

1842 onwards more weight was put on *liquid* reserves as banknotes were now fully convertible at par value in silver coins. From the 1840s onwards a limited amount of silver were also held as liquid deposits in foreign countries. The bank received *returns* on its silver deposits abroad although the size of the foreign exchange reserves held abroad was limited. From 1857 onwards the limits were lifted such that up to one third of the silver reserves could be held abroad.

The silver reserves were later converted into gold reserves during 1872-1873 and Norway adopted the gold standard from 1874 onwards. New legislation was introduced in 1892, which allowed the bank's head office to gain more control over the regional branches. The head office was also moved from Trondheim to Kristiania (Oslo) from 1897 onwards. The bank was from 1893 onwards also allowed to expand its foreign exchange reserves and invest in foreign securities. These reserves were however not taken into account as basis for the issuing of banknotes, which was still only depending on Norges Bank's level of gold reserves plus a fixed fiduciary amount, initially stipulated by the Storting to 24 million kroner in the Norges Bank Act of 1892.

Norges Bank has in practice owned and managed the nation's foreign exchange reserves since it was established in 1816. But since the bank was controlled by the Storting, at least before World War II, it is also correct to say that the bank managed these reserves on behalf of the general public. During World War II Norges Bank was separated in two parts, one in occupied Norway and one in London. When the war ended Norges Bank was controlled by the government, the bank had lost its pre-war independence and a couple of years later, in 1949, Norges Bank was nationalized.

The bank continued to manage the nation's foreign exchange reserves during the post-war period. Norges Bank took in this period a role as the government's main instrument in implementing foreign exchange policy. This included administrating the implementation of foreign reserve rationing from 1947 onwards. A regime of tight regulations and control of capital movements was established and Norges Bank's organisation was reshaped in order to accommodate these tasks, which included oversight and statistical reporting of the nation's available foreign exchange reserves.

The Norges Bank Act was revised again in 1985. The act states that Norges Bank shall administer the official foreign exchange reserves and that the Ministry of Finance may issue rules regarding this administration. In practice the reserve management regime was for the next 15 years subject to more or less continuous development and refinement. We will go into this in some detail in a later section. The annual reports from the bank refer to annual reviews and frequent revisions of the management guidelines, as these were presented by Norges Bank and approved by the Ministry of Finance.

In 2003 the Norges Bank Act was changed again and from 2004 onwards the sole responsibility for specifying objectives and formulating and implementing policies for managing reserves has rested with Norges Bank's Executive Board. The Executive Board lays down guidelines for the management of the foreign exchange reserves.⁵ This is also the current state of affairs today as specified in the latest revision of the Norges Bank Act in 2019.

⁵ The guidelines for management and performance reports for the foreign exchange reserves, as well as various funds managed by the Bank are published on Norges Banks website. A background paper on the strategic allocation of foreign exchange reserves was published in Norges Bank (2004). This paper provided an overview of analyses which were presented for the Executive Board in February 2004.

3.2 *An overview of foreign exchange reserves across 200 years*

International perspectives on foreign reserves

In a historical perspective, foreign reserve management has been a common central bank task in many countries. Over time the composition of Norges Bank's foreign reserves have changed in ways that are fairly typical and share similarities with those of other central banks. Eichengreen and Flandreau (2016) provide a historical survey of trends in foreign reserves and foreign reserve management since the mid nineteenth century. Their survey focuses on the main developments in principal reserve assets, from silver and gold bullion to sterling assets before 1914 and, finally, to the dominance of US dollar after World War II. Secondly they trace the evolution in foreign reserve management from passive accumulation and storage of silver and gold bullion in vaults in the early 19th century to a more active use of foreign reserve assets in interventions in foreign exchange markets in the decades leading up to World War I. After World War II there has been strong growth in foreign reserves in many countries and increased attention to using foreign reserves to generate return. The management practices in many central banks have changed accordingly and have adopted portfolio management strategies and standards used in the private asset management industry.⁶ We will briefly touch upon similar developments in Norges Bank later in this chapter.

There is still a lot to learn about long term international developments in this area. Hopefully there is scope for improvements in the data situation as long runs of foreign reserve data that shed light on this evolution are hitherto frequently scarce (Eichengreen and Flandreau, 2016, p. 282). A few studies exist which document long-run trends in central banks' balance sheets, including their foreign reserves. Maurer and Halbeisen (2007) present the assets and liabilities of the Swiss National Bank covering the years from 1907 to 2006.⁷ Fregert (2014) has undertaken a similar study of the balance sheet of the Swedish Riksbank, covering the period 1668-2012,⁸ and, similarly, Abildgren (2016) for the Danish Nationalbank for the years from 1839 to 2014.⁹ Common for the three studies is that foreign exchange reserves are divided into a metal and a non-metal component. Information on the currency composition, however, only cover a few decades.¹⁰

Compared with these studies, we go further in this chapter in breaking down the reserves into their individual asset components and we show how the currency composition has evolved since Norges Bank first held deposits in a foreign bank in 1840. With this level of detail and covering such a long time period it becomes possible to analyze how central banks managed their reserve portfolio under

⁶ In 2007 the Bank for International Settlement (BIS) arranged a meeting which aimed to take stock of recent developments in foreign reserve management. A background paper presented a framework for organizing multiple issues involved in foreign reserve management (Borio, Ebbesen, Galati and Heath, 2008a). A companion paper which focused on trends and challenges in foreign reserve management going forward was presented at the Past, Present and Policy (PPP) meeting in Genoa in 2008 (Borio, Galati and Heath, 2008b). The overview by (Eichengreen and Flandreau, 2016) provide a historical perspective on foreign reserve management since the mid 19th century.

⁷ https://www.snb.ch/en/mmr/reference/hist_fest_snb_2007/source/hist_fest_snb_2007.en.pdf

⁸ https://www.riksbank.se/globalassets/media/forskning/monetar-statistik/volym2/chapter8.-volume2_140613.pdf

⁹ <https://www.econstor.eu/bitstream/10419/171797/1/851419216.pdf>

¹⁰ Maurer and Halbeisen (2007) also give information on the part of the reserves placed in foreign exchange swaps to hedge currency rate changes. Fregert (2014) does not present the currency composition of the Swedish Riksbank's foreign exchange reserves.

Norges Bank's foreign exchange reserves, 1818-2021

various monetary regimes and how external shocks, such as regime changes, changes in regulations, wars and market turbulence had an impact on the asset and currency allocations.¹¹

Norges Bank's foreign reserves

In the beginning the foreign reserves consisted of silver stored in the bank's domestic vaults. From 1840 onwards a fraction of these reserves were held abroad as foreign exchange reserves (FX reserves) at Norges Bank's correspondents in selected countries. These correspondents were from the 1840s onward typically merchant banks and banker houses located in cities in northern Germany and in the UK. In the beginning the reserves held abroad were rather small amounts, later the parliament decided in 1842 that up to 500 000 speciedaler could be held abroad, which amounted to around 20 percent of the silver reserves at that time. From 1857 onwards one third of the silver reserves could be held abroad as foreign exchange reserves. In the 1870s the silver reserves were exchanged into gold reserves as Norway adopted the gold standard from 1874 onwards.

We recall from Chapter 2 that Norges Bank's metal fund served as legal foundation for the bank's maximum issuing of banknotes. During the gold standard period from 1874 the amount of physical gold which had to be stored in the bank's domestic vaults under the statutes were often referred to as the *banknote gold*. The direct link between the metal fund and the maximum amount of banknotes in circulation was upheld during the entire 19th century and early part of the 20th century until this link was abandoned after World War II.

We also recall from Chapter 2 that the *banknote gold* was successfully evacuated out of Oslo in the morning hours of 9 april 1940 when German forces attacked Norway. These 50 tons of gold were eventually transported to Canada and USA under dramatic circumstances. In October 1940 Norges Bank's gold was formally (not physically) transferred from the bank to the Norwegian exile government in London. Norges Bank entered into a repurchasing agreement with the government which stated that the gold was to be returned to the bank after the war. We saw in Chapter 2 that the separation between Norges Bank in Oslo and London and this loan agreement led to a massive expansion of the bank's balance sheet during the occupation years 1940-1944. We have made an attempt to provide a consolidated view of the bank's balance sheet in these years in Section 2.5 in Chapter 2. The gold was returned to the bank in December 1946, together with foreign exchange reserves which had accumulated on the central government's balance in London during the war.

Figure 3.1 shows the foreign exchange reserves 1818-2021. The reserves consist of *Metal reserves* (silver, gold), *FX assets* (bank deposits, bills of exchange, sovereign bonds, equities and other FX items such as clearing agreements and swap credit lines), *Domestic FX* (foreign exchange claims on residents) and *Claims on international organizations* (the Bank for International Settlements (BIS), the European Payment Union (EPU), the International Monetary Fund (IMF)). The thick blue line shows Norges Bank's balance. In the beginning we see that silver reserves counted for around a third of the total balance. This reflected quite accurately the note issue regulations as these were

¹¹ For more details on the exchange rate regimes in Norway the last 200 years see Eitheim, Klovland and Øksendal (2016, pp. 37-45) and Alstadheim (2016).

3.2 An overview of foreign exchange reserves across 200 years

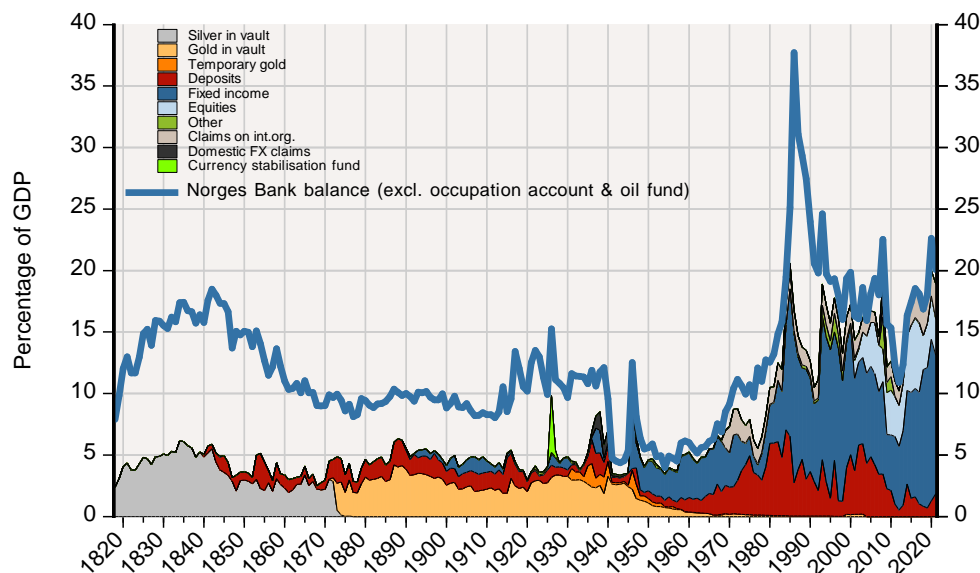


Figure 3.1 Norges Bank's international reserves, 1818-2021. In percentage of GDP

stipulated in the 1816 Norges Bank Act, that the ratio between banknotes in circulation and silver reserves should not exceed 2:1. The current situation of today is totally different as the bank's balance sheet is now completely dominated by foreign exchange reserves.

After World War II foreign exchange holdings were subject to strict regulations. All private holdings were to be handed over to the government according to temporary legislation which had been introduced by the London government during the war. These regulations were prolonged in the early postwar years and new foreign exchange legislation was not put in effect until the mid 1950s.¹²

Already in 1947 there was a foreign exchange crisis when Norges Bank's foreign reserves had depleted rapidly as a consequence of the balance of payment situation. Foreign exchange had to be severely rationed to only serve high priority purposes in this period. A *Foreign Exchange Council* was established in September 1947. Members were representatives from Noregs Bank and the main government ministries.¹³ The Foreign Exchange Council was chaired by the governor of Norges Bank and the council's secretariat resided in Norges Bank's Foreign Exchange department until the council was dismantled in the late 1980s. Norges Bank monitored the situation carefully and intensified its reporting on the foreign currency situation to the council.¹⁴

After World War II the formal ties that existed between Norges Bank's gold reserves and the

¹² A new Foreign Exchange Act was introduced by Stortinget in 1950, but was not put into effect until 1955.

¹³ See Brekk (1987) for a detailed overview of the institutional and structural framework of foreign exchange policy in Norway during the post-war period.

¹⁴ Table 3.2 on page 134 indicates that the first special reports we have retrieved from the Norges Bank Foreign Exchange Archive (NBFEA) appeared already in 1946.

Norges Bank's foreign exchange reserves, 1818-2021

amount of banknotes seems to have disappeared from the radar of the bank's management. Although the statutes in the Norges Bank Act remained unchanged, these were for practical purposes ignored.¹⁵

The gold reserves were used to fulfill Norway's quota obligations when IMF was established and when this quota later was enlarged in the 1950s and the 1960s. The remaining gold reserves were kept abroad until 1987. Then a large shipment of 11 tons of gold coins took place, which returned the gold coins to the vault in Norges Bank's new head office building in Oslo.

Norges Bank's holdings of non-metal foreign exchange reserves increased already from the early 1950s and soon took over as the dominating part of Norges Bank's foreign reserves.

Figure 3.2 shows three measures which relates the size of international reserves to real economic activity such as GDP and total imports and to the stock of broad money, similar to the measures of reserve adequacy presented in the BIS-paper by Borio et al. (2008a, Table 1, p. 3). The two first measures relate the size of reserves to the size of the economy and to foreign trade. The latter measure is broader and reflect that reserves are held as a buffer against sudden flight of capital which may threaten financial stability (Obstfeld, Shambaugh and Taylor, 2010). A Norges Bank study from 1981 discussed similar measures of foreign reserve adequacy and argued that in countries with free capital flows the stock of broad money (M3) would serve as a useful indicator for potential capital flight and therefore relevant for the evaluation of the size of foreign exchange reserves (Andreassen et al., 1981, p. 299). This study was written almost ten years before capital controls in Norway were finally removed in 1990.

The top panel (Figure 3.2(a)) shows that the average number of months of imports (red line) that can be covered by Norges Bank's international reserves moves closely in tandem with the size of the reserves measured in percentage of GDP (blue line). The import coverage fluctuated for a long time between one and three months imports as shown in the right axis, i.e. from the bank was established in 1816 up and until around 1980. Thereafter the reserves have increased to a level where the import coverage has fluctuated between five and seven months worth of imports. We should note here, of course, that we have not taken into account the amount of foreign exchange reserves held in the *oil fund*, the Government Pension Fund Global (GPFG).

The size of Norges Bank's reserves hovered around four percent of GDP until around 1960 and then increased to around eight percent of GDP in the early 1970s at the time when the Bretton Woods regime ended. Reserves then declined relative to GDP until the late 1970s when Norwegian exports of oil contributed to large current account surpluses and strong accumulation of reserves through the early 1980s. Since 1980 we note that the reserves to GDP ratio (Figure 3.2(a), blue line, left axis) have fluctuated quite widely, typically in the range between 10 and 20 percent of GDP.

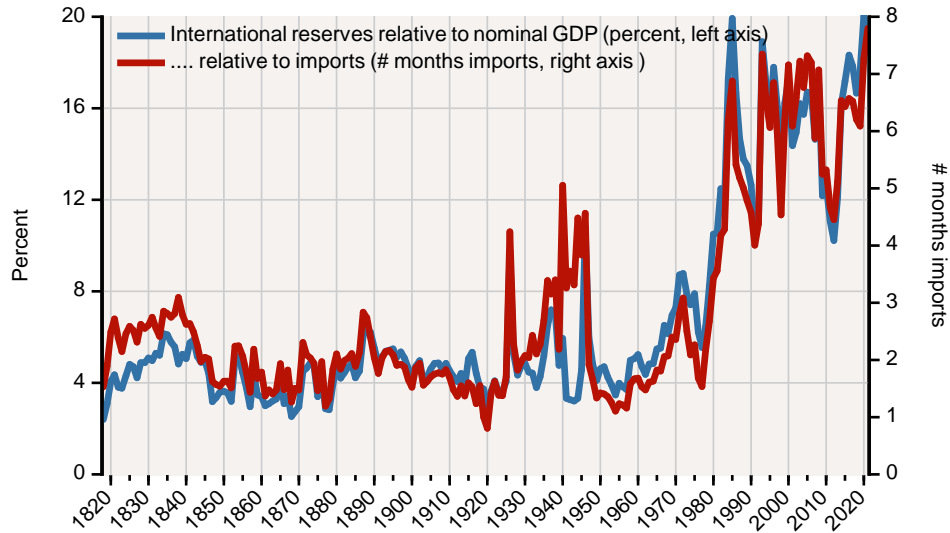
The bottom panel (Figure 3.2(b)) shows that international reserves have fluctuated around a level corresponding to an average of roughly 30 percent of the stock of broad money (M3) since the 1980s (27 percent in 2021). This is lower than the initial banknote coverage regulations from 1816 to 1840

¹⁵ Carsten Smith, a Norwegian law professor and member of the Official Committee who had recently finished their work on drafting new legislation regarding Norges Bank and monetary affairs (NOU 1983:39, 1983), criticised this practice as disrespectful of the law in a debate article in 1984 (Smith, 1984, p. 6).

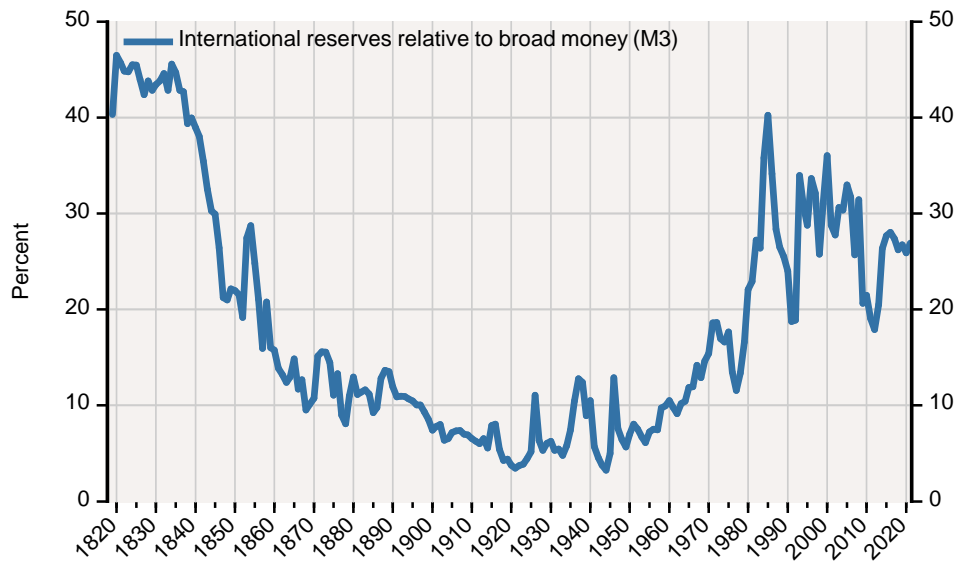
3.2 An overview of foreign exchange reserves across 200 years

which stated that Norges Bank's silver reserves should correspond to 50 percent of the stock of banknotes in circulation.

Norges Bank's foreign exchange reserves, 1818-2021



(a) Relative to GDP and imports



(b) Relative to broad money (M3)

Figure 3.2 Norges Bank's international reserves, relative to nominal GDP, imports and broad money (M3), 1818-2021. International reserves used in this figure consist of *Gross FX reserves* corrected for *Domestic FX*. See Section 3.3 below for details.

3.2 An overview of foreign exchange reserves across 200 years

Figure 3.2(b) shows that the reserve coverage rate of broad money fluctuated between 40 and 50 percent in this period. It should be added that deposits in savings banks were growing during these years and, more generally, that the strong growth and expansion of the private banking system in the 19th century brought the reserve coverage of broad money down to a level below ten percent in the first half of the 20th century, before the coverage increased again towards 20 percent during the period from the 1950s through the 1970s.

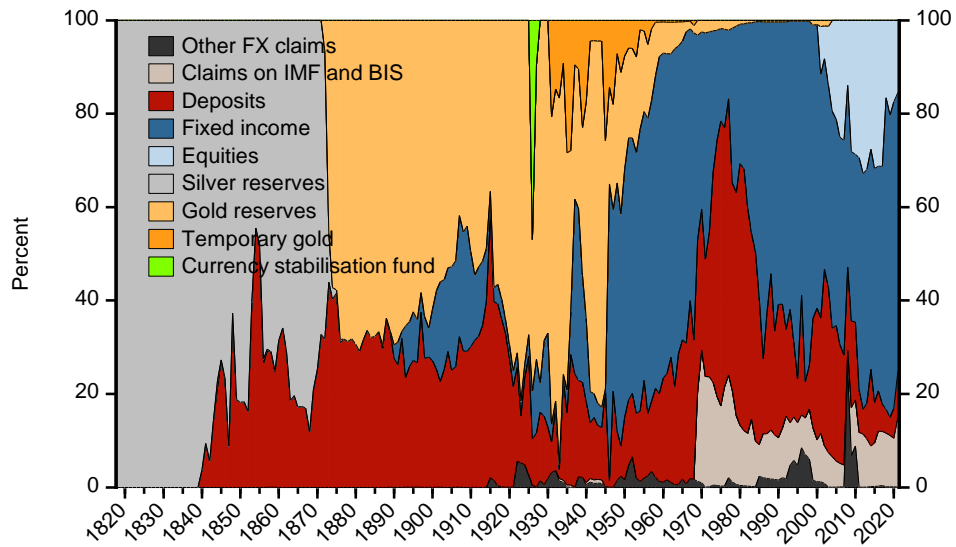
Today, more than two decades into the 21st century, Norges Bank's foreign reserves take the form of a well-diversified portfolio, which consists of equities, fixed income securities (predominantly sovereign bonds) and bank deposits nominated in different currencies. Figure 3.3 illustrates these changes in Norges Bank's reserves, focusing on changes in the distribution across selected financial instruments (Figure 3.3(a)) and in the distribution across different currencies (Figure 3.3(b)).

This more than two centuries long period from 1817 onwards can roughly be divided into two parts, which have different characteristics concerning the asset composition of FX reserves. These parts can be further divided into sub-periods, to which we will return for a more detailed presentation in Section 3.5.

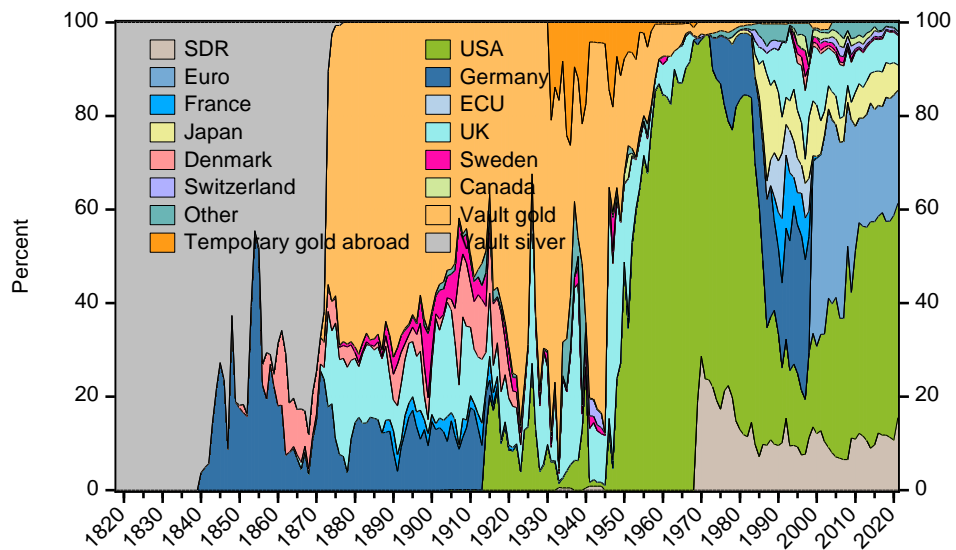
In part one, from 1817 to 1945, the lions share of the bank's foreign reserves were holdings in precious metals, first in silver bullion and silver coins during the silver standard period prior to 1873 and later, from 1873 onwards, in gold bullion and gold coins during the gold standard period. Silver reserves were given a prominent role in the bank's statutes already in 1816, as the Norges Bank Act linked the maximum amount of banknotes Norges Bank could issue directly to the size of its silver reserves. These note issue regulations were made more flexible from 1842 onwards. The ratio of notes to reserves was increased and foreign currency deposits in banks and banker houses abroad were included in the metal basis of the stock of banknotes up to a limit which was initially set at 500 000 speciedaler. This limit was increased to one third of the silver reserves in 1857. We recall from Chapter 2 that foreign currency deposits held in banks and banker houses abroad were included in the item we called *FX assets* (foreign currency assets) in the bank's balance sheet (cf. Table 2.1 on page 30). In this chapter we have divided *FX assets* into four subcomponents as explained in Section 3.3.

In part two, after World War II, the role of gold diminished as the old note issue regulations were no longer active. Instead, non-metal foreign currency assets soon became the dominant part of the bank's international reserves. The bank placed its reserves in liquid interest bearing assets, mostly in sovereign bonds and bank deposits. After World War II the reserves have mainly been used for interventions in the foreign exchange market, for meeting balance of payment financing needs and to generate returns. The currency distribution of the foreign reserves also became very concentrated in this period as the bank predominantly held its reserves in US dollars. More on this later.

Norges Bank's foreign exchange reserves, 1818-2021



(a) By instrument, 1818-2021



(b) By currency, 1818-2021

Figure 3.3 Norges Bank's foreign exchange reserves distributed across selected financial instruments (top) and across different currencies (bottom).

3.2 An overview of foreign exchange reserves across 200 years

A preview on FX reserve items

We end this overview with a brief presentation of the FX reserve items we have used in this study. We have listed the categories we have used from Norges Bank's balance sheet in Table 3.1 below. *Gross FX reserves* consist mainly of claims on non-residents *FX assets* but in some periods also of claims on residents denominated in FX currencies. We will refer to such FX claims on residents as *Domestic FX*. They constitute a wedge between *Gross FX reserves* as they appear in Norges Bank's balance sheet and IMF's definition of *International reserves*. This is since *Domestic FX* claims are not included in IMF's definition of international reserves.¹⁶

Table 3.1 *Gross FX reserves. Main asset groups and instruments and their first year of entry in the bank's balance sheet.*

Asset group	Instrument list	First year of entry	Commentary
1 Metal reserves	Silver	1819	Silver in domestic vaults
	Gold	1872	Gold in domestic vaults
	Temporary gold	1931	Gold held abroad
2 FX deposits	Bank deposits	1840	Cash holdings in foreign banks and banker houses, loans to foreign banks
3 FX fixed-income securities	Bills of exchange	1853	
	Bonds	1893	After changes in the 1892 act
4 FX equities	Equities	2001	Listed on a regulated and recognised exchange
5 Other FX claims	Other FX claims		Gross clearing accounts, FX swap lines
6 Claims on int'l organizations	Claims on int'l organizations	1931	BIS, EPU, IMF

Table 3.1 divides Norges Bank's FX reserves into six main groups of assets and also shows the first year of entry of the different instruments. Metal reserves have been further divided into silver reserves and gold reserves, respectively, which were held in the bank's domestic vaults. From 1931 onwards some gold reserves were also held temporarily abroad. Fixed income securities have been divided into holdings of international bills of exchange and long-term bonds, respectively. From 2001 onwards the FX reserve portfolio has also included equities.

¹⁶ See <https://www.imf.org/external/np/sta/ir/IRProcessWeb/pdf/guide2013.pdf> (page 10(3)).

3.3 Three dimensions of foreign reserves

We have organized the historical data on the bank's foreign reserves along three different dimensions.

1. Allocation between broad asset classes with different *financial instruments*. These include *Bank deposits*, typically in foreign merchant banks and banker houses, holdings of different types of *Fixed income instruments* like bills of exchange and bonds issued in foreign currencies, and finally, from 2001 onwards, holdings in a broad portfolio of foreign *Equities*. In addition we report data for an item we have called *Other FX claims*, which contain data for clearing positions, unsettled trades and derivatives. The sum across these four subcategories, listed as items 2-5 in Table 3.1, match exactly the sum of *FX assets* and *Domestic FX*, which were defined in Chapter 2.¹⁷ We also report data for *Metal reserves* and *Claims on int'l organizations*, such as the Bank for International Settlement (BIS), the European Payment Union (EPU) and the International Monetary Fund (IMF).

Taken together the items 1-6 in Table 3.1 constitute the bank's *Gross FX reserves*.

$$\begin{aligned} \text{Gross FX reserves} &= \text{Metal reserves} + \text{FX assets} + \text{Domestic FX claims} + \\ &\quad \text{Claims on int'l organizations} \\ &= \text{Metal reserves} + \text{FX deposits} + \text{FX fixed-income} + \\ &\quad \text{FX equities} + \text{Other FX claims} + \text{Claims on int'l organizations} \end{aligned} \quad (3.1)$$

2. Allocation along the *currency dimension*. We have estimated the currency distribution of financial assets held in the main global financial centres. These were typically in Germany in the early part of the 19th century, but also to some extent in Denmark and Sweden, later in the UK and in other European countries during the gold standard period in the latter part of the 19th century, and then in the USA starting during World War I. After World War II we observed a strong USD dominance which ended when the Bretton Woods system broke down in the early 1970s. The post Bretton Wood period saw a return to increased exposure in European currencies and also towards Japanese yen. From 1969 onwards *Claims on int'l organizations* are predominantly gross claims on IMF in Special Drawing Rights (SDR).¹⁸

3. Allocation in *different portfolios* (from 1985 onwards). These portfolios were subject to different risk-return considerations and were in many cases given names which reflected their intended purpose. For example a *liquidity portfolio*, which needed to be immediately available for interventions, and a long-term *investment portfolio*, which was designed to give higher return but would also have longer duration.

Figure 3.4 compares the level of FX reserves reported in Klovland (2004b) with the three aggregates we consider in this study, summed across different financial instruments, currencies and portfolios, respectively. The FX reserve aggregates have been scaled by nominal GDP to facilitate

¹⁷ See Table 2.1 on page 30.

¹⁸ Before 1945 and from 1989 onwards Norges Bank's shares in the Bank for International Settlements (BIS) have also been recorded in the bank's balance sheet. The BIS shares amount to only between 0.1 and 0.6 percent of *Claims on int'l organizations* in the latter period.

3.3 Three dimensions of foreign reserves

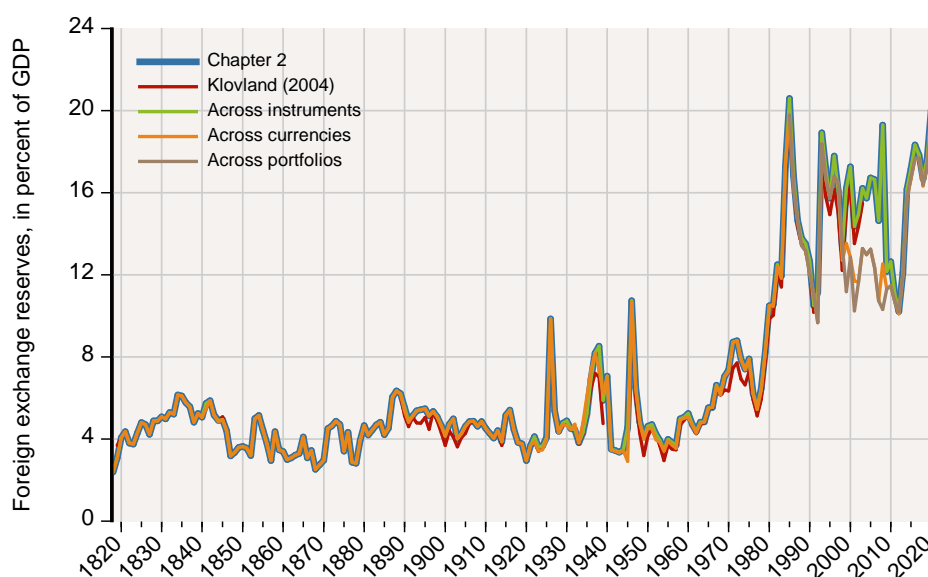


Figure 3.4 Norges Bank's Gross and Net FX reserves, 1818-2021. A comparison of FX reserve aggregates in Chapter 2 and Chapter 3 in this book with the FX reserve estimates in Klovland (2004b).

comparison across two centuries of data. Figure 3.4 confirms that the allocation across financial instruments (green line) match exactly *Gross FX reserves* summed across the four elements from Chapter 2 (blue line), whereas the allocation across currencies match a measure of *Net FX reserves*.

We recall from Chapter 2 that the balance sheet items are typically based on gross accounting principles. To obtain an estimate of *Net FX reserves* we have subtracted *Other foreign liabilities*, which are defined in Chapter 2.¹⁹

$$\text{Net FX reserves} = \text{Gross FX reserves} - \text{Other foreign liabilities} \quad (3.2)$$

We note that Klovland's estimates of total FX reserves are somewhat lower than the gross estimates of foreign reserves we collect from Chapter 2. This occurs typically during periods in the 1890s and 1900s, as the revised estimates in Chapter 2 have removed some instances of net accounting of foreign reserves held at Sveriges Riksbank and Danmarks Nationalbank during the Scandinavian Currency Union. But there are also discrepancies in the late 1930s, in the late 1940s and 1950s and in the 1970s. This is again due to increased use of gross accounting in our study plus the fact that we have removed netting of clearing debt in the late 1940s and 1950s and also introduced gross

¹⁹ *Other foreign liabilities* were initially debt to Danmarks Nationalbank and Sveriges Riksbank during the Scandinavian Currency Union (SCU) period. Before World War II these items were typically recorded as *Foreign deposits*. After World War II foreign debt was split between debt to foreign banks, which is a part of *Other foreign liabilities*, and debt to the European Payment Union, which is a part of *Liabilities to int'l organizations*. From 1969 the latter item also consist of debt to IMF. From 1992 onwards borrowing associated with repurchase agreements (repos) accounts for more than 90 percent of *Other foreign liabilities* and more than 95 percent in the 2000s before the global financial crisis in 2008. The use of repos was scaled significantly down from 2009 onwards.

claims on the IMF from 1969 onwards. In addition we also include claims on residents in foreign currencies (*Domestic FX*), which were not included in Klovland's study. Figure 3.4 shows that the largest discrepancies between *Gross FX reserves* and *Net FX reserves* are observed in the 1990s and 2000s. We discuss this in more detail in Section 3.4 below.

3.4 Sources and break adjustments

This section dig into details on the sources and methods we have used to construct composite historical data for foreign reserves in this study. We have considered three main dimensions of foreign reserves in the respect, which are presented in the following subsections. Firstly, zooming in on the distribution of foreign reserves across different financial instruments, secondly across different currencies and thirdly across different portfolios, respectively. Figure 3.5 provides an overview where we focus on *Gross FX reserves* and *Net FX reserves* in four subperiods. This enables us to see more clearly during which subperiods we observe differences between these concepts.

The main takeout from this comparison is that the aggregates are broadly in line with each other during most of the two first subperiods. We see some discrepancies in the third subperiod 1946-1980, in the 1950s during years when Norges Bank had debt to foreign banks and the European Payment Union (EPU). From 1969 onwards Norges Bank also recorded debt to the International Monetary Fund (IMF). Note that the scale differ substantially between the four subperiods in Figure 3.5. The magnitude of the discrepancies rise substantially from 1992 onwards (Figure 3.5(d)). As we saw earlier the difference between gross and net FX reserves is measured by the variable *Other foreign liabilities*, which we defined in Chapter 2. In the 1990s and 2000s *Other foreign liabilities* are heavily influenced by the increasing use of repurchase agreements (repos), which Norges Bank started to use as part of its management of foreign reserves in the early 1990s (Aamodt and Lerbak, 2013, pp. 4-6).

The accounting of this instrument expands the bank's balance sheet since the FX securities involved in the repo remain on the balance, whereas cash deposits (collateral) held in foreign banks are added to the item *FX deposits* on the asset side, cf. Table 3.1 on page 127. On the liability side the increased debt to foreign banks, which is recorded as an increase in *other foreign liabilities*, reflects the commitment to reverse these cash deposits when the repo agreement expires. The overall magnitude of repos were substantial in the late 1990s and early 2000s and accounted for almost 20 percent of the total balance. The use of repos were brought down significantly after the global financial crisis in 2008-2009 and the difference between gross and net FX reserves, notably the gap between the green and orange lines in Figure 3.5(d), became much smaller.

The bank also started to use reverse repos in their reserve management in the early 1990s. This instrument only affects items on the asset side of the balance sheet and does not expand the balance sheet. In the case of reverse repos, cash deposits in foreign banks are reduced and a corresponding increase is recorded in loans to foreign banks, which represents the commitment to reverse the reduction in cash deposits when the reverse repo agreement expires. It should be noted, however,

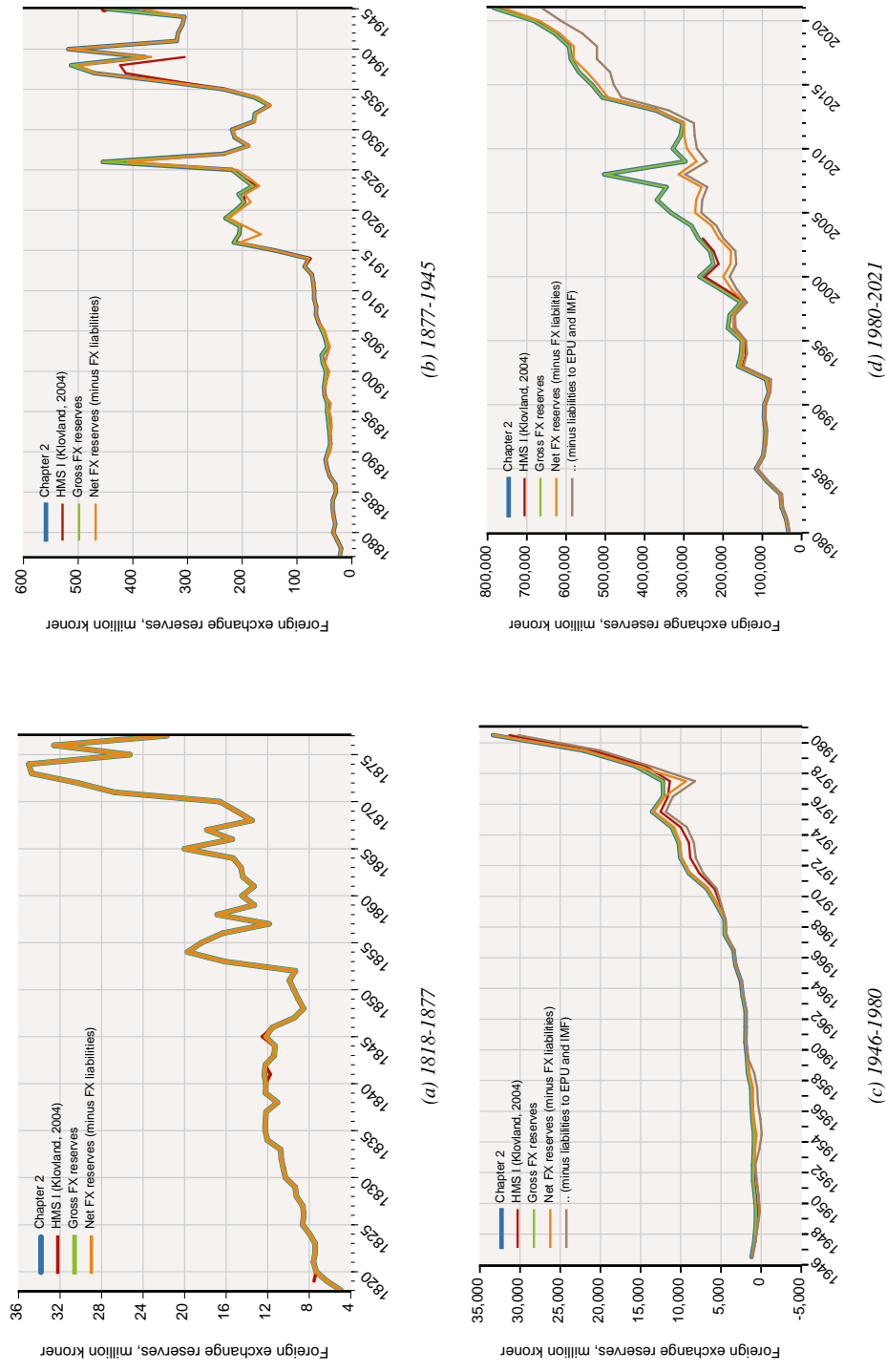


Figure 3.5 A comparison of Norges Bank's gross and net FX reserves in Chapter 3 with the total FX reserve estimates reported in Chapter 2 and Klovland (2004b).

Norges Bank's foreign exchange reserves, 1818-2021

that these items are all elements *within* the aggregated item *FX deposits* as defined in Table 3.1. Thus, the use of reverse repos as part of the bank's management of its foreign reserves leaves the total of *FX deposits* unchanged and is not detectable in the decomposition of the foreign exchange reserves we present in this chapter. The securities which the bank receives as collateral in reverse repo agreements do not enter the bank's balance sheet.²⁰

The foreign reserve aggregates summed across currencies differ from the aggregates summed across financial instruments for three main reasons. The first is the already mentioned distinction between gross and net FX reserves from 1992 onwards. The second is that the currency distribution is based in part on different sources and may not match the end-of-year records across financial instruments which we have obtained from the annual reports. A third reason is that we have used source observations in local currency for some periods, typically during the 1920s and 1930s, which are then multiplied with available observations of exchange rates in the month December in the relevant years to obtain estimates in kroner. These observations are typically calculated as monthly averages and may deviate from the exchange rates used in the annual report. More on this in Section 3.5 below.

Allocation across financial instruments

Information about the allocation of Norges Bank's international reserves across different financial instruments is available from Norges Bank's *annual reports*, either directly from the specification of the consolidated balance sheet or from the notes included in the annual reports. Norges Bank's annual reports have been published in a printed version in all years from 1817 until today.

In Section 2.7 in Chapter 2 we provided an overview of break adjustments which were needed to match the specifications of Norges Bank's balance sheet presented there, see Table 2.1 on page 30. We give a brief overview in the following paragraphs of how we have matched the historical data for the different financial instruments in this study with the more aggregated foreign exchange reserve data in Chapter 2. Recall that in Chapter 2 we distinguished between *Metal reserves*, *FX assets*, *Domestic FX* and *Claims on international organizations*.

From 1840 onwards we split aggregated holdings of foreign reserves between *vault silver* (*vault gold* from the mid 1870s onwards) and *bank deposits* held at Norges Bank's correspondents abroad. These were typically foreign merchant banks and banker houses. *Vault silver* and *vault gold* were also referred to as *banknote silver* and *banknote gold*, respectively, in light of the statutory regulations of banknote issue, which placed minimum limits on the coverage of silver and gold reserves that the bank was required to keep in domestic vaults.

From 1888 onwards we have implemented a gross accounting principle for Norges Bank's clearing account relative to Sveriges Riksbank and Danmarks Nationalbank during the Scandinavian Currency Union (SCU) years. This is similar to the gross accounting of IMF-related items in Norges Bank's balance under the current international accounting standards (IFRS), which Norges Bank

²⁰ See Aamodt and Lerbak (2013, pp. 4-6) for more details about the bank's use of repos and reverse repos in its management of foreign reserves in the period 2003-2012.

3.4 Sources and break adjustments

implemented from 2012 onwards. For previous years back to 1969, when IMF items first appeared on Norges Bank's balance sheet, we have therefore made upwards adjustments to *Claims on international organizations* and reported total IMF-quotas instead of the net IMF reserve positions. Correspondingly, we have added IMF's holding of NOK-deposits to the bank's *Liabilities to international organizations* on the liability side.

From 1893 onwards we made adjustments to distinguish correctly between Norges Bank's holdings of foreign and domestic securities. Some items, which had been wrongly classified as *domestic securities*, were reclassified as foreign exchange reserves and included in *FX assets*. The bank's holdings of foreign exchange claims on domestic residents have been recorded as *domestic FX*.²¹

The data are tabulated in the appendix, in Table 3.A.1 in speciedaler and in Table 3.A.2 in mill kroner.

Allocation across currencies

Until 1914 Norges Bank's annual reports reported the foreign reserve holdings at year-end in such detail that it was easy to make calculations of the currency distribution of the foreign reserves based on the reported accounts for the bank's correspondents in different foreign countries. From 1915 onwards however, information about currency distribution was no longer available in the annual report as only the aggregated total position of all deposits held at Norges Bank's foreign correspondents was reported. For the period after 1914 we have therefore searched for information on the currency composition of the bank's foreign reserves from various other sources. For this reason this subsection has become relatively long and detailed as we have prioritized to give a fairly accurate description of the various sources we have used in this study. The final estimates rely on a set of assumptions, which we will go into some details explaining in the following. The data are tabulated in the appendix in Table 3.A.3.

We should also add that the estimates of the currency composition of the foreign reserves which we present in this study rest on assumptions, e.g. regarding which source we choose to rely on when there are multiple sources available or which exchange rate we have used to convert recorded holdings in local currencies to kroner. The final estimates are therefore subject to uncertainties which we have tried to address and discuss in this subsection.

This search for information about the currency distribution of Norges Bank's foreign exchange reserves has been a quite tedious process, as it turned out to be surprisingly difficult to find this information in the bank's archives. In fact we are reminded that this project actually started already back in 2006. Professor Barry Eichengreen in collaboration with Professor Mark Flandreau led a project on the currency blocs in the interwar period and asked Norges Bank to help provide data about the currency composition of Noregs Bank's international reserves during this period. These

²¹ We recall that the bank's holdings of *domestic FX* is *not* counted as international reserves according to IMF's definition.

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.2 *Currency distribution of Norges Bank's international reserves. Overview of data sources.*

Period	Source	Items covered	Date	Location
1817-1914	Norges Bank's annual report	Deposits and securities	EOY	NB
1840-1922	Norges Bank's monthly extracts	Deposits and securities	EOM	NA
1915-1922	Norges Bank's balance extracts	Deposits	EOY	NA, NBEB
1923-1929	Letters to auditors (local currency)	Deposits	EOY	NA, NBAA
1930-1939	Letters to Supervisory Council (local currency)	Deposits	Jan,Nov	NA, NBSCA
1915-1936	Norges Bank's annual report	Securities	EOY	NB
1937+1939	Norges Bank's accounts and ledgers	Securities	EOY	NA, NBEB
1938	Unpublished material	Securities	EOY	NB
1940-1945	Norges Bank's annual report	Deposits and securities	EOY	NB
1946-1960	Statistical reports on FX currency	Deposits and securities	EOY	NBFEA
1961-1972	Statistical reports on FX currency	Deposits and securities	EOY	NA, NBFEA, MFAA
1973-1985	Statistical reports on FX currency	Deposits and securities	EOY	NBFEA
1978-	Norges Bank annual report	Reserves	EOY	NBFEA
1962-	IMF Quarterly COFER ^a Reporting	Reserves	EOY	NB
1985-1997	Internal reports on FX management	Reserves	EOY	NB
1998-	Internal database on FX management	Reserves	EOY	NBIRE
2005-	Norges Bank accounts information	Reserves	EOY	NBFRE

Sources: Archive/location acronyms: Norges Bank, Bankplassen in Oslo (NB), National Archive (NA), Norges Bank Executive Board Archive (NBEB), Norges Bank Audit Archive (NBAA), Norges Bank Supervisory Council Archive (NBSCA), Norges Bank Foreign Exchange Archive (NBFEA), Norges Bank Internal Reporting Electronically (NBIRE), Norges Bank Financial Reporting Electronically (NBFRE), Ministry of Foreign Affairs Archive (MFAA)

^a Currency Composition Of Foreign Exchange Reserves (COFER). Quarterly reports to IMF from 1962 onwards on the currency composition of Norges Bank's FX reserves.

efforts paid off and resulted in a first batch of historical data which described the distribution of Norges Bank's international reserves across different currencies during the period 1920-1939.²²

In this study we have revised the data for Norges Bank's foreign reserves in the interwar period. We have also extended the scope of the project to include data for international reserves before 1920 and from 1940 onwards. This is therefore the first study which aims at putting together a complete set of historical data for Norges Bank's foreign reserves along the three dimensions we have described above, i.e. across *financial asset instruments*, *different currencies* and *different portfolios*, covering a period of more than two centuries.

Table 3.2 provides an overview of the sources we have used in this study in order to construct composite historical data for the currency distribution of foreign reserves.

Between 1840 and 1922 data for Norges Bank's deposits in foreign currencies were also available from extracts which reported data on a monthly basis. These extracts listed the deposits Norges Bank had in various banks and banker houses in different countries both in local currency and the corresponding book value in Norwegian currency. We have assumed that deposits recorded in a

²² We owe thanks to Leif Alendal for his tireless efforts to search in Norges Bank's archival material at the Norwegian National Archives for information on the currency distribution of Norges Bank's foreign reserves in the period 1920-1939. A preliminary report appeared in Alendal and Eitheim (2007).

3.4 Sources and break adjustments

German banker house in the 1840s were denoted in German currency, that deposits in Danish and Swedish banks always was in Danish and Swedish currencies, respectively, and so on and so forth for the other countries/currencies including deposits in the international reserve currencies British sterling and US dollars.

By summing over the deposits in all banks in each country we obtain an estimate of the total value of deposits for that country's currency and the corresponding book value in Norwegian currency. Two examples are provided in Figure 3.6, from January 1847 and January 1872, respectively.

From 1893 onwards Norges Bank's international reserves also included securities like foreign currency bonds. The annual accounts for the years 1893 to 1936 contain detailed information about each bond in Norges Bank's bond portfolio, such as the currency they are nominated in, their book value in NOK and about the issuer. This has made it possible to separate between claims in foreign currency against resident and non-resident institutions respectively.²³

Norges Bank's accounting department, who prepared the balances presented in the annual report, made records of the bank's balances on a monthly basis from 1850. Until 1922 information about deposits abroad were included in these balances in a format similar to what was used in the annual report until 1914. From 1923 onwards however only the total value of foreign deposits was recorded in these reports and not their currency distribution.

Between 1923 and 1930 information about the currency distribution of foreign deposits was located in periodical reports sent to the bank's internal auditors found in the Norges Bank Audit Archive (NBAA). Deposits were reported in local currencies only. We follow the bank's accounting practice at the time and arrive at a NOK equivalent by multiplying each currency deposit with their par exchange rate against gold.

²³ We may note here that in the 1930s Norges Bank purchased significant amounts of bonds issued in foreign currencies by domestic resident institutions like local municipalities and public and private corporations. We have kept separate accounts of these as they are not counted as part of international reserves.

Norges Bank's foreign exchange reserves, 1818-2021

		Reservfondet	Reservfondet
279	Subfondene	Sp 851,135- 56	175,806- 77 1/2
8	" " " " "	. 579,097	
4	" " " " "	. 6	59
252	" " " " "	. 214,696	
19	Kongelig Bygd	. 170,775 - 52	
		<u>Sp 1,815,710 - 40</u>	
283	J. Møller	Sp 598,301	
394	C. H. Boman	. 883,979 14	
395	P. H. & F. Baur	. 616,004 12	
		<u>Sp 2,058,285 - 10</u>	686,095 - 25
		<u>Sp 2,501,305 - 65</u>	175,806 - 77 1/2
			<u>2,677,612 1/2</u>

(a) January 1847

		Sp	Sp
279	Subfondene	Sp 1761. 41	1761.912 85
	" " " " "		2,346,630 65
	" " " " "		15,500
	" " " " "	de . 6709. 69	211,934 16
		<u>8470. 110</u>	<u>4,405,427 46</u>
			8470 110
			<u>4,413,898 36</u>
	J. H. & F. Baur	Sp 943,847. 4	
	P. Møller & Co	. 577,791 -	
	John Thoresen & Co	. 974,969 -	
	Conrad Hen. Tonnes	. 1,242,410. 2	
	Mr. Mathiasen & Co	. 415,753. 8 1/2	
	P. H. & F. Baur	. 971,232. 5	
		<u>Sp 5,203,010. 3 1/2</u>	<u>Sp 1,704,326. 88 1/2</u>
	J. F. Suhr & Son	Sp 656,607. 87	
	Jac. Holm & S.	. 114,389. 71	
		<u>Ad 770,997. 72</u>	<u>315,491. 105</u>
	J. C. Hambro & Son	L 26816. - 11 1/2	119,777. 32
			<u>2,239,622 105 1/2</u>
			<u>6,653,521 21 1/2</u>

(b) January 1872

Figure 3.6 Monthly extracts from January 1847 and January 1872, respectively. The extracts show that the number of foreign correspondent banks had increases from three German banks in January 1847 to six German and two Danish banks plus Hambro & Son in London in January 1872.

3.4 Sources and break adjustments

Between 1931 and 1939 the sources we rely on for the currency distribution of deposits are letters from the Executive Board to the Supervisory Council found in Norges Bank Supervisory Council Archive (NBSCA). These reports were produced four times each year, respectively, in January, May, August and November, and observations were typically registered in the middle of the month, although this varies. Deposits were only reported in local currency and we arrive at crude estimate of a NOK equivalent by multiplying the local currency holdings reported in November with their December market value (in the accounts from 1931 the bank converted holdings abroad by using end-of-year market rates). The exchange rates we use for this purpose are the monthly average exchange rates reported in Klovland (2004a).

For the years 1937-1939 we retrieve information about the bond portfolio from two different sources. For 1938 a table with details on the bank's bond portfolio was included in some unpublished back-ground material to the 1938 annual report, which we found in the bank's archive. We acknowledge that the bond portfolio is probably valued differently in our study than in the published accounts (the difference for the totals amount to about one percent), and to reconcile we have made proportional adjustments of the figures in order to match the totals. For 1937 and 1939 we had to dig even deeper to find data for the currency distribution of the bond portfolio. For these years we made use of transaction information reported in ledgers from Norges Bank's main accounts. The main accounts specify all bond transactions which were recorded during a year, as a debit if sold or credit if bought. We have guessed which currency each transaction relates to from the reported information in the ledger about the bond and the institution on the other side of the transaction, often a central bank. We have calculated end-of-year balances for each currency based on the initial balance at the beginning of the year (we have made some qualified guesses regarding the currency involved in a few transactions).

The final transaction item reported in the ledger for 1937 is a debit of around NOK 20 million, which is specified as agio losses related to selling of gold. This item reduced the value of the bond portfolio, but is not related to any particular bond or currency. Norges Bank built up hidden reserves from 1931 and this transaction was part of that. We therefore have a difference of 20 NOK million between our estimates of the currency distribution of the bond portfolio and the official reported value of the bond portfolio.

In the accounts for the years 1940-45 is shown the currency distribution of the bank's deposits as well as the value of the bond portfolio (held solely in USD).

For the years from 1946 to 1960 we have information about the currency distribution of Norges Bank's assets from an overview the statistical department made about the bank's currency situation. This report was made on a weekly basis beginning in June 1946 and available until June 1961. The assets included in the currency distribution are bonds, deposits, temporary gold and other liquid assets (such as securities, bills of exchange), but not showed separately for each asset class.

A similar source is available from 1961 to 1985. The statistical department prepared on a monthly basis a report showing the foreign currency assets of various sectors (such as Norges Bank, banks, other financial institutions and industries). These reports were confidential but were distributed to

Norges Bank's foreign exchange reserves, 1818-2021

certain government institutions, such as the ministry of foreign affairs. We have localized these reports in the archives of the Ministry of Foreign Affairs at the National Archive of Norway for the years 1961-1969 and in the archives of the Ministry of Foreign Affairs for the years 1970-1973. For the years 1973-1985 we located these reports in Norges Bank's own archives at its head office in Oslo.

For the years after 1962 we can cross-check this currency distribution with other available sources, such as the quarterly reporting to IMF on Norges Bank's currency composition (the so called Currency composition of Official Foreign Exchange Reserves (COFER) reports, and a few other sources we have been able to find in the bank's archive. The COFER-reporting specify information for a subset of currencies (USD, EUR, JPY, RMB, AUD, CAD, CHF), with the remaining currency assets being bundled in a series labelled "other". The COFER reporting is in USD and is converted to NOK by using average market rates for December. These different sources show a similar evolution of Norges Bank's international reserves.

As we use different sources for the asset composition and the currency composition of Norges Bank's foreign exchange reserves from 1922, we have issues with reconciliation. There are some differences and particularly for the bank's deposits for the years 1931-1939. Between 1931 and 1939 the closest observations we have end-of-year is either mid-November or late January the following year. These observations are in addition in local currency and have been converted to NOK by using December average market rates. For the asset composition we have end-of-year numbers where end-of-year market rates are used for conversion. As the November observations on the currency distribution are consistently closer to the observations in the annual accounts, we have chosen to use these in this study. Even with these caveats, the foreign exchange reserves calculated from the asset composition across instruments and from the currency composition, adds up reasonably well for all years.

Allocation across portfolios

From 1985 onwards the bank developed further its management of foreign reserves. The bank hired more staff with expertise in financial portfolio management and started to work more systematically to build competence in this area. Staff from Norges Bank visited other central banks to learn more about their reserve management. It was also established an investment committee which advised the governor and the Executive Board on matters regarding reserve management.

The bank reported internally on the allocation of foreign reserves between different portfolios. These portfolios were subject to different risk-return considerations and were in many cases given names which reflected their intended purpose. In previous years there had been a distinction between very liquid holdings in the *First line of reserves* and somewhat less liquid holdings in the *Second line of reserves* and the *Third line of reserves*. The labels on these portfolios have changed on several occasions.

From 1994 onwards, for example, the reserves were divided between a *liquidity portfolio*, an *investment portfolio* with less liquid assets and higher duration, and an *immunization portfolio*. The

3.5 Foreign reserves in five subperiods

immunization portfolio was a hedging portfolio with a currency composition and maturity which matched that of the government's foreign debt.

A special portfolio which receives the government's cash flow from petroleum activities in foreign currency was established in 1998 and is denoted as the *petroleum buffer portfolio*. We provide more details on the different portfolios in a later subsection.

Today the foreign exchange reserves are divided between a *fixed-income portfolio* and an *equity portfolio* and there are no gold holdings in the foreign exchange reserves. When we relate these portfolio concepts to the assets listed in Table 3.1 above we take note of the fact that the *fixed-income portfolio* is a relatively broad concept which covers both cash deposits in foreign banks and holdings of foreign securities such as treasury bills and sovereign bonds. We have collected historical data on these portfolios from the different sources listed in the lower part of Table 3.2.

3.5 Foreign reserves in five subperiods

The years 1817-1945 is broken into three sub-periods with distinct characteristics regarding the monetary system in place. The first sub-period was from 1817 to 1873 when Norway's currency was tied to silver. The second sub-period was during the gold standard years from 1874 onwards. The silver reserves were replaced with gold reserves over a short time span beginning in 1872. The third sub-period started when gold convertibility was suspended shortly after the beginning of World War I. This period, which covers the two world wars and the interwar period, was a turbulent one with frequent regime changes. The period began with the suspension of gold convertibility in 1914, followed by a long period with floating exchange rates until convertibility at prewar gold parities was restored in 1928. A new suspension of gold convertibility came when Norway followed the UK and left the gold standard in 1931. After two more years with floating exchange rates Norway adopted fixed exchange rate against the British pound in 1933. Finally, in 1939, at the dawn of World War II, the krone was fixed against the US dollar.

The years 1945-2020, between the end of World War II and today are split into two periods based on a shift in the currency composition of the reserves which took place in the mid 1980s. From the end of World War II onwards the bank's foreign reserves were increasingly concentrated in US dollar holdings. After the Bretton Woods system had broken down in the early 1970s, we saw increases in holdings of German mark from the mid 1970s. From the early 1980s however we saw a rapid transition towards a more diversified portfolio of foreign exchange reserves, with a currency distribution including European currencies like German mark, French franc and British pounds, eventually ECU and Euro and also Japanese Yen.

The silver standard era

In the early years Norges Bank stored its silver reserves in the vaults of the bank's various regional offices. With the establishment of the bank in 1816 Stortinget decided that *speciedaler* was Norway's

Norges Bank's foreign exchange reserves, 1818-2021

new currency unit and that confidence in the mass of circulating notes should be secured by a silver fund of (at least) two million speciedaler.²⁴ The silver fund was eventually financed by mandatory contributions of two million speciedaler in silver deposits from the country's tax payers. This scrambling of silver to fund Norges Bank came to become known among people as the "silver tax". The contribution from each tax payer was based on assessments of wealth by regional tax commissions. The collection of these deposits began early in 1817 and, although it was assumed that the silver fund would be in place by the end of 1818, the work was not completed until 1826.

From 1840 onwards Norges Bank held deposits with foreign banks. The background for the first deposits was a law in 1839 stating that a large portion of coins kept by the bank were of so poor quality that they could not be further used as means of payment. The bank faced two choices: either melt the coins and reuse the silver they contained or sell them. The bank opted for the second alternative and sold the coins in Germany for 98 % of their face value and deposited some of the currency received with three private banks headquartered in Hamburg and Altona (Salomon Heine in Hamburg, C. H. Donner and J. H. M. Gehrt in Altona). Figure 3.7 shows that deposits were held in foreign banks in Germany from 1840 onwards.²⁵

Stortinget (the Norwegian parliament) decided three years later, in the Norges Bank Act of 8 August 1842, that deposits held with foreign banks were to be recognized as part of the bank's metal fund (as basis for issuing notes), but that these deposits should not exceed the amount of 500 000 speciedaler, which amounted to around one sixth of total reserves at the time. The bank's deposits exceeded this threshold several times during the 1840's and by quite significant margins in the 1850's. This limit was increased to one third of the silver fund in the Norges Bank Act of 28 September 1857.

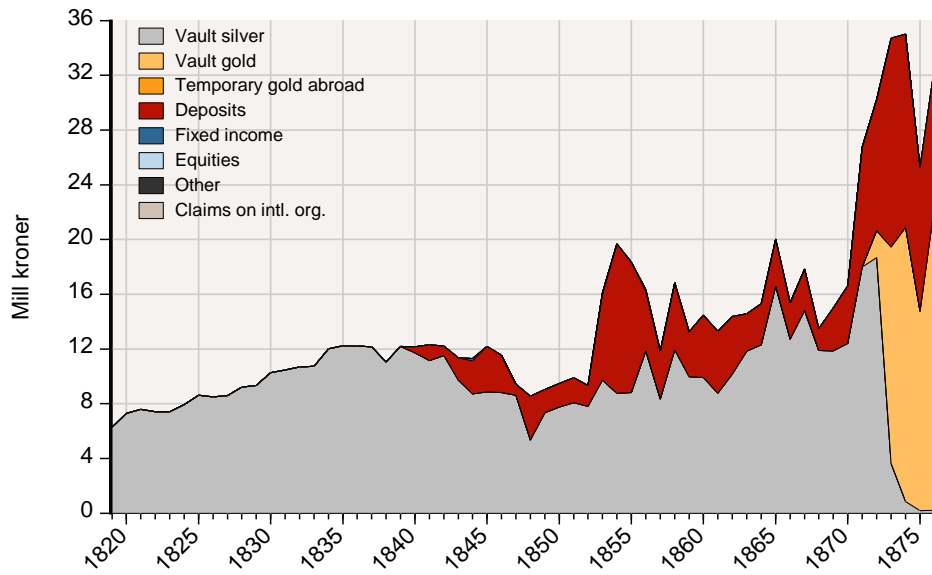
From the bank's perspective deposits held with foreign banks gave a higher return than metal stored in its domestic vaults. In addition to lost returns, there were also high costs involved in transporting the metal to or from Norway. Stortinget did not raise objections or concerns that the bank exceeded this threshold when the bank's annual report was submitted for approval.²⁶

²⁴ Norges Bank Act of June 14 1816.

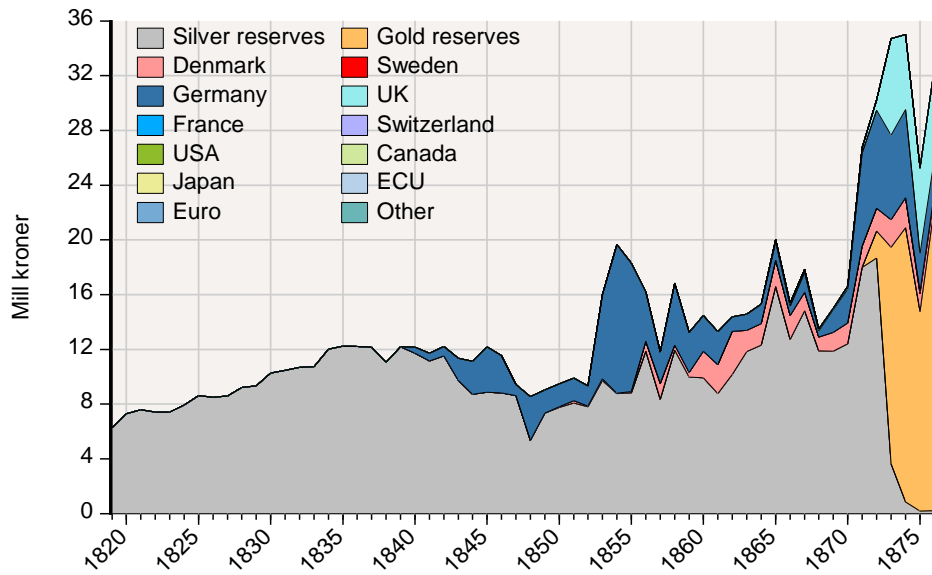
²⁵ See Tveite (1963) for an overview of developments in trade and financial flows between Hamburg and Altona and Norway during the period 1814-1860.

²⁶ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandler/Lesevisning/?p=1857&paid=4&wid=a&psid=DIVL75&pgid=a.0167>

3.5 Foreign reserves in five subperiods



(a) By instrument



(b) By currency

Figure 3.7 Norges Bank's holdings of silver, gold and FX reserves, 1819-1876.

Norges Bank's foreign exchange reserves, 1818-2021

In 1857 the Storting changed the law regulating the amount of deposits Norges Bank was allowed to keep in foreign banks. Norges Bank had suggested that its Executive Board should determine the threshold. Stortinget feared that such power vested with the board of the bank would induce a higher share of the reserves being stored abroad than it was comfortable with.^{27,28} The Storting held the opinion that reserves kept as deposits abroad implied a higher risk than silver stored in the bank's domestic vaults and therefore decided that the bank was allowed to keep only a maximum of one third of the metal fund as deposits abroad. The reserves which were actually kept abroad remained however broadly in line with the new threshold, except during a few months in 1861 when the Executive Board reported to the Storting that a cold winter made it difficult and very expensive to transport the metal home.^{29,30}

From its establishment in 1816 and until 1872 the main component of the bank's international reserves was silver. Deposits held abroad were on average 24 percent of total reserves between 1840 and 1872.

Between 1840 and 1872 foreign deposits were mostly held with German banks, as Germany was the financial centre for countries on the silver standard. From 1850 Norges Bank also held deposits with Danish banks (Figure 3.7(b)). The currencies and banks Norges Bank held deposits with were those that were considered important for trade.^{31,32}

The bank's first holdings of gold appeared on its balance sheet in 1872 (Figure 3.7(a)). Stortinget had already prepared for this a couple of years earlier, and Norges Bank was from 1869 onwards permitted to hold gold as part of its metal fund.³³

The gold standard era

A revision of the Norges Bank Act of June 4 1873 stated that the Speciedaler was to be backed by gold and Norges Bank replaced its silver reserves with gold during the years 1872-1876.³⁴ The change from a silver standard to a gold standard was swiftly executed and by the end of 1874 only 4 percent of the bank's metal consisted of silver.³⁵

²⁷ For a discussion of the share of reserves kept abroad, see <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1857&paid=9&wid=a&psid=DIVL969&pgid=a.0324>

²⁸ In the original proposition the foreign share was set to 1/2, but the second house of the Storting wanted a lower share, 1/3 because of the additional risk of keeping silver reserves abroad, see <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1857&paid=9&wid=a&psid=DIVL1139&pgid=a.0436>

²⁹ In April 1862 the share of reserves held abroad had been brought back within the legal limits.

³⁰ See report from the Banking commission regarding Norges Bank's activities in the period 1 October 1859 until 1 October 1862.

³¹ Cf. Lie, Kobberrød, Thomassen and Rongved (2016, p. 117).

³² During the 1857-58-crisis Norges Bank's Executive Board decided that deposits in Denmark were to be transported to Germany (Rygg, 1954, p. 22). A total of 625 000 speciedaler silver was also shipped to Hamburg from Norges Bank, cf. Norges Bank annual report (1858) and Lie, Kobberrød, Thomassen and Rongved (2016, p. 105).

³³ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1868-69&paid=5&wid=a&psid=DIVL366&pgid=a.0675>

³⁴ <https://stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1874&paid=6&wid=a&psid=DIVL345&pgid=a.0364>

³⁵ While the exchange took place the bank was temporarily allowed to hold a larger share of its reserves abroad. The limit held abroad was temporarily increased to 50 percent of the total fund, but was reduced to its original level of 1/3 at year-end 1876, see <https://stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1874&paid=6&wid=a&psid=DIVL345&pgid=a.0365>

3.5 Foreign reserves in five subperiods

The change from a silver to a gold standard also led to increasing foreign deposits held in British Pound Sterling, London being the dominant financial centre in the classical gold standard period (Figure 3.7(b)). A corresponding decrease in holdings of deposits in German mark followed. In 1872 only 8 percent of the bank's foreign non-metal reserves were placed with UK banks. This share had increased to 46 percent by 1873. At the same time the share placed in German mark deposits had dropped from 75 to about 40 percent.

In 1873 both Norway, Sweden and Denmark decided to replace the monetary policy regime from the silver standard to a gold standard regime and the three countries also introduced the krone as their new currency unit. Sweden and Denmark also entered the Scandinavian Currency Union (SCU) whereas the Storting declined this step. Within the SCU each central bank was allowed to mint their own krone coins that could be freely used as a means of payment within the union. In 1875 Norway, however, reconsidered their decision made two years earlier and joined the SCU together with Sweden and Denmark from 1877 onwards. In 1885 the three countries strengthened the ties within the union and the central banks opened mutual bank accounts which greatly simplified the netting of balances which accumulated and would normally have been settled by gold exports or imports. Under this arrangement Norges Bank could keep a maximum of 2 million kroner in Danmark's Nationalbank or Sveriges Riksbank in addition to the threshold of a third of the metal fund which could be held abroad.³⁶ This amount was raised to 3 million kroner when the central bank act was revised in 1892.^{37,38} These claims were also recognized as part of the bank's formal foundation which determined the bank's capacity to issue banknotes.³⁹

An important change that occurred with the revision of the 1892 Norges Bank Act was that the bank was permitted to make investments in financial securities, listed examples were domestic sovereign bonds, bonds issued by Hypotekbanken and other domestic or foreign securities quoted on a foreign stock exchange and were considered easy to liquidate. Prior to World War I the bond portfolio consisted mainly of German and English government bonds. Figure 3.8 shows the main developments in Norges Bank's foreign reserves in the period 1877-1913.

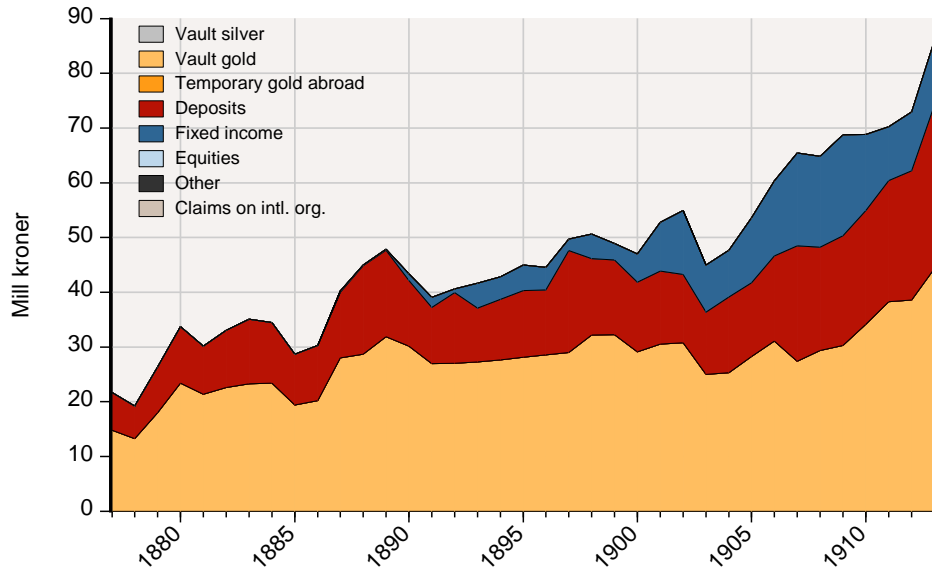
³⁶ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1888&paid=6&wid=a&psid=DIVL1840&pgid=a.1192>, See also annual report for 1887

³⁷ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1892&paid=8&wid=a&psid=DIVL670&pgid=a.1099>

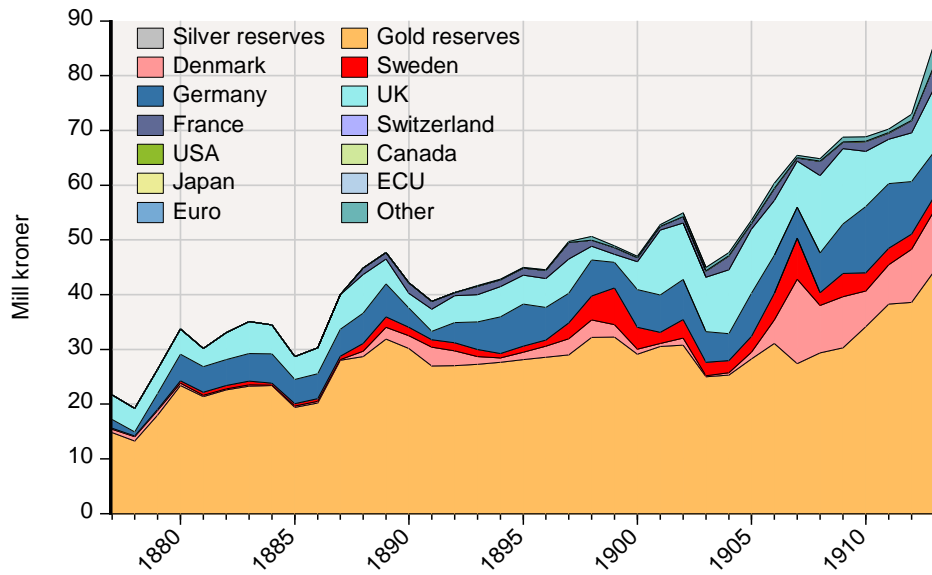
³⁸ Norges Bank stated in its annual report 1888 that the limit of 2 million kroner was too small, and that placements in Sveriges Riksbank and Danmarks Nationalbank should be included in the quota of 1/3 in order not to breach the regulations, see <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1889&paid=5&wid=a&psid=DIVL836&pgid=a.0388&vt=a&did=DIVL844>

³⁹ See Section 2.4 and Section 2.7 in Chapter 2 for details regarding the note issue regulations from Norges Bank was established in 1816 until 1940.

Norges Bank's foreign exchange reserves, 1818-2021



(a) By instrument



(b) By currency

Figure 3.8 Norges Bank's holdings of gold and FX reserves, 1877-1913.

3.5 Foreign reserves in five subperiods

The holdings of foreign sovereign bonds were not counted as part of the bank's metal fund, hence they were not included in the foundation of banknotes. But because they were easy to sell, these bonds could quickly be converted into foreign bank deposits, which were included in the metal fund. This happened during the 1899 crisis when Norges Bank sold almost its entire bond portfolio to support its metal fund. Only French government bonds remained in the fixed-income portfolio.⁴⁰

The restriction that the bank's foreign deposits were not to exceed one third of the metal fund was considered by Norges Bank as too restrictive. The Executive Board wanted the Storting to change the law such that Norges Bank could hold deposits abroad in excess of the amount which was accepted as part of the metal fund, which defined the legal maximum of banknotes in circulation. A change in this direction was made in 1912.⁴¹

This change implied that there was no longer a direct link between the level of the bank's foreign deposits and the metal fund, whereas the link between the bank's metal fund and the legal maximum of banknotes in circulation was left unchanged.

For the period 1877-1913 metal in the bank's basement constituted around 60 percent of the bank's foreign exchange reserves, deposits around 30 percent, bills of exchange 3 percent and bonds 6 percent (Figure 3.8). During this period the bank held assets mainly in German mark and British pound sterling, in addition came assets in Danish and Swedish kroner. The period witnessed a rise in the number of foreign correspondent banks, with which Norges Bank held deposits, and a rise in the number of currencies in the foreign reserve portfolio, which reflected changes in trade patterns in this period.⁴²

World War I, the interwar years and World War II

World War I marks an end to the classical gold era and had great impacts on the composition of the bank's foreign exchange reserves. Two characteristics of the gold era regime was firstly that trade deficits led to gold transfers between central banks and second that individuals could present notes (gold) to a central bank and demand gold (notes) in return. During the first year of the war most countries (including Norway) suspended note conversion and prohibited gold export.⁴³

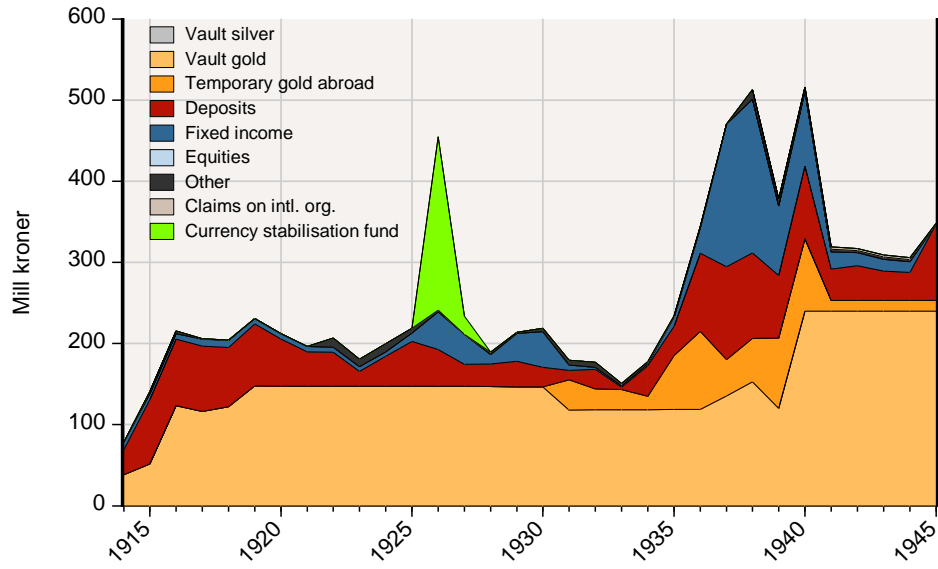
⁴⁰ Øksendal (2008) investigates Norges Bank's monetary policy during the years 1893-1914 and finds that the bank sheltered domestic money supply from balance of payment shocks. The bank did not fully utilize its note issuing capacity and foreign securities could thus be used in a crisis to increase the money supply.

⁴¹ Whereas §10 in the 1892 act stated that "The bank is permitted to hold up to a third of its gold reserves abroad", the wording in the act of 1912 was changed to the following. "As part of the bank's metal fund is to be considered means deposited with foreign banks up to a third of the metal fund as defined in §9" (Authors translation). See <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1912&paid=8&wid=a&psid=DIVL750&pgid=a.1600>.

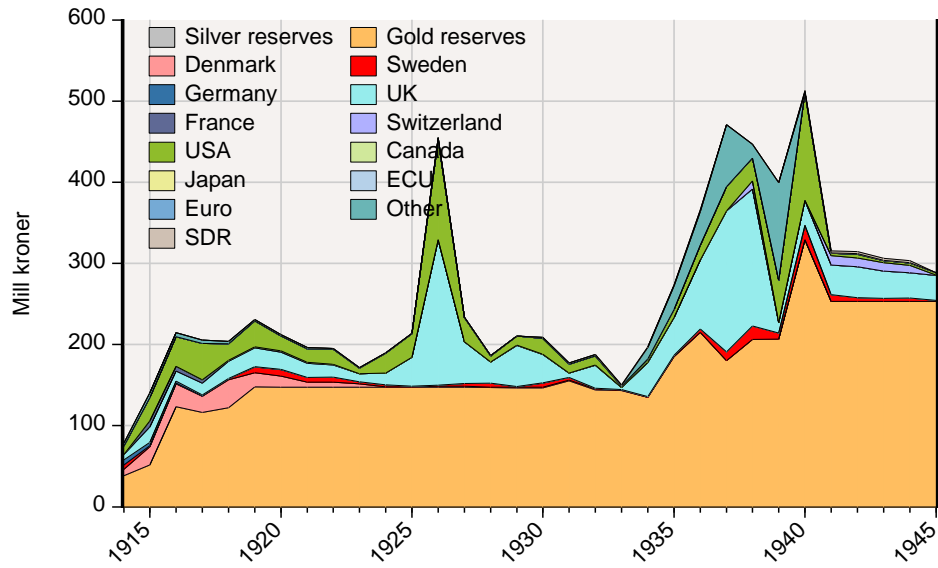
⁴² Rygg (1954, pp. 281-284)

⁴³ Gold convertibility was suspended from 4 August 1914 and gold exports was made illegal from 18 August 1914 onwards. An overview of the changes in regulations during the period with floating exchange rates from 1914 to 1928 was given in Norges Bank's annual report for 1928, see <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1929&paid=5&wid=a&psid=DIVL149&pgid=a.0133>

Norges Bank's foreign exchange reserves, 1818-2021



(a) By instrument



(b) By currency

Figure 3.9 Norges Bank's holdings of gold and FX reserves, 1914-1945.

3.5 Foreign reserves in five subperiods

Norwegian fish exporters and the shipping industry benefitted hugely from increased prices during the first years of the war. This resulted in incomes that eventually ended up on the balance sheet of the central bank, when exporters wanted Norwegian kroner in return for their foreign currency.⁴⁴ By the end of 1916 deposits abroad had risen almost threefold (up from NOK 29.8 million in 1913 to NOK 82.3 million).⁴⁵ As most countries had a ban on gold exports, deposits abroad were not easily converted to gold and shipped back home. Even with this ban, the bank's gold reserves near tripled between 1913 and 1916.⁴⁶ A consequence of the war was that more assets were held in US dollar. Before the outbreak an insignificant portion (0.1 percent in 1913) of the bank's deposits were nominated in dollar, but already by 1914 this portion had increased to more than 41 percent.

Whereas prices favored Norwegian exporters at the beginning of the war, the opposite was the case towards the end of the war and the following years. As demand for Norwegian exports were low, Norges Bank's deposits abroad diminished. Contributing to this decline was that the bank sold part of its reserves to stall the depreciation of NOK. By the end of 1923 the bank's foreign deposits had fallen back to its prewar level. German bonds were written down to zero after the German hyperinflation.

Beginning in 1924 the bank faced a similar challenge, but this time with a rapid appreciating currency. Norges Bank aimed at returning to the gold standard with kroner tied to its prewar gold value, but it wanted the resumption to par to take place only gradually. To stagger appreciation pressures, the bank at first sought to constrain the appreciation by buying foreign currency.⁴⁷ As this measure was not sufficient, the bank and the government joined forces and established an FX consortium in 1926. The consortium operated between June 1926 and March 1928 and purchased foreign currency in a large scale, with the purpose of slowing down the krone appreciation and shield exporters. The balance of the FX consortium was not made explicit in the bank's official balance sheet for 1926, but information about the consortium's balance sheet was subsequently revealed in Norges Bank's annual report for 1927. These sources do not specify what assets the consortium purchased or in which currencies they were nominated. A table in an appendix to White paper 18 of 1927 shows that two thirds of the assets held by the consortium on 30 April 1927 were placed in sterling and the remaining third was placed in USD. We have here assumed that this currency distribution is representative for the two-year period the consortium operated.

By the end of 1927 many western countries had returned to the gold standard. Norway followed on 1 May 1928 when the convertibility of banknotes at the prewar gold parity was reintroduced and the export ban of gold was lifted (against other countries on the gold standard).⁴⁸ The reintroduction of the gold standard was short-lived, however. Britain suspended convertibility on September 20 1931

⁴⁴ See e.g. Chapter 7 in Eitrheim et al. (2016).

⁴⁵ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1916&paid=5&wid=a&psid=DIVL626&pgid=a.0351>

⁴⁶ By resolution of 28 April 1916 the bank was exempted from its obligation to purchase gold.

⁴⁷ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1929&paid=5&wid=a&psid=DIVL149&pgid=a.0137>

⁴⁸ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1929&paid=5&wid=a&psid=DIVL149&pgid=a.0133>

Norges Bank's foreign exchange reserves, 1818-2021

and Norway and the other Scandinavian countries followed Britain's example only a week later.⁴⁹ Convertibility of banknotes into gold was suspended by the royal decree of 27 September 1931, formally supported by an escape clause which had been added to §7 in the 1892 act in 1914, which opened for temporary suspension of convertibility during particularly dangerous circumstances without changing the legal status of the banknotes as legal tender. This suspension turned however out to be permanent and was effective until a revised Norges Bank Act was implemented from 1 September 1985 onwards.⁵⁰

When Britain left the gold standard money and credit markets stopped. By the end of September 1931 Norges Bank sent 27.2 million kroner in gold from its domestic vaults to increase its available reserves abroad. Norges Bank reacted to the turbulence by reducing its holdings of FX assets and instead the bank purchased gold which was kept abroad. The term used in the bank's annual reports for this was as holdings of *Temporary gold* abroad. *Temporary gold* was not part of the bank's metal fund, but could easily support the stock of banknotes in circulation by being shipped back to Norway, as was the case on some occasions in 1937 and 1938.^{51 52 53}

The Norwegian currency was in a managed float after losing its ties to gold in September 1931. A fixed target rate of NOK 19.90 per british pound sterling was adopted in June 1933,⁵⁴ although the bank never received a legal instruction to peg Norwegian kroner against British pounds at this rate (Petersen, 2012, p. 42 and p. 98).

At the end of 1933 the bank's deposits abroad amounted to only 2.9 million kroner. The previous time the bank's deposits abroad had been at a similar low level at year-end was in 1865. The bank had since 1931 had a preference for keeping temporary gold instead of bank deposits or sovereign bonds, but when gold prices were favorable in 1934, the bank used the opportunity to buy British pound sterling.⁵⁵

It was debated whether the rate of NOK 19.90 per pound was set too low. However, from mid-1934 and the next following years exports were high and together with capital inflows, this contributed to a large increase in Norges Banks foreign exchange reserves, cf. Petersen (1945, p. 10) and Rygg

⁴⁹ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1932&paid=5&wid=a&psid=DIVL223&pgid=a.0185>

⁵⁰ There were also other gold-related regulations in the 1892 act, which continued to exist but were in practise ignored after World War II. Examples are the regulations of the maximal issuance of notes, the penalty for overissuing notes and the statutes which said that the *banknote gold* had to be located in domestic vaults. It was this stock of close to 50 tons of *banknote gold* which was evacuated from Norges Bank's head office in Oslo in the morning hours of 9 April 1940 during the German attack. During World War II Norges Bank's gold reserves were kept in USA and Canada. A provisional regulation of 22 April 1940 stated that the bank could keep its gold outside occupied Norway. This regulation was removed when the war ended in 1945. Norges Bank kept most of its gold abroad in the postwar period, ignoring the 1892-statutes. Likewise, the penalty regulations remained unchanged and were ignored in the postwar period. These gold-related regulations were first removed when the Norges Bank Act was revised in 1985.

⁵¹ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1932&paid=5&wid=a&psid=DIVL223&pgid=a.0199>

⁵² <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1938&paid=5&wid=a&psid=DIVL246&pgid=a.0343>

⁵³ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1939&paid=5&wid=a&psid=DIVL326&pgid=a.0287>

⁵⁴ The exact date for the adoption of the fixed rate is unavailable (Alstadheim, 2016, p. 4).

⁵⁵ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1935&paid=5&wid=a&psid=DIVL231&pgid=a.0268>

3.5 Foreign reserves in five subperiods

(1950, p. 599-605). The banks reserves, excl. vault gold (the banknote gold), grew from NOK 32 million in 1933 to NOK 360 million in 1938. This enormous increase opened for additional areas in which the reserves could be made useful.

Norges Bank seems in the interwar years to have developed a skeptical view on the tendency of Norwegian institutions to increase their debt in foreign currency loans, as international credit markets were perceived to be volatile.⁵⁶ To help improve the control of the nation's foreign debt Norges Bank used of its own reserves to purchase foreign currency bonds issued by Norwegian institutions. These were FX claims on domestic sectors such as the central government, local governments (municipalities), financial institutions and firms, which had been placed in international markets. The director of Norges Bank at the time, Nicolai Rygg, viewed this as an important use of the bank's reserves and he stated in 1938: "A primary goal is to secure our future position, but another important task, not in conflict, is to contribute to reducing our foreign debt. Here is room for an effort from Norges Bank, as far as our means allows us".⁵⁷ Between 1936 and 1939 Norges Bank purchased foreign currency bonds issued by Norwegian institutions for approximately 90 million kroner, most of which were denominated in US dollars.

As a precautionary measure, the bank moved its entire currency portfolio to US dollars at the dawn of World War II in 1939 and the bank shipped gold with a total value of NOK 36.8 million abroad. What remained of gold reserves in the bank's vault were the 50 tons of *banknote gold*. These gold reserves were hastily evacuated in the morning hours of 9 April 1940 when the Germans attacked. After dramatic weeks the *banknote gold* arrived in UK, and was later transported to Canada and USA. A royal decree of 29 October 1940 let the Norwegian exile government in London take control of the part of Norges Bank's FX reserves which were kept at the Federal Reserve Bank of New York. The purpose of this transfer was to avoid any legal issues in the US regarding entitlement to these reserves. Norges Bank and the government stated in a repurchase agreement that within 3 years after the war the government would return the gold to Norges Bank ounce for ounce, and the other FX assets (bills of exchange, bonds and bank deposits) would be returned dollar for dollar together with 2 percent accrued interest.⁵⁸

On 6 July 1940 the government approved a revaluation of Norges Bank's gold. The gold was to be valued at 4 960 NOK per kilo gold compared to 2 480 NOK per kilo gold before. With this revaluation gold was booked with a value of 240 NOK million in 1940, instead of NOK 120 million with the previous gold rate. The currency gain was distributed between the government and Norges Bank, with 4/5 going to the government.⁵⁹

⁵⁶ See for example governor Nicolai Rygg's annual speeches to the Supervisory Council in 1936, 1937 and 1938.

⁵⁷ Nicolai Rygg's annual speech to the Supervisory Council in February 1938 [translated by the authors].

⁵⁸ https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1945-46&paid=5&wid=a&psid=DIVL226&pgid=a_0840&vt=a&did=DIVL382

⁵⁹ https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1945-46&paid=5&wid=a&psid=DIVL226&pgid=a_0744&vt=a&did=DIVL382

The Bretton Woods era

After World War II Norges Bank chose a reserve composition that took into considerations factors such as safety, liquidity, returns and the interest of Norway's industries. Compared with the years prior to World War II and also compared with other countries after the war, gold represented a small component of the foreign reserves.⁶⁰ The composition of the bank's foreign reserves shifted after World War II. A higher share was placed in interest bearing assets and less of the reserves were made up of gold.

On December 21 1946 the government returned the assets that temporarily had been transferred to the government. Two days later, on December 23 1946, the government also transferred to Norges Bank foreign currency reserves that the government had built up during the war (mostly related to Nortraship). The second transfer contributed heavily to the increase of almost NOK 700 million in the bank's foreign reserves between 1945 and 1946 and similarly to the increase in the government's deposits with Norges Bank.⁶¹

Norway observed substantial trade deficits for a long period after World War II. For the years 1945-1947, these deficits drained the bank's foreign reserves, leading up to the currency crisis in 1947. For the subsequent years the deficit was financed through loans, the Marshall aid and by drawing on credit facilities, which entered the bank's balance sheet as clearing debt and debt to the European Payment Union.⁶² For the years from 1954 to 1965 huge capital inflows (Norwegian institutions borrowing abroad, mostly in USD) ensured an increase in Norges Bank's foreign reserves, despite the huge trade deficits.⁶³

In 1947 Norges Bank's note foundation gold was reduced from about NOK 240 million to about NOK 185 million. The difference was used to pay for Norway's quota in IMF (25 % of the drawing rights were paid for in gold). Similarly, in 1959 and 1966 when the quota was increased, the gold reserves were further reduced by NOK 55 million respectively. Gold was sold to the government who then paid IMF for the quota increase.⁶⁴

By the Storting decision of 23 May 1969, Norges Bank became responsible for the relations with IMF, a responsibility which previously had vested with the state.⁶⁵ The transfer resulted in IMF assets and liabilities being transferred to the accounts of Norges Bank, and as compensation the government was credited about NOK 521.9 million. Norway's quota in IMF was recorded among the bank's assets (about NOK 1 071 million) while IMF's NOK inventory (about NOK 450 million) was recorded as a liability (see chapter 2 for details on how IMF assets and liabilities are accounted for here).

⁶⁰ Getz Wold (1972)

⁶¹ See Norges Bank annual report 1946 (page 99) and 1948 (page 9).

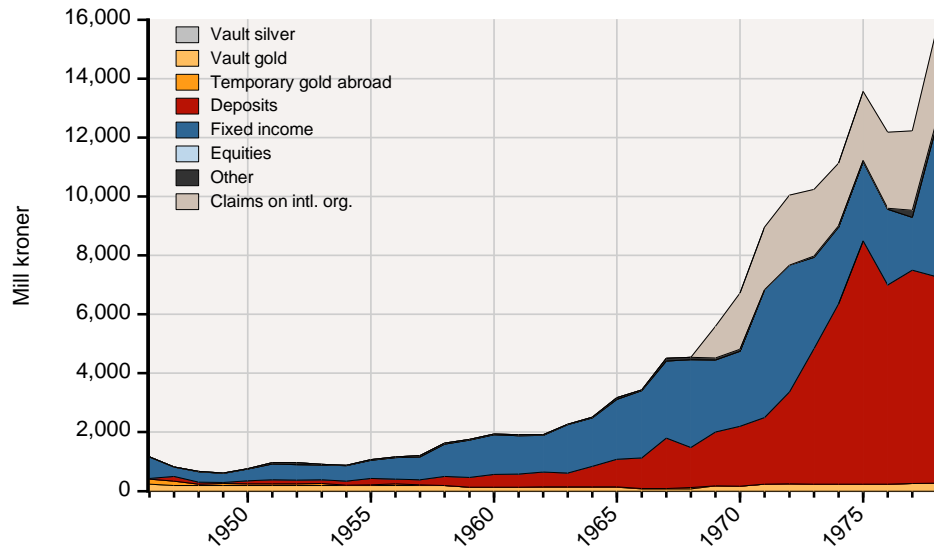
⁶² See the bank's balance sheet in Chapter 2

⁶³ See Norges Bank annual report 1959 (page 67) and 1965 (page 73).

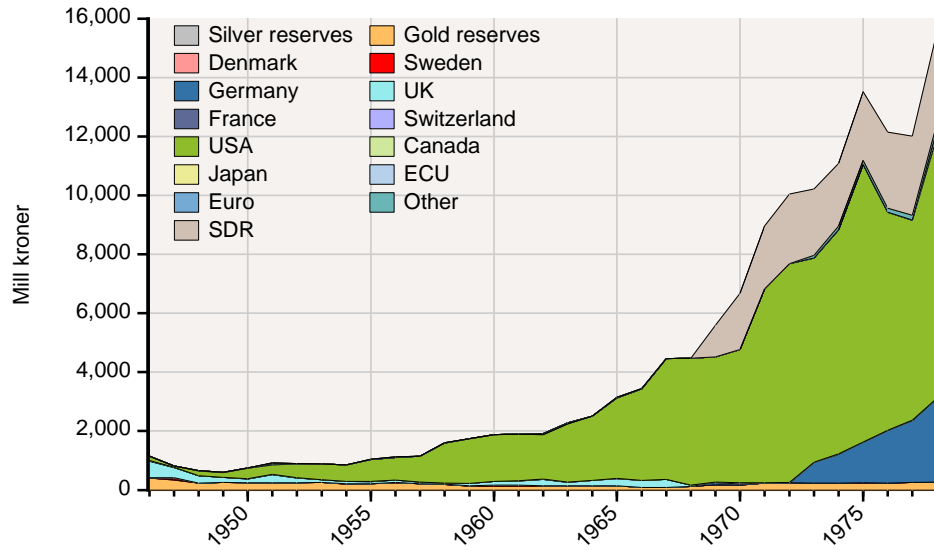
⁶⁴ Norges Bank annual report 1948 (page 116), 1959 (page 106) and 1966 (page 123).

⁶⁵ https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandling/Lesevisning/?p=1968-69&paid=7&wid=a&psid=DIVL973&pgid=c_0794

3.5 Foreign reserves in five subperiods



(a) By instrument



(b) By currency

Figure 3.10 Norges Bank's holdings of gold and FX reserves, 1946-1978.

Norges Bank's foreign exchange reserves, 1818-2021

Between 1931 and 1968 Norges Bank's balance sheet distinguished between the gold that previously had been part of the banknote foundation (*banknote gold*) and the gold that was part of the foreign exchange reserves (*temporary gold*). Whereas the *banknote gold* was valued at NOK 4 960 per kilo gold, *temporary gold* was valued at market prices of gold. After Norges Bank had been given responsibility for managing relations with IMF from 1969 onwards, it was convenient to combine the gold reserves and to account for all gold on the bank's balance sheet in a unified way. As a result, the *banknote gold* was written up. The total value of the bank's gold reserves in 1969 was NOK 180 million, compared with NOK 123 million the year before. A part of the gold reserves (NOK 13.1 million) was also used to pay for an additional increase in the IMF quota in 1969, which in turn increased Norges Bank's claim on IMF.

Between 1977 and 1979 IMF returned part of the gold that its members had paid in. For these years, this contributed to increase Norges Bank's gold reserves. During the latter part of the 1960's and much of the 1970's, currency fluctuations affected greatly the composition of the bank's reserves and their NOK book value.

On November 18 1967 the government of Britain devalued GBP from a par value towards USD of 2.8 to a new parity of 2.4 USD per GBP. Following the devaluation, Norges Bank reduced its GBP deposits to a bare minimum. In December 1967 Norges Bank had deposits in GBP worth NOK 276.2 million which in December the following year had been reduced to NOK 38 million.⁶⁶ In December 1969 Norges Bank's claim in GBP was only NOK 2.8 million. Similarly, the USD share of foreign reserves (excl. gold) increased from 1967 to 1971 from 93.4 to 99.8 percent. The travails of Britain continued into 1968 and the increase in temporary gold in 1968 of 39.3 million was a result of Britain and France borrowing from the IMF stand-by arrangement. Part of Norway's contribution was settled by IMF purchasing NOK against gold.

In the anticipation of a devaluation of USD in 1971, Norwegian banks and firms sold their USD deposits to Norges Bank, who in turn increased the liquidity provision of NOK. In the first two weeks of August alone, Norges Bank bought USD for about NOK 722 million. Most of the reserves were placed in bonds and short-term interest bearing assets. Until August 15 1971, when President Nixon suspended the conversion of USD at a fixed price to gold, Norges Bank had sought to keep the NOK USD rate stable through market interventions. With the suspension of gold convertibility Norges Bank instead sought to keep NOK stable against a basket of currencies. In the G-10 meeting of December 1971 it was agreed to restore a fixed exchange rate regime and to depreciate USD against gold.

The so called "Norway Scheme" illustrates how the reserves were used to serve the interest of the mechanical engineering industry. The episode is described in more detail in Lie et al. (2016, pp. 349-351) and Lie (2020, p. 204). Norges Bank accepted low returns on deposits with some foreign banks (notably Hambro's Bank in London), who in turn gave cheaper loans to ship owners (Norwegian and foreign) who ordered ships from Norwegian wharfs. The scheme began in 1965 and the last repayment was made in 1982. The arrangement was criticized for granting hidden subsidies

⁶⁶ Norges Bank annual report 1967, page 16

3.5 Foreign reserves in five subperiods

to Norwegian wharfs through this arrangement, which was hardly a transparent way to conduct fiscal policy and it was afterwards questioned if Stortinget had been given sufficient information.

Another factor which affected the currency composition of Norges Bank's international reserves after World War II was government borrowing. When the government borrowed abroad, Norges Bank would often receive the foreign currency and credit the government's deposit account in kroner. One example is when government borrowing in Japanese Yen started in 1978. That year we can also observe a significant increase in Norges Bank's holdings of JPY (see Table 3.A.3). The increased diversification of the bank's currency holdings in the 1970's reflects in particular larger holdings of German mark from 1973 onwards after the collapse in the Bretton Woods regime (Figure 3.10(b)). From the mid-1970s onwards the government also increased its borrowing in US dollar and in European currencies. Chapter 6 provides a broad overview of central government debt across more than two centuries and its borrowing in foreign currencies, see Section 6.6 and Appendix 6.A. Table 6.A.8 shows how the foreign debt is distributed across different currencies and 6.A.9 provides an overview of the currency distribution of new foreign debt from 1946 onwards.

The post-Bretton Woods era. Introduction of portfolios.

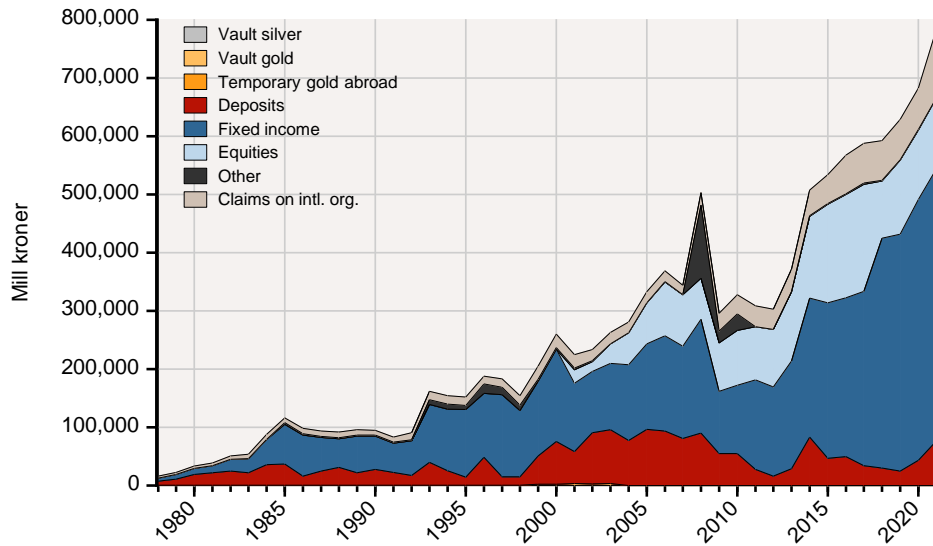
The experiences with fluctuating currency rates in the 1970's affected the structure of the bank's FX reserves. Up to a certain threshold Norges Bank placed its reserves in liquid assets that could be readily available for intervention purposes. For this component returns were given a lower priority than liquidity, and the USD bond market was thus particularly attractive given the market size. For the part of the reserves that exceeded the need for intervention, the bank placed higher weight on return and less on liquidity, but ensured that the assets had a termination structure that ensured that a part of this component was available at all times.⁶⁷

Between 1979 and 1985 Norges Bank's reserves expanded more than 5-fold, from about NOK 22 billion to NOK 116 billion. Several factors contributed to this huge increase. Compared with the years 1946-1978, when Norway mostly ran a trade deficit, Norway's trade balance for the most part showed a surplus for all years following 1979 (except for the years 1985-1988). Also contributing were Norges Bank's market interventions. A new factor contributing to increasing the bank's reserves were oil taxes paid from petroleum companies operating in Norway. In October 1980 tax payments from oil companies alone contributed 5.8 billion to the bank's foreign reserves.⁶⁸

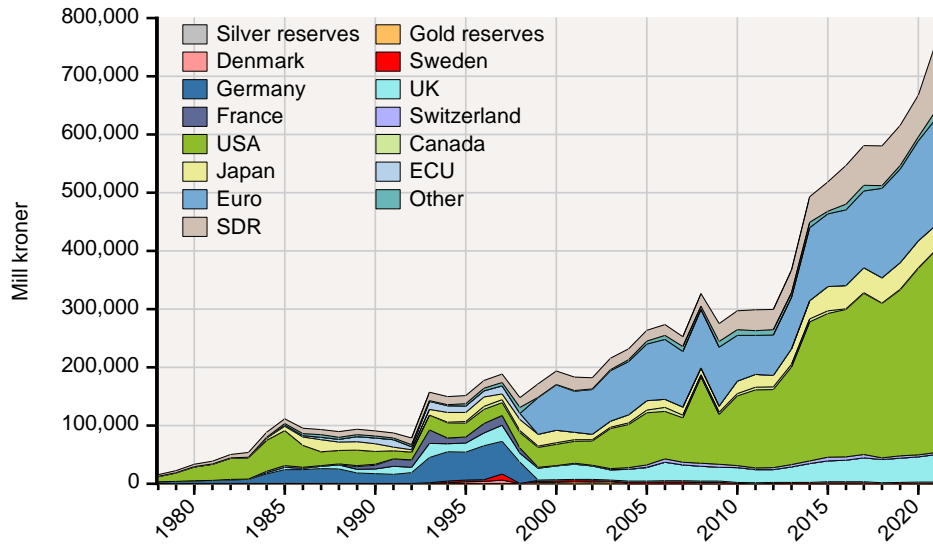
⁶⁷ See Norges Bank annual report 1979, pages 48-49.

⁶⁸ See for example Norges Bank annual report 1980, page 48.

Norges Bank's foreign exchange reserves, 1818-2021



(a) By instrument



(b) By currency

Figure 3.11 Norges Bank's holdings of gold and FX reserves, 1978-2021

3.5 Foreign reserves in five subperiods

As the reserves grew to much higher levels than what was needed for intervention purposes, the Ministry of Finance and Norges Bank in 1985 agreed on a set of revised principles for Norges Bank's management of the country's foreign reserves. The revised guidelines stated that the official level of foreign exchange reserves, for which liquidity concerns would be of most importance, should correspond to four months of imports plus a corresponding share of the annual current account deficit stemming from the balance of interest, dividends and transfers. For reserves in excess of this level, more weight would be placed on traditional risk-return considerations. These guidelines were consistent with the government's views stated in the national budget and would be subject to dialogue with the Ministry of Finance on an annual basis.⁶⁹

According to the agreement the reserves were to be divided into the following three tranches:

- The first tranche was referred to as "foreign exchange reserves" and contained only safe and highly liquid assets. The purpose of the tranche was to fulfill the traditional role of reserves; to settle international transactions and support the NOK exchange rate through interventions when necessary. The targeted size of this tranche corresponded to a level which should cover four months of imports.
- A second tranche called "other foreign reserves" consisted of secure but more long-term investments. For this tranche more weight was put on returns than on liquidity.
- A third tranche consisted of foreign currency deposits in Norwegian banks. The intention was that Norwegian banks could receive deposits from Norges Bank and use these to lend to Norwegian firms established abroad. The rates Norges Bank would receive should correspond to the rates Norges Bank received on its deposits with foreign banks, so these deposits were not intended as a means to subsidize Norwegian firms.⁷⁰

Tides turned in 1985 and instead of increasing, the bank's reserves declined. The arrangement whereby Norges Bank deposited reserves with Norwegian banks was therefore short-lived, and was terminated after an agreement between Norges Bank and the Ministry of Finance during the spring of 1986.⁷¹ These deposits had a value of NOK 3.8 billion at year-end 1985, corresponding to around 10 percent of all FX deposits this year, NOK 0.8 billion in 1986 and 0 thereafter.

The distinction between "foreign exchange reserves" and "other foreign reserves" was short-lived too. Already in the annual report for 1987 a more traditional definition of international reserves had replaced this attempt to tie the term "foreign exchange reserves" explicitly to a particular target level.

To reduce currency risk Norges Bank began to diversify its currency portfolio in the mid 1980's. This led to more of the reserves being placed in DEM, Yen, CHF, GBP and ECU.⁷²

In 1989 an amendment was made to the central bank act specifying that Norges Bank shall invest

⁶⁹ Letter to the Ministry of Finance 4 December 1985 (appendix C in NB 1985). See also Ranberg (1985). The explicit target for foreign exchange reserves which related this concept to a level corresponding to four months of import was short-lived and the bank returned to using traditional definitions of international reserves already in 1987.

⁷⁰ See Attachment 16 to Storting Proposition No. 1 (1984-85)
<https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1984-85&paid=1&wid=c&psid=DIVL1979&s=True&pgid=c.1126>

⁷¹ See Circular from Norges Bank No. 18, 30 May 1986 (published in an appendix to Norges Bank's annual report for 1986)

⁷² See Norges Bank's annual report for 1986, page 68.

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the official foreign exchange reserves with a view to maintaining the foreign exchange policy that has been established. In the 1990's the Executive Board continued the process with annual revisions of its guidelines for managing FX reserves. The revised guidelines were approved by the Ministry of Finance.⁷³

From 1994 onwards the reserves were divided into three portfolios according to their intended purpose. A significant part of the bank's reserves in the early 1990s originated from the government's foreign borrowing. To reduce exchange rate and interest rate exposure, a hedging portfolio was established as the *immunization portfolio*, with a currency composition and maturity which matched that of the government's foreign debt. Exchange rate losses (gains) on the immunization portfolio were offset by exchange rate gains (losses) on the government debt. The establishment of the hedging portfolio affected the currency composition of the reserves, leading to a reduction in GBP and FRF and an increase in DEM, JPY and USD.⁷⁴

The remaining foreign exchange reserves were organized in a *liquidity portfolio* and an *investment portfolio*. The *liquidity portfolio* was primarily constructed for intervention purposes and the *investment portfolio*, which was less liquid and had higher duration, for generating return.⁷⁵

We will now look in more detail at the historical data we have collected for these portfolios. Figure 3.12 shows the development in Norges Bank's foreign reserve portfolios in the period 1985-2021. Unfortunately, we can only separate out data for the *immunization portfolio* for the years 1994-1998. The residual reserves are therefore reported jointly as *liquidity and investment portfolio* in Figure 3.12 prior to 1999.

In 1998 new guidelines for the management of the bank's FX reserves were adopted.⁷⁶ The official reserves were now divided between four portfolios, the three we have already mentioned above plus a *buffer portfolio* for the pension fund. The *buffer portfolio* receives income from the government's direct financial interests in oil related activities on an ongoing basis, and in the beginning funds were channeled from the buffer portfolio to the pension fund each quarter. This was later changed to take place on a monthly basis. The aim of the *buffer portfolio* is to reduce the transaction costs associated with transfers to or from the Government Pension Fund Global (GPF). The sign of transfer depends on the magnitude of the budget deficit relative to the inflow of government petroleum revenues. Instead of a first-line and a second-line reserve, the *investment portfolio* was rearranged into a *liquidity portfolio* and a *long-term portfolio*. The former was intended for intervention purposes (its size was initially set to 30 billion NOK), and the latter to generate return.

In 2000 it was decided that a part of the long-term portfolio should be invested in equities and

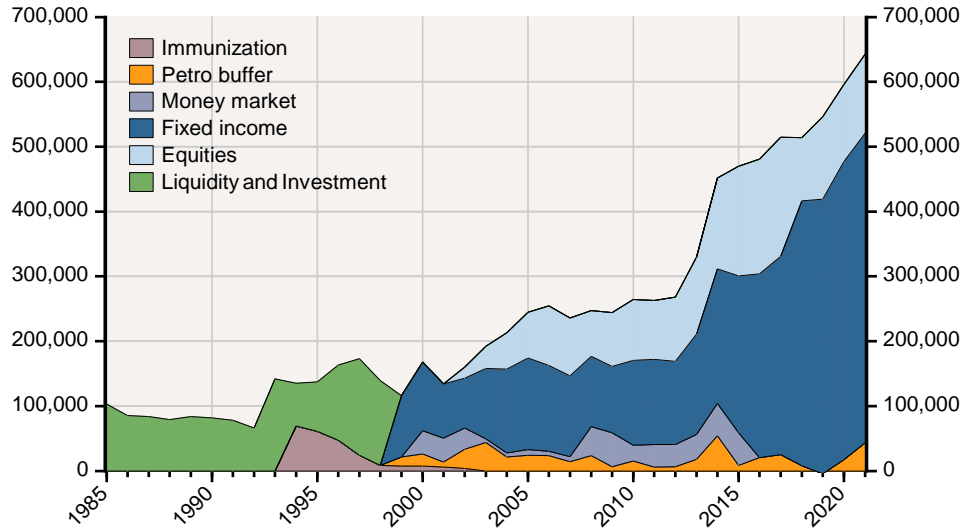
⁷³ See for example Norges Bank's annual report for 1994, page 42.

⁷⁴ The operational principles and implementation of the *immunization portfolio* is explained in some detail in Eide (1994). There seems to be a resemblance here to what Nicolai Rygg did in the late 1930s in order to reduce uncertainty on behalf of the indebted sectors. However, a main difference was that whereas Rygg used Norges Bank's balance sheet and bought back a portfolio of foreign currency debt issued by Norwegian sectors, the bank in this case only used the currency composition of its FX reserves in order to produce a hedge against foreign currency risk in the central government's foreign debt. A counter item on the liability side of Norges Bank's balance sheet was defined as the government's foreign debt account.

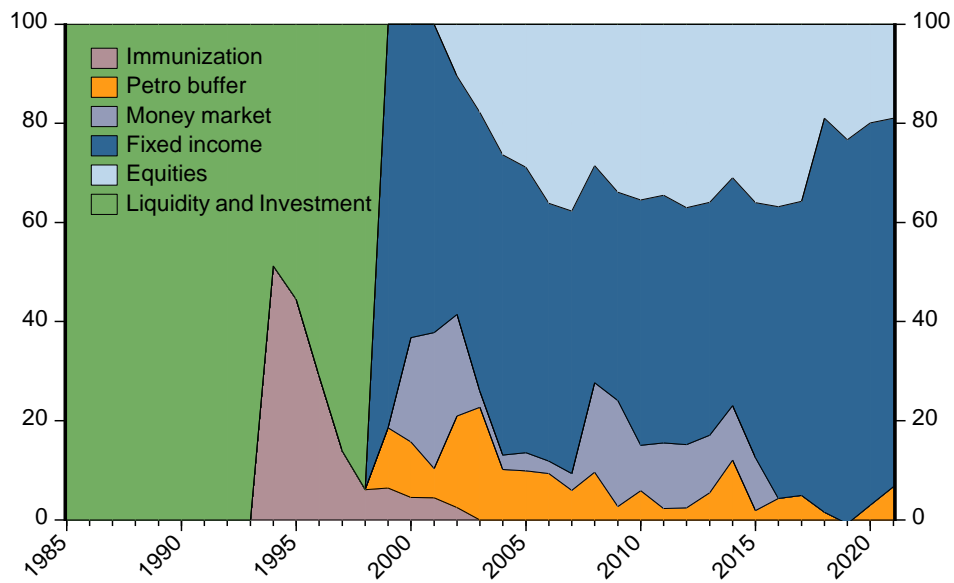
⁷⁵ See Norges Bank's annual reports for 1994 (page 28-29), 1995 (page 15) and 1996 (page 10).

⁷⁶ See Norges Bank's annual report for 1998, page 14.

3.5 Foreign reserves in five subperiods



(a) Foreign reserve portfolios (in million kroner), 1985-2021



(b) Foreign reserve portfolios (percentage shares), 1985-2021

Figure 3.12

during the first half of 2001 the equity share rose from 0 to 20 percent.⁷⁷ From 2001 onwards we

⁷⁷ See Norges Bank's annual report for 2001, page 37.

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have separate data for the *equity portfolio* and the *fixed-income portfolio*. In 2002 the Executive Board increased the strategic equity share, in 2004 to 30 percent, later in 2006 to 40 percent.

The guidelines were changed again in 2003. The *immunization portfolio* ceased to exist as the government had brought its foreign debt down to zero. The *liquidity portfolio* was reduced to 5 billion NOK and its name changed and was subsequently referred to as a *money market portfolio*, reflecting that the portfolio only consisted of short-term money market instruments. The remaining part was transferred to the long-term portfolio.⁷⁸

In 2008, following market turbulence triggered by the global financial crisis, Norges Bank entered into a swap agreement with Federal Reserve Bank, whereby Norges Bank borrowed USD 8.2 billion from the Federal Reserve Bank (NOK 57.6 billion). The USD was lent to Norwegian banks against security. The facility was terminated during 2009. The arrangement is accounted for in 2008 as *Domestic FX* deposits in domestic banks. Another crisis measure in 2008 was to increase the *money market portfolio* by a transfer of resources from the *fixed-income portfolio*. In 2017 the Executive Board reduced the strategic equity share from 40 percent to 35 percent, and from 2018 onwards the equity share has been 20 percent. These changes are shown in Figure 3.12(b).

There were also a couple of changes in the management of the bank's gold portfolio in the late 20th century and early 21th century worth noting. Since 1992 Norges Bank have received returns on gold from a lending program for gold bars to customers through international banks. The gold bars eligible for this lending program were prepared to satisfy the requirements set for "good delivery bars". In 1999 the Executive Board decided to change the valuation of gold and introduced mark-to-market evaluation. In previous years between 1973 and 1998 gold had been valued at 1973 cost prices. This resulted in a 7-fold increase in the book value of the banks gold in 1999. Second, in the fall of 2003 the board decided to sell the banks entire gold stock (less the gold coins and a few gold bars). The selling of gold was effectuated in the first quarter of 2004 and marked an end of the precious metals era in the history of Norges Banks foreign exchange reserves.⁷⁹

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⁷⁸ See Norges Bank's annual report for 2003, page 68. A more comprehensive discussion of strategic allocation of foreign exchange reserves is provided in Norges Bank (2004).

⁷⁹ See Norges Bank annual report 1999, page 44 and 2004, page 10.

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3.A Appendix, Norges Bank's foreign exchange reserves

Figure 3.13 shows a comparison of the aggregated sum of currency distributed FX reserves with *Gross FX reserves* and *Net FX reserves* defined in Section 3.3. We note that this sum generally matches *Gross FX reserves* better than *Net FX reserves* before 1992.

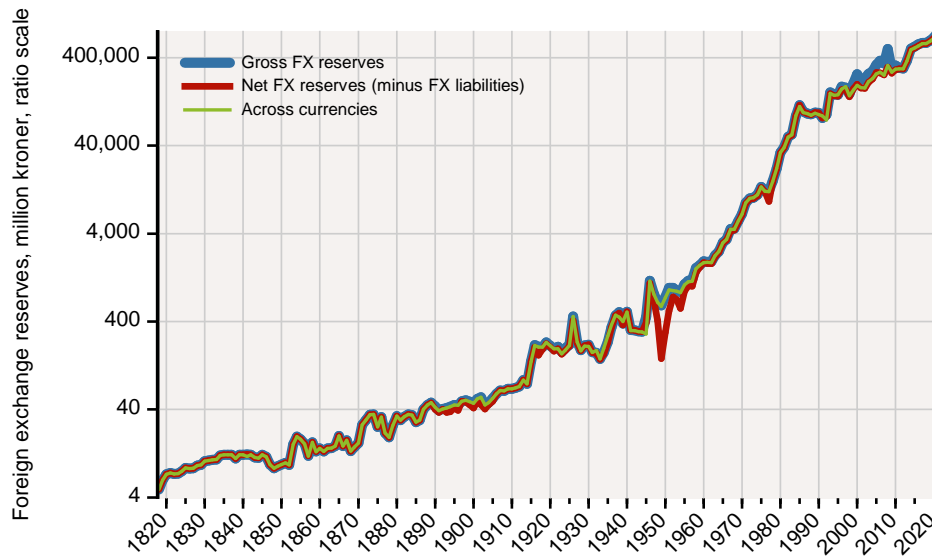


Figure 3.13 The aggregated sum of currency distributed FX reserves compared with Gross FX reserves and Net FX reserves, logarithmic ratio scale.

Data for the currency distribution are collected from different sources in different time periods (see Table 3.2 on page 134). The currencies for which we have reported reserve positions in Table 3.A.3 below (in percentage shares), have been selected to show the main changes and transitions in the currency composition of Norges Bank's foreign exchange reserve management over the past two centuries. We have also included silver and gold reserves in this overview.

Table 3.A.1: Norges Bank's foreign exchange reserves, asset allocation 1819-1876, in speciedaler

Year	Total FX reserves	<i>Metal reserves</i>		<i>FX assets</i>			
		Vault silver	Vault gold	FX deposits	FX fixed income	FX equities	FX other assets
1817							
1818	1 233 078	1 233 078					
1819	1 571 144	1 571 144					
1820	1 825 625	1 825 625					
1821	1 893 977	1 893 977					
1822	1 852 755	1 852 755					
1823	1 853 642	1 853 642					
1824	1 985 285	1 985 285					
1825	2 154 569	2 154 569					
1826	2 126 389	2 126 389					
1827	2 147 547	2 147 547					
1828	2 302 922	2 302 922					
1829	2 333 409	2 333 409					
1830	2 569 344	2 569 344					
1831	2 618 170	2 618 170					
1832	2 670 473	2 670 473					
1833	2 684 117	2 684 117					
1834	3 005 199	3 005 199					
1835	3 057 398	3 057 398					
1836	3 054 217	3 054 217					
1837	3 038 069	3 038 069					
1838	2 760 815	2 760 815					
1839	3 047 098	3 047 098					
1840	3 042 157	2 927 210		114 947			
1841	3 076 625	2 787 563		289 062			
1842	3 051 650	2 878 571		173 079			
1843	2 838 520	2 432 503		406 017			
1844	2 822 335	2 178 066		604 816	39 453		
1845	3 047 136	2 216 528		830 608			
1846	2 884 368	2 206 820		677 548			
1847	2 360 315	2 152 690		207 625			
1848	2 133 845	1 337 790		796 055			
1849	2 258 686	1 833 972		424 714			
1850	2 366 829	1 936 743		430 086			
1851	2 475 235	2 021 280		453 955			

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.A.1: Norges Bank's foreign exchange reserves, asset allocation 1819-1876, in speciedaler

Year	Total FX reserves	<i>Metal reserves</i>		<i>FX assets</i>			
		Vault silver	Vault gold	FX deposits	FX fixed income	FX equities	FX other assets
1852	2 331 695	1 952 580		379 115			
1853	4 023 223	2 430 729		1 570 715	21 779		
1854	4 924 149	2 192 096		2 723 592	8 461		
1855	4 591 004	2 204 047		2 373 891	13 066		
1856	4 085 779	2 963 922		1 091 414	30 443		
1857	2 964 498	2 086 778		868 620	9 100		0.158
1858	4 208 944	2 985 864		1 221 455	1 625		0.333
1859	3 319 485	2 490 820		822 661	6 004		0.150
1860	3 615 277	2 480 360		1 134 918			
1861	3 322 459	2 188 948		1 133 511			
1862	3 594 885	2 544 588		1 050 298			
1863	3 639 825	2 961 195		678 630			
1864	3 827 894	3 075 052		752 842			
1865	5 005 152	4 143 900		861 253			
1866	3 848 199	3 180 060		668 140			
1867	4 462 894	3 706 896		755 999			
1868	3 372 890	2 971 322		401 568			
1869	3 748 177	2 965 305		782 872			
1870	4 152 110	3 101 394		1 050 716			
1871	6 685 002	4 498 337		2 186 665			
1872	7 561 310	4 669 756	492 970	2 398 583			
1873	8 677 767	908 455	3 958 479	3 810 833			
1874	8 749 077	214 216	5 006 028	3 528 832			
1875	6 315 556	44 796	3 645 161	2 625 599			
1876	8 146 845	54 950	5 565 813	2 526 082			

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1818	4.932	4.932							
1819	6.285	6.285							
1820	7.303	7.303							
1821	7.576	7.576							
1822	7.411	7.411							
1823	7.415	7.415							
1824	7.941	7.941							
1825	8.618	8.618							
1826	8.506	8.506							
1827	8.590	8.590							
1828	9.212	9.212							
1829	9.334	9.334							
1830	10.277	10.277							
1831	10.473	10.473							
1832	10.682	10.682							
1833	10.736	10.736							
1834	12.021	12.021							
1835	12.230	12.230							
1836	12.217	12.217							
1837	12.152	12.152							
1838	11.043	11.043							
1839	12.188	12.188							
1840	12.169	11.709			0.460				
1841	12.306	11.150			1.156				
1842	12.207	11.514			0.692				
1843	11.354	9.730			1.624				
1844	11.289	8.712			2.419	0.158			
1845	12.189	8.866			3.322				
1846	11.537	8.827			2.710				
1847	9.441	8.611			0.830				
1848	8.535	5.351			3.184				
1849	9.035	7.336			1.699				
1850	9.467	7.747			1.720				

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1851	9.901	8.085			1.816				
1852	9.327	7.810			1.516				
1853	16.093	9.723			6.283	0.087			
1854	19.697	8.768			10.894	0.034			
1855	18.364	8.816			9.496	0.052			
1856	16.343	11.856			4.366	0.122			
1857	11.858	8.347			3.474	0.036			
1858	16.836	11.943			4.886	0.006			
1859	13.278	9.963			3.291	0.024			
1860	14.461	9.921			4.540				
1861	13.290	8.756			4.534				
1862	14.380	10.178			4.201				
1863	14.559	11.845			2.715				
1864	15.312	12.300			3.011				
1865	20.021	16.576			3.445				
1866	15.393	12.720			2.673				
1867	17.852	14.828			3.024				
1868	13.492	11.885			1.606				
1869	14.993	11.861			3.131				
1870	16.608	12.406			4.203				
1871	26.740	17.993			8.747				
1872	30.245	18.679	1.972		9.594				
1873	34.711	3.634	15.834		15.243				
1874	34.996	0.857	20.024		14.115				
1875	25.262	0.179	14.581		10.502				
1876	32.587	0.220	22.263		10.104				
1877	21.701		14.813		6.887				
1878	19.215		13.220		5.995				
1879	26.350		17.976		8.374				
1880	33.721		23.391		10.331				
1881	30.134		21.356		8.771				
1882	33.067		22.606		10.461				
1883	35.065		23.291		11.774				

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1884	34.481		23.403		11.077				
1885	28.676		19.408		9.268				
1886	30.256		20.176		10.080				
1887	40.246		28.012		11.997	0.237			
1888	44.962		28.689		16.174	0.099			
1889	47.832		31.894		15.766	0.171			
1890	43.385		30.161		11.974	1.251			
1891	39.097		26.938		10.281	1.877			
1892	40.588		27.022		12.932	0.634			
1893	41.673		27.267		9.810	4.595			
1894	42.845		27.628		11.098	4.118			
1895	44.986		28.096		12.229	4.660			
1896	44.549		28.543		11.884	4.122			
1897	49.683		28.979		18.628	2.075			
1898	50.648		32.156		14.012	4.481			
1899	48.927		32.223		13.668	3.036			
1900	47.018		29.087		12.737	5.195			
1901	52.799		30.543		13.317	8.939			
1902	54.938		30.760		12.464	11.714			
1903	44.991		24.986		11.371	8.634			
1904	47.697		25.279		13.854	8.563			
1905	53.577		28.273		13.442	11.861			
1906	60.335		31.059		15.598	13.677			
1907	65.427		27.368		21.084	16.975			
1908	64.814		29.332		18.924	16.558			
1909	68.739		30.294		20.013	18.432			
1910	68.826		34.163		20.770	13.893			
1911	70.207		38.268		22.118	9.821			
1912	72.948		38.572		23.585	10.792			
1913	86.056		44.374		29.828	11.854			
1914	78.541		38.394		31.210	8.937			
1915	140.840		51.630		79.163	7.123		2.925	
1916	215.238		123.236		82.295	6.540		3.167	

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1917	206.055		116.393		80.286	8.712		0.665	
1918	204.038		121.980		73.016	8.801		0.241	
1919	230.847		147.724		76.194	6.815		0.115	
1920	211.971		147.284		58.295	6.353		0.040	
1921	196.246		147.292		42.452	6.491		0.010	
1922	206.877		147.291		41.829	6.274		11.483	
1923	180.686		147.285		18.309	5.709		9.383	
1924	199.541		147.226		36.918	5.660		9.737	
1925	218.612		147.225		55.514	10.102		5.771	
1926	454.839		147.227		45.321	260.276		2.015	
1927	233.561		147.232		27.067	59.236		0.026	
1928	189.271		146.875		27.710	11.982		2.705	
1929	213.943		146.654		31.243	34.758		1.288	
1930	218.635		146.427		24.108	43.863		4.236	
1931	179.234		118.076	37.006	11.683	6.685		5.785	
1932	176.865		118.246	25.996	24.013	2.345		6.265	
1933	150.666		118.326	25.031	2.943	1.524		2.026	0.816
1934	177.807		118.484	16.377	37.882	2.324		1.816	0.924
1935	233.876		118.843	66.287	36.080	11.358		0.023	1.285
1936	344.497		118.856	96.211	96.139	31.426		0.027	1.838
1937	470.347		135.273	44.907	114.385	175.763		0.019	
1938	512.715		152.764	53.550	105.467	189.157		11.778	
1939	377.756		120.051	86.646	77.054	86.048		7.957	
1940	517.569		240.000	90.591	89.496	92.253		2.730	2.500
1941	319.858		240.000	14.235	38.305	21.323		3.495	2.500
1942	317.445		240.000	13.805	42.467	16.135		2.538	2.500
1943	309.614		240.000	13.747	35.873	14.752		2.743	2.500
1944	305.989		240.000	13.530	34.276	13.254		2.430	2.500
1945	451.157		240.000	116.135	94.023	0.081		0.918	
1946	1 159.136		239.822	166.241	16.496	736.296		0.281	
1947	820.878		184.744	147.798	168.714	319.322		0.300	
1948	668.991		184.749	48.084	69.804	356.619		9.735	
1949	609.601		184.750	67.853	39.521	302.945		14.532	

3.A Appendix, Norges Bank's foreign exchange reserves

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1950	760.336		184.751	58.409	394.439	110.153		12.585	
1951	962.654		184.751	57.513	667.709	7.283		45.396	
1952	962.777		184.751	57.862	639.464	17.979		62.721	
1953	903.477		184.750	70.555	600.836	29.604		17.732	
1954	869.197		184.750	18.139	548.881	106.329		11.098	
1955	1 066.827		184.750	23.905	222.626	614.184		21.362	
1956	1 162.209		184.750	59.693	155.383	733.083		29.300	
1957	1 201.714		184.750	21.681	179.734	774.085		41.465	
1958	1 622.812		184.750	6.829	308.987	1 087.423		34.823	
1959	1 749.628		129.613	6.941	330.008	1 261.572		21.494	
1960	1 939.187		129.613	6.038	432.089	1 350.102		21.345	
1961	1 907.916		129.613	6.960	435.144	1 305.869		30.330	
1962	1 912.337		129.613	7.578	512.576	1 242.396		20.173	
1963	2 269.447		129.613	8.256	476.969	1 640.342		14.267	
1964	2 504.448		129.613	8.919	699.818	1 651.206		14.893	
1965	3 163.973		129.613	9.593	942.206	2 025.805		56.756	
1966	3 432.834		74.515	9.675	1 035.175	2 288.339		25.130	
1967	4 503.498		74.515	9.725	1 712.708	2 621.131		85.419	
1968	4 534.147		74.515	49.028	1 354.206	2 978.863		77.536	
1969	5 591.462		180.637		1 822.344	2 447.611		69.441	1 071.429
1970	6 725.566		167.441		2 028.142	2 555.210		66.203	1 908.570
1971	8 963.882		239.249		2 254.820	4 342.058		0.000	2 127.755
1972	10 038.795		247.225		3 119.131	4 298.252		8.773	2 365.414
1973	10 234.163		235.390		4 602.053	3 092.677		50.308	2 253.735
1974	11 123.796		235.390		6 115.715	2 611.327		44.603	2 116.761
1975	13 556.426		235.390		8 253.587	2 694.500		35.001	2 337.948
1976	12 177.349		235.390		6 762.118	2 563.875		35.001	2 580.965
1977	12 221.000		260.090		7 233.486	1 793.734		247.775	2 685.915
1978	15 751.944		272.000		6 993.807	5 211.089		172.786	3 102.262
1979	22 144.304		285.000		10 593.626	7 881.393		134.981	3 249.304
1980	33 381.779		285.000		18 680.804	9 977.115		135.424	4 303.436
1981	38 476.719		285.000		21 579.603	11 951.504		135.454	4 525.158
1982	50 474.602		285.000		24 274.494	20 061.353		134.555	5 719.200

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	Metal reserves (silver and gold)			FX assets + Domestic FX claims (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
1983	53 707.000		285.000		21 412.879	24 185.890		112.231	7 711.000
1984	87 570.100		285.000		35 463.586	43 156.579		103.835	8 561.100
1985	115 733.400		285.000		36 446.986	68 342.579		2 696.435	7 962.400
1986	97 847.500		285.000		15 655.000	70 631.800		2 029.200	9 246.500
1987	93 115.200		285.000		24 024.896	58 103.656		1 774.448	8 927.200
1988	91 468.000		285.000		30 570.197	49 398.245		1 610.558	9 604.000
1989	95 633.032		284.788		21 275.385	63 311.936		1 620.426	9 140.497
1990	94 797.433		284.788		27 053.973	57 362.647		1 450.761	8 645.264
1991	82 999.194		284.788		22 089.099	50 126.307		1 707.203	8 791.797
1992	90 550.170		284.788		16 851.799	59 647.928		1 669.590	12 096.065
1993	161 687.758		284.821		39 072.292	99 864.786		7 661.391	14 804.468
1994	153 865.092		284.822		24 574.236	105 793.912		8 944.028	14 268.094
1995	151 480.457		284.874		14 162.761	116 047.717		6 985.657	13 999.448
1996	187 548.501		285.049		47 839.703	110 240.494		15 902.633	13 280.622
1997	183 192.243		283.621		14 238.251	141 449.440		12 809.257	14 411.674
1998	154 238.150		284.778		14 249.930	113 814.657		9 374.095	16 514.690
1999	205 174.459		2 206.904		48 255.324	128 616.708		3 056.146	23 039.377
2000	259 993.971		2 275.089		73 397.053	157 892.576		3 150.042	23 279.211
2001	224 531.435		2 932.674		55 446.825	117 274.632	22 951.890	2 628.500	23 296.914
2002	233 036.515		2 808.093		87 913.980	105 139.231	16 357.360	1 964.885	18 852.966
2003	262 570.930		3 276.949		92 517.482	113 599.703	33 605.012	8.487	19 563.297
2004	280 387.783				77 189.560	130 158.917	54 568.305	14.001	18 457.000
2005	332 443				96 394	146 676	70 614	19	18 740
2006	368 481				93 352	163 757	92 300	448	18 624
2007	343 919				80 859	158 030	88 498	60	16 472
2008	502 701				89 950	195 598	69 962	125 988	21 203
2009	295 380				54 782	107 052	83 063	20 046	30 437
2010	327 172				54 661	117 412	93 890	28 803	32 406
2011	308 653				27 677	153 807	90 778	207	36 184
2012	302 672				16 060	152 735	99 341	21	34 515
2013	371 145				28 408	185 420	118 627	60	38 630
2014	507 267				83 023	238 905	140 225	873	44 241
2015	533 939				46 310	267 446	169 321	866	49 996

Table 3.A.2: Norges Bank's foreign exchange reserves, asset allocation 1818-2021, in million kroner (1 speciedaler = 4 kroner)

Year	Total FX reserves	<i>Metal reserves</i> (silver and gold)			<i>FX assets + Domestic FX claims</i> (deposits, securities, other)				Claims on international organizations
		Vault silver	Vault gold	Temporary gold abroad	FX deposits	FX fixed income	FX equities	Other FX assets	
2016	567 609				49 370	273 073	177 195	1 456	66 515
2017	587 765				33 935	299 357	183 787	2 521	68 165
2018	591 962				29 704	394 995	98 219	829	68 215
2019	628 740				24 455	406 898	127 397	715	69 275
2020	682 614				42 963	448 105	119 331	934	71 281
2021	783 866				76 302	467 667	121 969	403	117 525

Note: The balance sheet for 1818 has been reconstructed as explained in Chapter 2, Section 2.4 (page 61). *Emphasized* items are estimated. During the years 1916-1936 a tiny fraction of the reserves we have recorded as *FX fixed income* in this table were in fact *FX equities*. On average these equities made up around one percent of *FX fixed income* during these years. In the future we might be able to split these equities into their currency composition. The sources provide only scarce information about the companies to which these stocks were related.

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.													
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR
1818	4.932	4.932	100.000													
1819	6.285	6.285	100.000													
1820	7.303	7.303	100.000													
1821	7.576	7.576	100.000													
1822	7.411	7.411	100.000													
1823	7.415	7.415	100.000													
1824	7.941	7.941	100.000													
1825	8.618	8.618	100.000													
1826	8.506	8.506	100.000													
1827	8.590	8.590	100.000													
1828	9.212	9.212	100.000													
1829	9.334	9.334	100.000													
1830	10.277	10.277	100.000													
1831	10.473	10.473	100.000													
1832	10.682	10.682	100.000													
1833	10.736	10.736	100.000													
1834	12.021	12.021	100.000													
1835	12.230	12.230	100.000													
1836	12.217	12.217	100.000													
1837	12.152	12.152	100.000													
1838	11.043	11.043	100.000													
1839	12.188	12.188	100.000													
1840	12.169	12.169	96.282					3.718								
1841	12.306	12.306	95.165					4.835								
1842	12.207	12.207	94.328					5.672								
1843	11.354	11.354	85.696					14.304								
1844	11.289	11.289	78.267					21.733								
1845	12.189	12.189	72.741					27.259								
1846	11.537	11.537	76.510					23.490								
1847	9.441	9.441	91.204					8.796								
1848	8.535	8.535	62.694					37.306								
1849	9.035	9.035	81.196					18.804								
1850	9.467	9.467	81.829		0.633			17.539							0.000	
1851	9.901	9.901	81.660		1.751			16.589							0.000	

3.A Appendix, Norges Bank's foreign exchange reserves

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.													
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR
1852	9.327	9.327	83.741		0.504		15.755									0.000
1853	16.093	16.093	60.746		0.765		38.488									0.000
1854	19.697	19.697	44.594		0.120		55.286									0.000
1855	18.364	18.364	48.145		0.520		51.335									0.000
1856	16.343	16.343	73.087		4.477		22.436									0.000
1857	11.858	11.858	70.609		9.865		19.525									0.000
1858	16.836	16.836	70.968		2.161		26.870									0.000
1859	13.278	13.278	75.172		2.685		22.142									0.000
1860	14.461	14.461	68.608		13.405		17.988									0.000
1861	13.290	13.290	65.883		15.955		18.162									0.000
1862	14.380	14.380	70.784		21.733		7.484									0.000
1863	14.559	14.559	81.355		10.528		8.117									0.000
1864	15.312	15.312	80.333		10.384		8.860	0.423								0.000
1865	20.021	20.021	82.793		9.662		6.693	0.852								0.000
1866	15.393	15.393	82.638		11.452		4.467	1.443								0.000
1867	17.852	17.852	83.060		7.563		8.071	1.305								0.000
1868	13.492	13.492	88.094		7.431		3.398	1.077								0.000
1869	14.993	14.993	79.113		9.203		10.917	0.766								0.000
1870	16.608	16.608	74.694		9.237		14.748	1.263	0.057							0.000
1871	26.740	26.740	67.290		5.752		25.502	1.456								0.000
1872	30.245	30.245	61.759	6.520	5.497		23.689	2.536								0.000
1873	34.711	34.711	10.469	45.616	5.775		17.785	20.355								0.000
1874	34.996	34.996	2.448	57.218	6.264		18.425	15.644								0.000
1875	25.262	25.262	0.709	57.717	5.194	0.686	10.922	24.772								0.000
1876	32.587	32.587	0.674	68.319	2.637	0.493	7.617	20.260								0.000
1877	21.701	21.701		68.261	2.727	0.839	7.220	20.953								0.000
1878	19.215	19.215		68.798	4.251	0.626	3.777	22.547								0.000
1879	26.350	26.350		68.221	3.303	0.742	10.884	16.849								0.000
1880	33.721	33.721		69.365	1.213	1.260	14.428	13.733								0.000
1881	30.134	30.134		70.886	0.846	1.832	15.563	10.873								0.000
1882	33.067	33.067		68.364	0.435	1.908	14.292	15.001								0.000
1883	35.065	35.065		66.423	0.585	1.903	14.387	16.703								0.000
1884	34.481	34.481		67.873	0.164	1.066	15.556	15.341								0.000
1885	28.676	28.676		67.680	0.809	1.553	15.366	14.592								0.000

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.													
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR
1886	30.256	30.256		66.684	1.045	1.634	15.093	15.543								0.000
1887	40.246	40.246		70.013	0.322	1.567	12.209	15.889								0.000
1888	44.962	44.962		63.948	2.185	3.102	12.321	15.824	2.620							0.000
1889	47.832	47.411		66.919	4.432	4.072	12.601	9.492	2.483							0.000
1890	43.385	40.146		71.582	5.575	3.628	8.252	6.433	4.530							0.000
1891	39.097	36.946		69.548	8.904	3.536	3.972	10.417	3.623							0.000
1892	40.588	39.997		66.971	6.741	3.577	9.145	12.153	1.412							0.000
1893	41.673	37.101		65.433	3.426	2.985	12.223	11.926	3.661							0.345
1894	42.845	37.621		64.485	1.808	1.976	15.655	12.808	2.933							0.336
1895	44.986	41.420		62.455	3.134	2.354	17.078	11.804	2.856							0.320
1896	44.549	38.912		64.071	4.644	2.357	13.484	11.860	3.262							0.323
1897	49.683	49.683		58.329	5.995	5.724	10.929	12.596	6.137							0.290
1898	50.648	48.805		63.488	6.311	8.660	12.949	5.026	2.143							1.424
1899	48.927	45.332		65.858	4.676	13.720	9.486	3.037	2.576							0.647
1900	47.018	41.695		61.862	2.072	8.474	14.617	10.850	1.519							0.605
1901	52.799	49.168		57.848	1.000	3.844	12.934	22.503	1.243							0.628
1902	54.938	45.238		55.991	2.379	6.163	13.330	18.794	2.112							1.231
1903	44.991	40.426		55.535	0.409	5.443	12.415	22.194	2.436		0.058	0.042				1.467
1904	47.697	45.450		53.000	0.908	4.609	10.370	24.450	5.313		0.050	0.037				1.263
1905	53.577	49.640		52.772	2.231	5.416	14.708	21.936	1.766		0.101	0.032				1.038
1906	60.335	59.412		51.479	7.128	8.090	11.530	16.631	3.570		0.049	0.025				1.500
1907	65.427	65.427		41.830	23.606	11.479	8.644	12.911	0.808		0.095	0.009				0.618
1908	64.814	64.814		45.255	13.435	3.599	11.209	21.734	4.047		0.029	0.048				0.645
1909	68.739	68.739		44.071	13.604	6.120	13.166	20.003	1.696		0.142	0.022				1.177
1910	68.826	68.826		49.637	9.459	4.839	17.575	14.659	2.568		0.037	0.052				1.173
1911	70.207	70.207		54.508	10.226	4.291	16.872	11.540	1.556		0.124	0.023				0.860
1912	72.948	72.948		52.876	13.316	3.829	13.085	12.242	3.060		0.056	0.014				1.522
1913	86.056	86.056		51.564	12.834	3.025	9.457	13.572	4.861		0.045	0.009				4.634
1914	78.541	78.441		48.884	9.816	7.152	7.857	8.155	0.472	0.006	13.006	0.059				4.593
1915	140.840	140.356		36.740	15.850	0.877	3.169	13.503	5.173	0.055	20.285	0.029				4.318
1916	215.238	203.928		57.403	13.139	0.510	1.141	5.796	2.598	0.005	17.116	0.015				2.277
1917	206.055	165.925		56.669	9.583	0.239	0.602	7.196	1.958	0.025	21.696	0.007				2.025
1918	204.038	194.938		59.854	16.918	0.742	0.104	10.346	0.562	0.016	10.022	0.016				1.420
1919	230.847	224.447		64.024	7.554	3.089	0.096	10.090	0.611	0.032	13.828	0.021				0.656

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.													
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR
1920	211.971	205.371		69.496	6.470	3.665	0.244	10.018	0.826	0.011	8.552	0.008			0.710	
1921	196.246	184.646		75.059	3.314	2.879	0.037	8.818	0.663	0.030	8.383	0.039			0.778	
1922	206.877	195.877		75.451	3.343	3.049	0.002	7.715	0.340	0.038	9.570	0.056			0.437	
1923	180.686	169.386		85.823	2.608	1.342		5.735	0.046	0.029	3.886	0.111			0.421	
1924	199.541	187.041		77.608	0.254	1.325	0.002	7.762	0.017	0.004	12.806	0.076			0.146	
1925	218.612	209.512		68.903	0.188	0.519	0.017	16.590	0.006	0.000	13.561	0.023			0.194	
1926	454.839	408.839		32.380	0.301	0.306	0.009	39.366	0.003	0.001	27.109	0.014			0.512	
1927	233.561	228.261		63.063	0.643	1.362	0.017	21.955	0.006	0.002	12.825	0.016			0.111	
1928	189.271	186.871		78.794	0.332	2.638	0.092	13.869	0.071	0.003	4.007	0.026			0.169	
1929	213.943	211.743		69.640	0.360	0.280	0.142	24.056	0.118	0.003	5.320	0.037			0.043	
1930	218.635	217.335		70.133	0.504	2.426	0.214	16.625	0.113		9.446				0.539	
1931	179.234	177.034		87.439	0.613	1.761	0.107	2.966	0.091		6.018				1.005	
1932	176.865	174.465		76.912	0.498	0.453	0.118	15.039	0.114		6.063				0.803	
1933	150.666	149.266		95.344	0.147	0.257	0.335	1.684	0.078		0.921				0.692	0.543
1934	177.807	170.455		68.355	0.009	0.546	0.003	21.238	0.042		2.102				7.235	0.468
1935	233.876	230.682		67.666	0.008	0.652	0.001	16.934	0.017		3.614				10.639	0.470
1936	344.497	342.992		58.798	0.010	1.127	0.000	23.222	0.007		4.942				11.392	0.502
1937	470.347	468.250		38.280	0.014	2.261	0.002	36.892	0.003		6.356				16.192	
1938	512.715	499.572		46.169	0.014	3.669	0.000	37.804	0.002	2.218	6.281				3.841	
1939	377.756	366.665		51.714	0.004	1.821	0.001	3.270	0.003		13.047				30.141	
1940	517.569	517.569		64.144		3.457		6.000			25.882	0.005			0.024	0.487
1941	319.858	319.858		80.305		2.632		11.574		3.695	0.845	0.008			0.148	0.793
1942	317.445	317.445		80.572		1.378		12.160		3.455	1.485	0.008			0.147	0.795
1943	309.614	309.614		82.665		1.241		10.950	0.002	3.264	0.902	0.009			0.151	0.816
1944	305.989	305.989		83.509		1.294		10.325	0.003	2.998	0.886	0.009			0.153	0.824
1945	451.157	385.784		87.788		0.336		10.721		0.181	0.964	0.009			0.001	
1946	1159.136	1087.401		35.271		0.619		48.508	2.251	0.100	13.045				0.206	
1947	820.878	691.037		40.679	2.562	7.306		42.105	1.574	0.463	4.740	0.097			0.474	
1948	668.991	409.073		35.350	0.014	0.305		38.640	0.007	0.161	23.769	1.584			0.171	
1949	609.601	151.400		42.475	0.013	0.064		30.052	0.093	0.022	27.099	0.085			0.097	
1950	760.336	301.007		32.491	0.021	0.055	0.032	16.665	1.134	0.022	47.581	1.850			0.150	
1951	962.654	530.770		26.385	0.014	0.052	0.019	29.637	2.272	0.036	34.607	5.065			1.913	
1952	962.777	760.717		26.946	0.064	0.088	0.040	18.357	0.713	0.019	52.172	0.565			1.036	
1953	903.477	708.121		28.846	0.117	0.080	0.006	10.381	0.528	0.030	59.708	0.095			0.208	

Norges Bank's foreign exchange reserves, 1818-2021

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.													
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR
1954	869.197	563.075		23.700	0.101	0.355	0.039	9.934	0.167	0.014	64.456	0.144			1.090	
1955	1066.827	881.904		19.929	0.028	0.146	0.007	7.096	0.107	0.017	71.436	0.068			1.166	
1956	1162.209	1020.469		21.657	0.335	0.301	0.021	7.113	0.194	0.029	67.780	0.068			2.502	
1957	1201.714	1011.414		17.967	0.172	0.062	0.034	4.628	0.075	0.044	76.814	0.039			0.164	
1958	1622.812	1433.810		11.975	0.118	0.035	0.204	2.219	0.002	0.012	85.241	0.035			0.159	
1959	1749.628	1659.169		7.860	0.010	0.021	0.005	5.147	0.004	0.018	86.887	0.012			0.036	
1960	1939.187	1862.902		7.232	0.020	1.517	0.079	6.464	0.007	0.126	84.454	0.013			0.089	
1961	1907.916	1842.640		7.232	-0.069	1.530	0.016	7.673	-0.085	0.106	84.301				-0.704	
1962	1912.337	1824.870		7.316	-0.048	0.096	0.048	12.041	-0.064	0.101	82.574				-2.064	
1963	2269.447	2188.982		6.142	-0.004	0.080	0.022	5.524	-0.089	0.076	90.008				-1.760	
1964	2504.448	2464.210		5.533	0.008	0.012	0.028	7.556	-0.080	0.072	87.119				-0.248	
1965	3163.973	3104.093		4.429	-0.016	0.003	0.016	7.928	-0.057	0.089	87.115				0.493	
1966	3432.834	3378.753		2.444				6.859			90.262				0.435	
1967	4503.498	4281.121		1.888	0.007	0.016	0.002	6.189	0.009	0.069	91.623				0.197	
1968	4534.147	4407.507		2.763	0.004	0.007	0.011	0.850	0.004	0.069	96.178				0.114	
1969	5591.462	5404.817		3.232	0.005	0.009	1.394	0.050	0.005	0.066	76.047				0.018	19.172
1970	6725.566	6578.145		2.509	0.004	0.009	0.385	0.100	0.004	0.661	67.712				0.013	28.601
1971	8963.882	8835.922		2.671				0.056		0.033	73.451				0.033	23.755
1972	10038.795	9895.783		2.461				0.040		0.040	73.885				0.030	23.544
1973	10234.163	10084.894		2.303			6.869	0.049		0.039	67.785				0.900	22.054
1974	11123.796	10809.124		2.125	0.004	0.018	8.775	0.082	0.006	0.024	68.729	0.002			1.129	19.106
1975	13556.426	13368.921		1.741	0.003	0.109	10.165	0.020	0.007	0.029	69.660	0.003	0.001		0.971	17.291
1976	12177.349	11995.586		1.939	0.011	0.025	14.668	0.022	0.004	0.033	60.903	0.002	0.000		1.137	21.256
1977	12221.000	9326.256		2.166			17.494	0.017	0.008	0.050	56.520		0.025		1.357	22.364
1978	15751.944	15554.944		1.746			18.280	0.019	0.006	0.032	57.069		1.560		1.368	19.919
1979	22144.304	21836.304		1.294			14.875	-0.005	0.005	0.027	67.174		0.890		0.981	14.758
1980	33381.779	33118.779		0.853			14.015	0.015	0.003	0.042	70.694		0.754		0.740	12.884
1981	38476.719	38240.719		0.746			13.156	0.005	0.003	0.105	72.676		0.770		0.686	11.852
1982	50474.602	50015.602		0.570			13.264	0.026	0.002	0.280	72.964		0.716		0.746	11.433
1983	53707.000	52954.000		0.536			13.033	0.006	0.004	0.669	69.391		0.797		1.064	14.500
1984	87570.100	87184.100		0.324			18.403	2.829		2.488	60.066		4.838	0.125	1.209	9.718
1985	115733.400	115381.400		0.256			21.473	3.722		2.422	53.894		6.717	1.781	2.575	7.160
1986	97847.500	97324.500		0.301			24.823	2.523		2.018	39.360		15.352	2.530	3.342	9.750
1987	93115.200	92692.200		0.307			27.367	4.525		1.401	25.104		22.842	3.987	4.849	9.619

Table 3.A.3: Norges Bank's FX reserves, currency distribution 1818–2021 (percentage shares)

Year	Million kroner		Percentage shares of gross reserves 1818-1991, thereafter of net reserves 1992-2021.														
	FX gross reserves	FX net reserves	Silver	Gold	Den	Swe	GER	UK	Fra	Swi	USA	Can	Jap	ECU/ EUR	Other	BIS/ SDR	
1988	91468.000	90638.000		0.320				28.093	7.557		1.956	26.226		15.913	5.512	3.645	10.779
1989	95633.032	95201.989		0.306				19.083	6.827	5.199	1.720	28.617		15.559	9.428	3.452	9.809
1990	94797.433	94576.845		0.315				18.297	8.923	7.571	1.893	23.975		14.782	10.996	3.695	9.553
1991	82999.194	82733.607		0.327				18.187	15.947	13.707	0.269	16.037		7.705	14.066	3.673	10.082
1992	90550.170	85647.297		0.362				23.757	11.710	15.585	0.168	16.849		5.813	6.571	3.791	15.393
1993	161687.758	156315.451		0.181	0.633			27.660	15.548	14.553		16.180		6.327	9.039	0.452	9.426
1994	153865.092	147437.520		0.190	0.881	1.717		33.864	9.182	6.073	0.509	17.373	0.786	11.142	7.737	1.013	9.534
1995	151480.457	147253.821		0.188	2.009	1.959		31.644	10.135	6.869		15.780	2.082	10.250	7.325	2.505	9.254
1996	187548.501	173868.295		0.161	1.847	1.662		33.056	12.281	9.141	0.185	13.758	2.955	9.049	6.002	2.401	7.504
1997	183192.243	174209.863		0.151	3.017	5.479		29.917	14.685	8.866	0.041	11.685	3.008	5.162	7.450	2.869	7.669
1998	154238.150	143489.551		0.193		0.001		24.765	10.652	5.479	0.026	18.208	2.181	13.086	7.036	7.190	11.185
1999	205174.459	177810.492		1.290	0.876	1.161	0.307	11.735	0.966	0.014	20.001	1.412	11.692	36.755	0.326	13.464	
2000	259993.971	199102.877		1.175	0.946	1.228	0.101	12.217	0.301	0.075	18.713	1.591	11.008	40.210	0.413	12.024	
2001	224531.435	180703.286		1.602	0.848	1.401		14.304	0.162	0.706	20.549	1.604	7.099	38.402	0.597	12.725	
2002	233036.515	179250.659		1.547	0.842	1.351	0.095	12.866	0.134	0.538	22.967	1.213	5.185	42.200	0.680	10.383	
2003	262570.930	210616.221		1.524	0.495	0.639	0.090	8.157	0.127	0.853	31.949	1.178	4.967	40.189	0.739	9.095	
2004	280387.783	229249.927			0.724	1.040	0.078	8.725	0.029	1.268	31.850	1.498	5.965	39.280	1.567	7.976	
2005	332443.000	270672.000			0.577	0.996		8.961	0.024	1.651	34.039	1.756	6.113	36.954	1.813	7.117	
2006	368481.000	268644.000			0.580	1.290		11.508		2.093	29.937	2.434	5.082	37.632	2.630	6.815	
2007	343919.000	254883.000			0.652	1.274		10.742		1.963	30.171	1.948	5.337	37.888	3.495	6.532	
2008	502701.000	313243.000			0.561	0.697		7.841		1.533	45.594	1.083	3.561	30.835	1.795	6.498	
2009	295380.000	267244.000			0.635	0.990		8.532		1.869	31.162	1.571	3.671	37.003	3.485	11.083	
2010	327172.000	291781.000			0.185	0.489		8.590		1.120	40.373	1.273	7.236	26.555	3.265	10.914	
2011	308653.000	298597.000			0.148	0.379		7.416		1.030	45.018	1.502	7.288	22.435	2.669	12.115	
2012	302672.000	299043.000			0.178	0.433		7.409		1.128	44.850	1.556	6.554	23.162	3.187	11.542	
2013	371145.000	366953.000			0.180	0.421		7.197		1.113	45.720	1.254	7.173	24.125	2.289	10.527	
2014	507267.000	492869.000			0.159	0.310		6.502		0.944	48.424	1.083	6.327	25.400	1.874	8.977	
2015	533939.000	518178.000			0.259	0.358		6.883		1.216	47.713	0.880	8.059	24.068	0.917	9.648	
2016	567609.000	546655.000			0.203	0.340		6.754		1.074	46.345	0.203	7.325	23.739	1.850	12.168	
2017	587765.000	580560.000			0.224	0.341		7.057		1.036	47.601	0.224	7.421	22.651	1.704	11.741	
2018	591962.000	579987.000			0.104	0.173		6.865		0.524	45.716	0.104	7.424	26.507	0.821	11.761	
2019	628740.000	615599.000			0.133	0.204		6.765		0.679	46.284	0.133	7.426	26.138	0.986	11.253	
2020	682614.000	667166.000			0.142	0.206		6.500		0.542	48.036	0.142	6.926	25.789	1.031	10.684	
2021	783866.000	760125.000			0.121	0.185		6.299		0.465	45.812	0.121	5.519	24.130	1.887	15.461	

Norges Bank's foreign exchange reserves, 1818-2021

Money and credit, composite historical data series spanning
two centuries

Øyvind Eitrheim and Jan Tore Klovland

4.1 A long view of money and credit

In this chapter we provide a detailed overview of historical data on money and credit in Norway and their sources since around the time when Norges Bank was established in 1816 (Section 4.2). This study extends the work on money and credit previously published in HMS I (2004, 2007) along several dimensions. We return to the details on this in the respective sections on money (4.3) and credit (4.4) below. Selected data are tabulated in appendices 4.A-4.D.

We begin with a bird's eye perspective on developments in money and credit held by the general public in Norway during the past two centuries, mainly focusing on broad and inclusive measures of money and credit. Thereafter we provide an overview of sources and methods used to construct long runs of composite historical time series for money and credit aggregates and their main subcomponents, including some necessary break-adjustments and data revisions.

Methodological difficulties in measuring monetary aggregates were lively discussed in the literature which emerged after Milton Friedman and Anna Schwartz published their monetary history of the USA (Friedman and Schwartz, 1963). We will briefly return to this literature in the section on money below. Instead we turn our attention to ongoing work pertaining to the measurement of credit aggregates.

Bignon and Flandreau (2022) have recently pointed to three types of methodological difficulties when one aims at constructing long time series of credit aggregates:

1. *Incomplete information.* Information from available public and private (voluntary) sources may be partial and incomplete.

2. *Credit from non-banks.* Credit from sources outside the banking sector may have played a larger role in earlier periods than it does in our bank-centred credit markets today. Consequently, one needs to account for both the historic evolution of credit markets and all forms credit may have taken through history, as well as the available statistics. Bignon and Flandreau (2022) have argued that this task calls for meticulous work and the joint expertise of both historians and statisticians, coined as "*Statistorians*" by Bignon and Flandreau in Bignon et al. (2022).

3. *Credit from shadow banks.* One has to acknowledge the potential of unmeasured credit, which for some reason have gone under the radar of regulators and supervisors, for example credit provided by "near-banks" operating in the "grey" credit market. These institutions are often referred to as "shadow-banks".

For all three dimensions of these methodological difficulties the statistical measurement will be subject to limitations set by the available sources. This can give rise to biases similar to those we know from the literature on the lamp-post syndrome. Thus, we need to acknowledge that biases may arise in situations when available evidence is incomplete or cannot be regarded as representative of what we set out to measure.¹ The first two difficulties represent lamp-posts that reflect a bank-centric credit system and the accompanying aggregation problems when lack of information either about the total population of banks or about the transition from non-bank credit to bank credit when

¹ A related reminder is the following quote we may recall from the econometrics literature, "It is a capital mistake to theorize before you have all the evidence. It biases the judgement" (Arthur Conan Doyle (1887), *A Study in Scarlet*).

4.1 A long view of money and credit

banks were created. The third difficulty represents non-bank credit that is provided by institutions known as shadow banks or near-banks. Credit from such sources is typically imperfectly measured and monitored since it typically operates under the radar of regulators and monitoring authorities. Over time this area is further complicated by shifts back and forth between bank-based credit (loans) and market-based credit (bills, bonds, certificates or other securities).

We will argue that statisticians who are engaged in the construction of long-run time series of money and credit are facing similar types of measurement problems in both areas. Aggregated measures of money has evolved from coins to banknotes to bank deposits as the dominating type of money. All these sub-components of *broad money* are subject to measurement difficulties we need to address when we want to gauge the total amount of money held by the general public. The different types of money were historically also issued by different money-creating institutions. Coins were typically issued by the sovereign, in our case represented by the Ministry of Finance before 1962 when Norges Bank took over the Royal Mint of Norway. Banknotes are issued by Norges Bank and we have seen in Chapter 2 how we could derive consistent estimates of the total amount of banknotes in circulation outside Norges Bank. Finally, the dominating type of money today, *deposit money*, is issued by *savings banks* and *commercial banks*. Looking back, however, there were periods in the past when we also needed to take into account bank deposits which were issued by public banks like the postal banks and Norges Bank.

Today the postal banks have merged into the private bank sector. Norges Bank's activities are concentrated on central bank functions for the private money-creating banks that keep appropriate amounts of bank reserves in Norges Bank in the form of deposits and have access to central bank borrowing facilities.

Credit have similarly evolved from the different forms of credit which were used before banks were established to becoming a bank-centred concept. In Norway we also lose the distinction between *savings banks* and *commercial banks* from 2003 onwards. We have adopted the term *private banks* when we refer to institutions which belong to the union of these two banking groups.² To make further complications, we also need to include *credit companies* together with the *private banks* after the global financial crisis 2007-2008 for reasons we will explain in a later section.

So, in order to conclude, there are many important issues we need to resolve which have to do with the delineation of what we mean when we refer to *banks*. The following examples illustrates that this feature is not unique for Norway.

In Germany, for instance, a common distinction is between *private banks* and *credit banks*. *Private banks* originated from individuals like *private bankers* or *private banking houses*, but also from partnerships or family groups based upon these. In many cases *private banks* were forerunners of *credit banks* as they changed their corporate form and reorganized as joint-stock *universal banks* around the midst of the 19th century. The term *universal banks* underscores that these were institu-

² The background is that the distinction between the two banking groups became meaningless after DNB, which is Norway's largest financial services group, was created in 2003 in a merger between the largest commercial bank in Norway at the time (DnB) and Gjensidige NOR, which originated from a previous merger between a savings bank and a life insurer.

tions which offered a broader set of services to their customers. (Guinnane, 2002, p. 79) has argued that the main distinction between *private banks* and *credit banks* is that the latter were organized as limited liability joint-stock financial institutions. Germany also had other bank type institutions which were organized as *credit-cooperatives* or *Sparkassen* (Guinnane (2002)).

In the UK *private banks* ranged from *country banks* to *discount houses*, *accepting houses*, *merchant houses* and various forms of trusts such as, e.g., *investment trusts*.

In France one consequence of the collapse of John Law's Banque Royal and the Mississippi Company around 1720 was that for the following 150 years or so bank-like institutions were established under names such as "caisse", "credit", "société" or "comptoir". Bignon and Flandreau (2022) have used France as a case study to illustrate the difficulties involved in constructing credit aggregates based on publicly available information on banks.

Let us now turn back to the case of Norway, and at the same time remind ourselves that the term *private banks* in this study will be used, in a more trivial way, to distinguish between privately owned savings banks and commercial banks on the one hand and publicly owned state banks on the other.

Norges Bank was established in 1816 and started offering credit in 1818, *savings banks* were established in Norway from 1822 onwards and *commercial banks* from 1848 onwards. It is difficult to gauge the extent to which the loans which were recorded in the balances of these banks originated as new credit or represented a continuation and some times a roll-over of credit that had previously been granted by merchant houses or on a peer-to-peer basis from domestic or foreign sources. From 1828 onwards we also need to factor in state banks as a source of lending to the general public in Norway. The first state banks were state discount commissions which were established by the government in the major cities in the country to distribute the proceedings from a state loan to the general public. In periods when the central government ran a budget surplus the discount commissions provided an instrument for the government to earn interest on their savings. From 1852 onwards another state bank called *Hypotekbanken* emerged on the scene. In the 20th century there were a couple of additional entrants among state banks before World War I, but the big shift in the scale and scope of the state bank sector did not occur until after World War II. We discuss this in more detail in Section 4.4.3 below.³

The broad credit aggregate C3 measures the total amount of debt which is distributed across the different C3 credit-items. Each of these C3 credit-items are recorded as claims on the general public from both domestic and foreign sources. The list of such credit-items include financial instruments like loans, bills, bonds, certificates or other debt securities.⁴

³ See Eitheim, Klovland and Øksendal (2016, Chapter 4) for a detailed discussion of the financial breakthrough in Norway in the midst of the 19th century with a strong expansion of the private banking system (savings banks and commercial banks) and state banks (Hypotekbanken) 1850-1870. A recent book published the Ministry of Finance (2022) describes the evolution of credit markets in Norway from 1816 to 1892 and zoom in on the role merchant houses and private bankers played during the years when financial institutions were established, beginning with *Norges Bank* in 1816, followed by savings banks from 1822, the first state banks from 1828 and commercial banks from 1848 onwards.

⁴ The Norwegian financial databases FINSE and its predecessor FINDATR have both adopted a gross accounting principle for all its financial instruments such that the database keeps track, for each credit instrument, on all kinds of claims on other sectors as well as all kinds of liabilities to other sectors. This holds for all credit instruments whether these are loans, bonds, bills, certificates or other debt securities.

4.1 A long view of money and credit

Broad money M3 includes in this context *currency* (notes and coins) and *bank deposits*. Currency consists of the stock of banknotes issued by Norges Bank and the stock of coins issued by the Royal Mint, respectively, which circulates among the general public. In addition to currency broad money M3 consists of bank deposits in savings banks and commercial banks held by the general public.⁵ The main sources of monetary statistics on the components of broad money are the published balance sheets of the money-creating institutions, in the case of Norway these count financial institutions like Norges Bank as well as savings banks, commercial banks and credit companies.

Broad credit C3, on the other hand, includes loans to the general public from a wide range of domestic financial institutions, such as Norges Bank, savings banks, commercial banks, state banks, credit companies and financial companies, in addition to loans from other sectors such as insurance companies and public funds, plus bond market credit and credit from abroad.

Figure 4.1 shows broad aggregates for the two M3 components of broad money (stacked areas in blue and red) and broad credit C3 (thick blue line), all measured in percentages of GDP since 1816.⁶ We have also included the total supply of credit from money creating private banks and credit companies in the form of bank loans in Figure 4.1 (green line). We should note that M3 and C3 denote broad money and credit aggregates, respectively, which relates to the general public. In contrast, the green line in Figure 4.1 shows the total amount of bank loans to a wider group of recipients, which include both loans to the general public as well as loans to other banks. This is important in order to understand the changing trends in the total supply of bank loans when we consider such a long period. On the other hand, loans from private banks and credit companies to the general public are only a subset of C3 (blue line). The broad credit measure C3 also contains loans from Norges Bank, state banks and financial companies as well as loans from other sectors such as insurance companies and public funds, in addition to bond market credit and credit from abroad.

It is important to take into account much contextual details about historical developments in money and credit markets when we construct these composite historical data series for broad money and credit aggregates. Historical studies tend to identify credit with bank credit. This bank-centric view on credit may be misleading for several reasons. We will address some of the problems in the following paragraph.

Money and credit aggregates across two centuries

The background areas in Figure 4.1 show the amount of broad money held by the general public, in bank deposits (red area) and currency (notes and coins) (light blue area), respectively. The blue line

⁵ Our starting point is the official definition of money used by Statistics Norway since 2015. Under this level of aggregation we should remind the reader that *bank deposits* also include monetary instruments which are in very limited use but are formally counted as part of the money stock due to the fact that they are close substitutes to bank deposits. These instruments are for example repurchase agreements (repos) and short-term bonds and certificates. This also reminds us that among the money creating sectors in Norway today are both private banks and credit companies in addition to Norges Bank. We discuss this in further detail in a later section which describes Statistics Norway's 2015 revision of the official money stock.

⁶ We have adopted similar definitions and delineations of credit as is used in Skånland (1967).

Money and credit, composite historical data series spanning two centuries

in Figure 4.1 shows the broad credit aggregate which includes bond market credit and loans to the general public as described above.

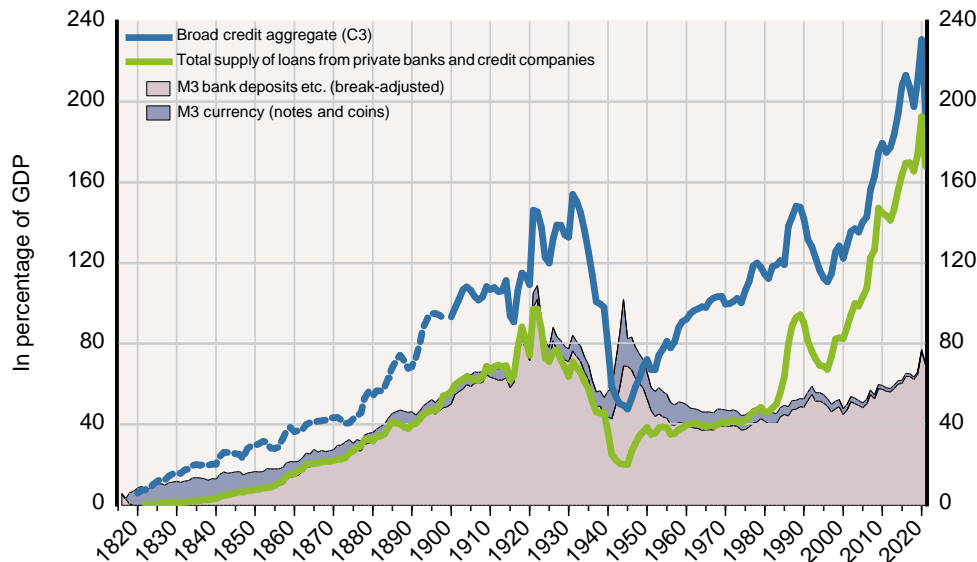


Figure 4.1 Money and credit - a long view, 1816-2021.

Broad money (M3) held by the general public (households, non-financial companies and local communities), including bank deposits etc. (red area) and currency (notes and coins) (blue area). The blue line shows estimates of the total amount of aggregated credit (C3) to the general public, including bond market credit, loans from financial institutions like Norges Bank, savings banks, commercial banks and state banks, plus loans from other sectors such as insurance companies and public funds. The green line denotes total loan supply from private banks and credit companies.

Although we have extended the overview of the supply of loans in this chapter significantly in comparison with the coverage offered in HMS I (2004, 2007), we should make it clear that there are still some sources of loan supply that are missing in this overview, such as loans from insurance companies and from some public funds. In addition we know that there were also a large number of credit relationships between individuals in the private sector prior to the establishment of savings banks and commercial banks. We discuss this in further detail in Section 4.4.1 below and in Chapter 5.

In addition to the broad measures of money and credit (M3 and C3) Figure 4.1 also shows data for the total supply of loans from savings banks and commercial banks plus loans from credit companies in Norway (green line). We note that the total supply of loans remains close to the level of bank deposits until World War II begins. Deposits from customers were still the banks' main source of funding of their loans throughout this period, and only for short periods during the 19th century can we observe a significant rise in other sources of funding. This close relationship between loans and customer deposits continued in the postwar period during the 1950s and 1960s but changed

4.1 A long view of money and credit

significantly from the end of the 1970s onwards. We discuss this in further detail in Section 4.4.2 below.

Norges Bank started its lending activities in 1818, savings banks entered the scene from 1822 onwards. The savingsbanks were to a large extent confined to local lending activities, although with some notable exceptions. The first commercial bank was established in 1848 and represented the beginning of a rapid expansion of the banking sector during the following decades. This development has been described in detail in Eitheim, Klovland and Øksendal (2016). The first state banks started lending from 1828 onwards. Over the past two centuries total credit first increased from 8 percent of GDP around 1820 to more than 150 percent in the early 1930s. Bank loans had then already been on a steep downward trend since the beginning of the banking crisis in the early 1920s.

Loans from private banks and credit companies declined from a level around 100 percent of GDP to 20 percent of GDP when the German occupation ended in 1945. Total credit had then decreased from 150 percent of GDP to around 50 percent of GDP, hence loans from other sources and bond credit to the general public also declined. The story after World War II is one of strong credit growth but with a marked distinction between the heavily regulated financial regime from 1945 until the early 1980s, in which credit growth over and above the growth in GDP took place outside the banking sector, and the deregulated financial regime from the early 1980s onwards.⁷ It reached a level of more than 200 percent of GDP in 2020.

We will return to these changes in the composition of lending growth from different financial institutions in Section 4.4.4.

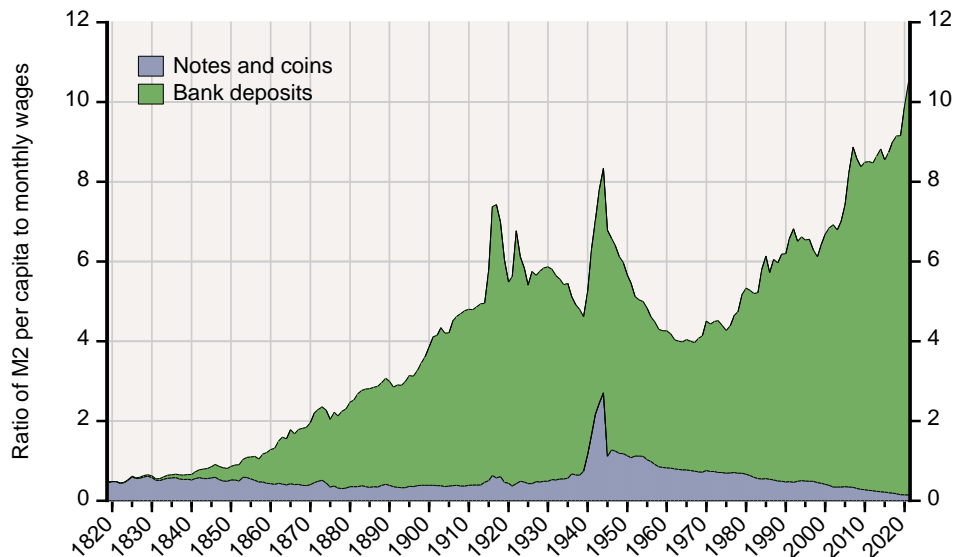


Figure 4.2 Broad money (M2) per capita relative to average monthly wages (Grytten, 2007).

⁷ Eitheim, Klovland and Øksendal (2016)

Money and credit, composite historical data series spanning two centuries

Figure 4.2 compares the historical developments in money per capita relative to the average monthly wage level over the past two centuries. These calculations are made on the basis of historical data for broad money documented in this chapter and historical data for the size of the population and developments in wages, which will be presented in later chapters of this book. The sources of data on movements in the population in Norway are discussed in detail in Chapter 12 and Chapter 13 provides an overview of long run trends in the demographic data. Money per capita is in turn divided by the average monthly wage level, which we may calculate from the historical data on the development in average annual wage levels discussed in Chapter 11.

Interestingly, the average amount of currency (notes and coins) fluctuated around approximately one half of the average monthly wage level during the long period from before 1820 until World War II. When the war started in 1940 this ratio increased rapidly and amounted to close to three months' wages when the war ended. After a sharp decline following the note withdrawal in the fall of 1945 we observe a gradual decline in the currency to wage ratio, bringing the ratio down to a level which is way below one half of a monthly wage.

On the other hand we see from Figure 4.2 that money holdings showed a steady increase during the 19th century following the expansion of the banking sector, with a notable peak close to seven monthly wages around World War I. After a second peak after World War II there was a marked decline in the general public holdings of bank deposits until around 1960. Around that time people could access their bank accounts more easily after the introduction of giro systems for transferring funds between bank accounts, also including the postal bank system. During the 1960s it became customary for wages to be deposited directly into checking accounts, which made bank deposits even more accessible. We see from Figure 4.2 that the average amount of money held in bank deposits has now trended upwards for more than fifty years. During these past five decades there has been a continuous development in payment technology which has contributed to these increases. The most recent increases in bank deposits held by the general public during the Covid-19 pandemics from 2020 onwards have been analysed in Alstadheim (2022).

The general public trust the banks to safeguard their deposits, although we note from Figure 4.2 that the growth in the average money holdings ceased during the banking crisis from 1988 to 1993 before picking up again. It should be noted that an important feature of the Norwegian banking system is that bank deposits are subject to a deposit guarantee up to a fairly high limit, two million kroner for a deposit in a single bank. This amount largely exceeds the average level of bank deposits held on a per capita basis.

4.2 Sources of historical data for money and credit

4.2.1 Monetary aggregates

Norges Bank started to collect and publish statistics for monetary aggregates on a regular basis in the early 1970s.⁸ Klovland (2004) reported historical data for broad monetary aggregates for Norway from 1819 onwards in the first volume of Historical Monetary Statistics for Norway (HMS I, 2004). These data were in turn a revised and extended version of data first published in Klovland (1984).

In this volume we present historical data for monetary aggregates which have been updated until 2020, and we have also extended these data with estimates of the total amounts of notes and coins in circulation in Norway from 1813 onwards (cf. Section 2.3 in Chapter 2). The historical data for broad money M2 were slightly revised in 2007 in connection with revisions and extensions of historical data for bank deposits and bank loans that appeared in the second volume of Historical Monetary Statistics for Norway (HMS I, 2007) (see (Klovland, 2007a,b; Eitheim, Grytten and Klovland, 2007)).

Composite historical time series for monetary aggregates have been calculated and numerous break-adjustments are discussed in Section 4.3 below. The official statistical measurement of monetary aggregates by Statistics Norway was changed in 2015, and we have made adjustments of the historical data for monetary aggregates from earlier vintages in order to arrive at break-adjusted composite data for broad money in Norway extending back to 1813.

The main sources of historical data for bank deposits in the 20th century are publications from Statistics Norway. Frozen deposits in banks under public administration during the banking crisis of the 1920s and 1930s are not included in the broad money aggregate M2 discussed in Section 4.3. But these deposits were included in banking statistics published by Statistics Norway, and we have included these in Section 4.4.2 where we discuss balance sheet data for the banking sector.

4.2.2 Credit aggregates and balance sheet data

A small set of historical time series on credit aggregates was documented in HMS I (2004, 2007). Here we focus on the new historical data that have been collected later. We have included annual data for lending from state banks from 1828, private credit companies from 1900, the postal bank from 1946 and financial companies from 1965. This chapter also accounts for extensions and revisions in the aggregate balance sheet for savings banks and commercial banks.

The main sources of information about credit developments originate from the records of the financial institutions: Norges Bank from 1818, savings banks from 1822, state banks from 1828 and commercial banks from 1848 onwards. We have, however, only fragmentary information on whether this information represented new credit or whether it partly reflects the surfacing of private credit relationships already existing among the general public.

⁸ The first empirical evidence on the role of the money stock in Norway appeared in a Norges Bank working paper by Nordhus (1969). A complete set of monthly publications of monetary statistics for the short-term money market and the liquidity situation in the banking sector (known as "green leaflets") are available from the bank's archives from 1973 to 1993.

We believe it is quite likely that the process of transferring private credit to institution based credit affected the reported credit growth in the following decades. During this period many merchants and other businesses, who had been providing financial services as private bankers, either full time or as a side activity, went through a transition and became commercial banks. The growth in the Norwegian banking sector was particularly strong during the 1850s and 1860s and, although the savings banks increased the most in numbers, it was the commercial banks that increased the most in size.⁹

A similar evolution of banking, e.g. from merchant banks to commercial banks, took place in other countries during the 18th and 19th century (Grossman, 2010, p. 45-52). The timing of this transition was also influenced by the transition to new forms of corporate organizations, like incorporated businesses with limited liability replacing smaller family-run businesses with unlimited liability. It is therefore uncertain to what extent these estimates capture the total supply of credit (Grossman, 2010, p. 15). The evidence we present in Chapter 5 of this book indicates that private credit still accounted for a significant amount of total loans registered at the notaries office around the middle of the 19th century.

In (Klovland, 2007a,b) an attempt was made to construct equity shares for the aggregate balance sheet of savings banks and commercial banks for the 19th century. For the 20th century publications from Statistics Norway provided the main sources.

Drawing on these sources we provide a revised set of estimates of the total balance sheet of all commercial banks before 1920. The estimates are based on a more complete coverage of commercial banks during the 19th century. The extensions affect in particular estimates of this total for the early 1870s and during the late 1890s. Thus, we can now present a complete set of annual balance sheet data for private banks in Norway, for savings banks from 1822 onwards and for commercial banks from 1848 onwards.

The first state banks appeared already from 1828 onwards, they were called *State discount commissions* (Egge, 1988).¹⁰ In 1852 *Hypotekbanken*, a *State mortgage bank*, was established (Kaartvedt and Hartsang, 1952), which soon took over for Norges Bank and surpassed it as the main provider of mortgage loans to the general public. This happened already in the mid-1860s. Around the turn of the century more state banks arrived on the scene, although it was not until after World War II that we could observe the main build-up of the state bank sector in Norway, with the *State housing bank* as the largest of these (Reiersen and Thue, 1996). We have provided some more details about the rise and fall of the state bank sector in Norway in Section 4.4.3 below.

4.3 Money

4.3.1 Money aggregates

This chapter provides documentation of composite historical data series for monetary aggregates covering a period of more than two centuries. The focus on money in a policy perspective has shifted

⁹ See Eitrheim et al. (2016, p. 153-156) for details on the banking sector breakthrough in Norway.

¹⁰ The main sources of historical data and records for the early state banks are referred to (in parenthesis). More on this later.

4.3 Money

over time. In the early part of the monetary history covered in this study, during the silver and gold standard periods, there existed detailed rules which regulated the total amount of banknotes that could be put in circulation by the *banks of issue* such as Norges Bank. We have discussed these regulations in detail in Chapter 2. There were typically no similar rules and regulations which restricted the total amounts of private bank deposits held by the general public as the banking sector expanded during the 19th century. Private banks soon overtook the role as the dominating money-creating sector in many countries.

The focus of money in a policy perspective reappeared on the scene after Milton Friedman and Anna Schwartz published their monetary history of the USA (Friedman and Schwartz, 1963). This focus was reinforced in many countries during the period with high inflation during the 1970s and 1980s, but this was later partly reversed during the 1990s and 2000s as money went off the radar of policy makers again. With the recent extensions of the monetary policy arsenal taking on Quantitative Easing (QE) this has also brought back some attention to developments in monetary aggregates. The surge in monetary aggregates during the recent Covid-19 pandemic has also contributed to increased focus on money.

On this background we see it as an advantage that we have available long runs of historical data series, which shed light on the shifting developments in money aggregates and their subcomponents. We start with a short recollection of the international background for monetary analysis before we turn to the case of Norway. The goal is to describe the main shifts in the composition of monetary aggregates, from metal coins issued by the Royal mint to paper banknotes issued by Norges Bank as the country's monopolist bank of issue and finally to bank deposits created by private banks. This happened in an economy which over time became increasingly influenced by credit supplied by public and private financial institutions.¹¹ As "Times They Are A-Changin'" we attempt to account for the major structural changes which help interpret these long-run developments in the statistical measurement of money.

4.3.2 International perspectives

Monetary aggregates took centre stage at the scene of monetary analysis in central banks after Milton Friedman and Anna Schwartz published their monetary history of the USA (Friedman and Schwartz, 1963). Their statistical data for USA were documented some years later (Friedman and Schwartz, 1970). Friedman and Schwartz referred to their main money supply measures as M1 and M2. These names were later adopted by the Federal Reserve when it began publishing estimates based on Friedman and Schwartz's definitions in the 1960s and have since become common language and the basis of extended money measures like M3 and M4.¹²

(Friedman and Schwartz, 1963) reported historical data for M1 back to 1913 and for M2 back to 1867, which was later extended back to the period prior to the Civil War (Friedman and Schwartz

¹¹ The evolution of credit supply is described in Section 4.4 below.

¹² A third volume, entitled *Monetary Trends* (Friedman and Schwartz, 1982), completed their trilogy on the money stock, focusing on the comparison of monetary trends in USA with those in the UK. In contrast to their previous work, which has gained widespread influence on applied monetary history, this volume has not made so much impact.

(1970)). Other countries followed up on this approach. A Monetary History of the UK appeared in Capie and Webber (1985). Official estimates of the money stock in the UK started in 1963.

Friedman and Schwartz (1970) selected their preferred measure of a broad money aggregate (M2) as the sum of public holdings of currency (banknotes and coins) and their holdings of demand deposits and time deposits in commercial banks, leaving out deposits held with postal and savings institutions. Data for large negotiable certificates of deposit exist after January 1961 but were not included in their preferred measure either. One main distinction between demand deposits and time deposits held in commercial banks was that only demand deposits were transferable by check.¹³

With this stated preference for a broad measure of money Friedman and Schwartz (1970) have largely settled a century long debate about what constitutes the most appropriate definition of money supply. In short, their view was that the definition of the money supply should be regarded as a practical matter as opposed to one of principle (Nakamura and Steinsson, 2019). An important feature of a broad money definition is that it internalizes changes in deposit terms that have tended to severely affect the consistency of the narrow M1 definitions of the money stock over time.

A primary object of interest from this research has been the income velocity of circulation of monetary aggregates. A large number of studies have appeared in this literature, see e.g. (Bordo and Jonung, 1987, 1990, 2004) for empirical evidence on income velocity back to 1870 for USA, UK and Canada as well as for Norway and Sweden.

A number of studies have investigated a simple long-run money demand model for the UK. In a Festschrift article in honour of Forrest Capie (Chrystal and Mizen, 2011) revisited this topic, which they had also written about previously in another Festschrift article in honour of Charles Goodhart (Chrystal and Mizen, 2003).

In both cases they choose not to look at narrow money. Instead they consider the broad monetary aggregate for UK, denoted M4, which includes deposits held with the building societies.¹⁴ But Chrystal and Mizon also argue that some adjustments in the data are necessary in order to find a stable relationship and they estimate the model using retail M4 back to 1963, spliced with M3 for earlier years. Retail M4 is used instead of Total M4 due to the distortions rendered by deposits at OFCs (Other Financial Corporations). As an alternative Chrystal and Mizon also consider Total M4 excluding OFCs. Again they find that excluding OFCs help establish a stable relationship.

According to Chrystal and Mizon, both Bank of England staff and members of the Monetary Policy Committee (MPC) shared a sceptic view on the distortions of monetary aggregates created by including OFCs. They explain that OFCs might have been aggregated together with banks and as money creator their money holdings would have been defined out of the official money stock, just as interbank deposits. Monetary statistics disappeared from the limelight. According to Chrystal

¹³ In practice, according to Friedman and Schwartz (1970), even time deposits were also available on demand except during and after some infrequent periods with banking panic, which called for restrictions to be imposed on the convertibility of deposits into currency.

¹⁴ Capie and Webber (1985) reported data for M0, M1 (checking accounts) and M3 (all deposits). But they only considered banks and not building societies, which were permitted to convert to banks from 1988.

4.3 Money

and Mizon Quantitative Easing(QE) has brought monetary aggregates back after two decades in the wilderness (1990s and 2000s).

4.3.3 Money aggregates in Norway

This study extend previous work on money aggregates in Norway along several dimensions.

Firstly, we present estimates of the stock of banknotes in circulation in Norway, which include the early period 1813-1819. We zoom in on two main features:

- The shift from the stock of old devalued banknotes from the pre-1813 monetary union with Denmark to the riksbankdaler banknotes issued by the Riksbank that was established in 1813.
- The shift which took place in 1818-1819 from the riksbankdaler banknotes, issued from 1813 onwards, to the new speciedaler banknotes issued by Norges Bank.¹⁵

Secondly, we present composite and break-adjusted historical time series for broad money in Norway since 1813. This series comprises the stock of coins and banknotes held by the general public plus their liquid savings held in different types of bank deposits. The types of bank deposits recorded in statistical publications have varied over time and we show how measures of M1 and M2 have changed accordingly. We adopted a preferred measure of broad money, from 2015 denoted as M3, in light of the 2015 revisions made by Statistics Norway of the official statistics for money aggregates (Tangen, 2014). We have made break-adjustments that take into account the revisions to money creating and money holding sectors taking place in 2015.

Thirdly, we also discuss other sources of breaks in the statistical measurement of money aggregates in Norway since 1960. We show that these breaks have primarily distorted measures of narrow money M1 and rendered the distinction between narrow and broad money rather blurry and non-informative.

Finally, we report a composite historical time series for broad money in Norway, M3, which we will argue is quite robust to the breaks and changes in statistical definitions we have observed across this long period. We denote this M3 series as our preferred measure of broad money.

Money aggregates since 1813

Figure 4.3 and Figure 4.4 show the different components of the monetary aggregates in percent GDP and as percentage shares of our preferred break-adjusted measure of *broad money*. We will refer to this as M3 in the following. These figures show how the money stock shifted over time, from being predominantly held as banknotes, which accounted for more than 80 percent in the early years. Still, more than 10 percent of the money stock was held as coins until the 1850s, whereas the overall share of bank deposits then had taken over as the dominating part of the money stock, reflecting the strong growth in the private banking sector which accelerated during the latter half of the 19th century.

¹⁵ See Section 2.3 in Chapter 2 for some broader context and more details on the monetary transition in Norway after the Napoleonic wars. In this chapter we focus solely on what available data for notes and coins in circulation during this period can tell us about the total stock of money in the years before Norges Bank was established.

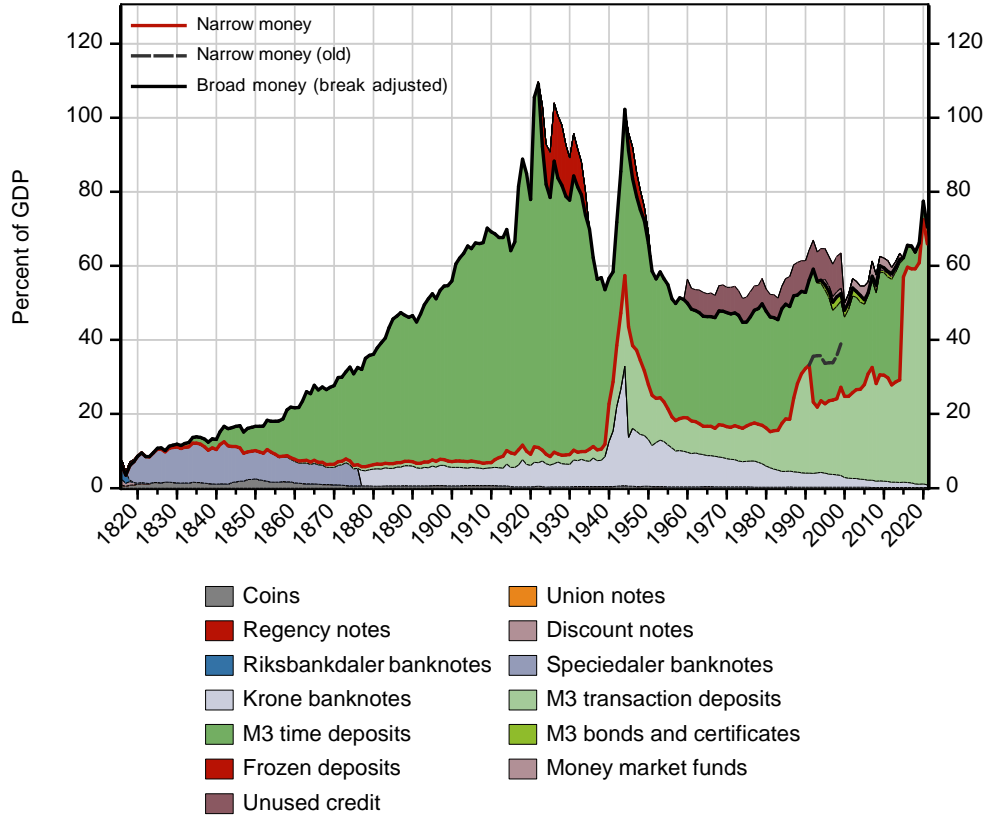


Figure 4.3 Monetary aggregates and their subcomponents in Norway across two centuries, in percentage of GDP. Since we have combined as many as 13 subcomponents of money in this figure it may be hard to distinguish between some of the colours. To help the reader we have listed all subcomponents in Table 4.A.1 in Appendix 4.A (page 221) together with information about the timespan in which they were used. The preferred break-adjusted measure of broad money M3 is marked with a solid black line.

Figure 4.4 shows that Norges Banks banknotes constituted the largest component until the private banking sector started its rapid expansion in the middle of the 19th century. Thereafter bank deposits have constituted the largest component of the money stock, accounting for around 90 % of the total at the eve of World War I in 1914

The banking crisis in Norway in the early 1920s was severe. Norges Bank provided liquidity support and offered crisis management for the troubled banks. This had consequences for the stock of money held by the general public. Deposits in banks which were brought under a form of receivership under the 1923 Administration Act were frozen and were not reckoned as part of the money stock until a resolution was in place. For many banks this took a long time and the volume of such frozen deposits lasted until the mid-1930s. Items which are not included in the money stock are illustrated in Figure 4.4 by areas above the 100 percent line. The first of these are the frozen bank

4.3 Money

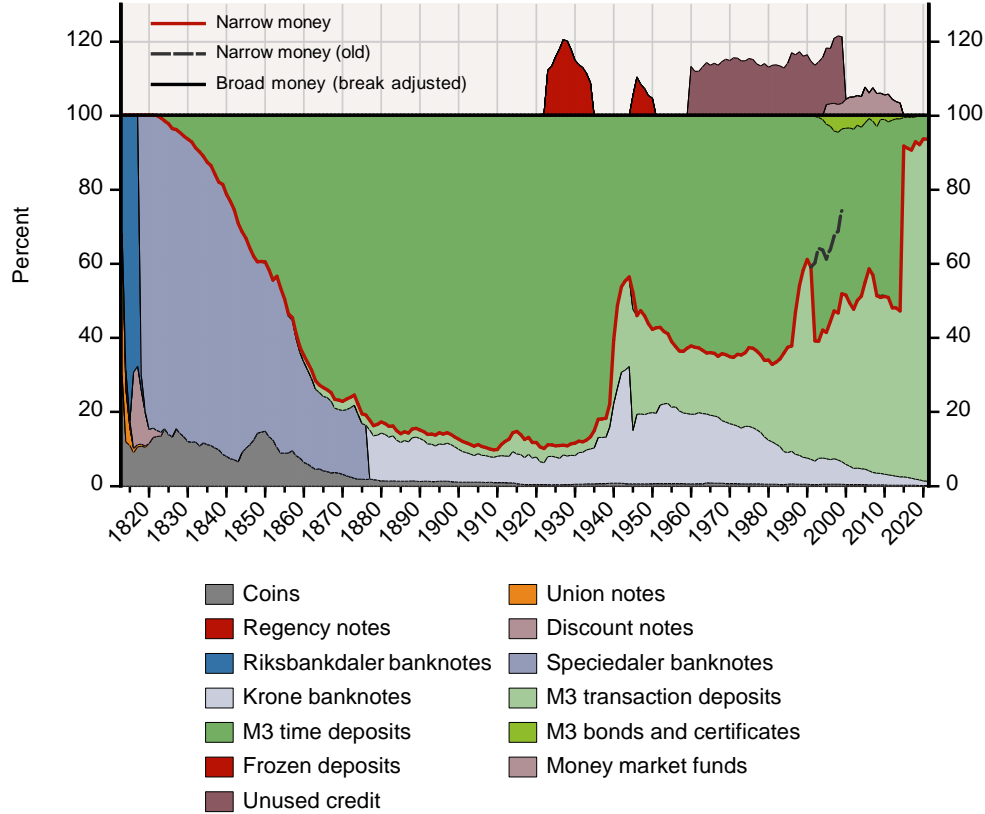


Figure 4.4 Monetary aggregates and their subcomponents in Norway across two centuries, 1813-2021, in percentage of our preferred broad money aggregate (break-adjusted). Monetary items which have been excluded from this break-adjusted series turn up above the 100 percent line, such as frozen deposits, unused credit facilities and shares in money market funds (from 1995 onwards). Sources: Chapter 2, Rygg (1918, p. 363-373), Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 10947, Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

deposits (dark red area) from 1923 to 1936. Some deposits were frozen in the autumn of 1945, but now for a different reason; this was part of the government's attempt to control the liquidity overhang created during the war.

We distinguish in Figure 4.4 between transaction deposits, typically demand deposits (light green area) and other deposits, like time or saving deposits (dark green area). There have been several changes in the statistical measurement of these two categories of deposits over this period. We will make some further comments on these instabilities below. We observe that transaction deposits, which accounts for around 90 percent of the money stock today, only constituted a minor fraction (less than 10 %) of broad money before World War II. For a long period time (saving) deposits were the dominant item in the money stock. Although formally only callable by the depositors at 3 or

Money and credit, composite historical data series spanning two centuries

6 months notice these saving deposits could usually be withdrawn on demand, although the banks might deduct part of the interest income.

World War II and later technological developments changed this and largely eroded the distinction between demand deposits and time deposits. The deposit categories offered to money holders were subject to numerous changes over time. This was due to various technological and structural changes: the composition of the banking sector developed over time, deposits were more easily accessible using checks, giro systems could be operated by mail, or in the second half of the 20th century, operated through ATMs (Automated Teller Machines), computers and mobile cell phones.

World War II represented a serious shock to the monetary system and the postwar years were a game changer for the money creating sectors. In short, Norges Bank took on its role as the government's bank and the private banks were for the next 30 years subject to quite strict regulations and financial repression. Norges Bank was nationalised in 1949 when the government acquired all of its share capital. An attempt was made to bring down the huge liquidity overhang that the war had created through the partial withdrawal of banknotes in September 1945 accompanied by a temporary freeze on large bank deposits, which were to be held as blocked deposits (*riksinnskudd*) in Norges Bank.

4.3 Money

Revisions to money aggregates 2015 onwards

The most recent substantial revision to money aggregates came in 2015 when Statistics Norway published new and revised data for monetary aggregates. Figure 4.5 shows the gross changes in the main components of these revisions back to 2008. The initiative to revise the money aggregates came from Statistics Norway and was motivated by a goal to improve adaptation to international standards and institutional changes and develop simpler and more robust production routines (Tangen, 2014, pp. 3-4). In this chapter we present break-adjusted money aggregates which match the official definitions used by Statistics Norway from 2015 onwards.

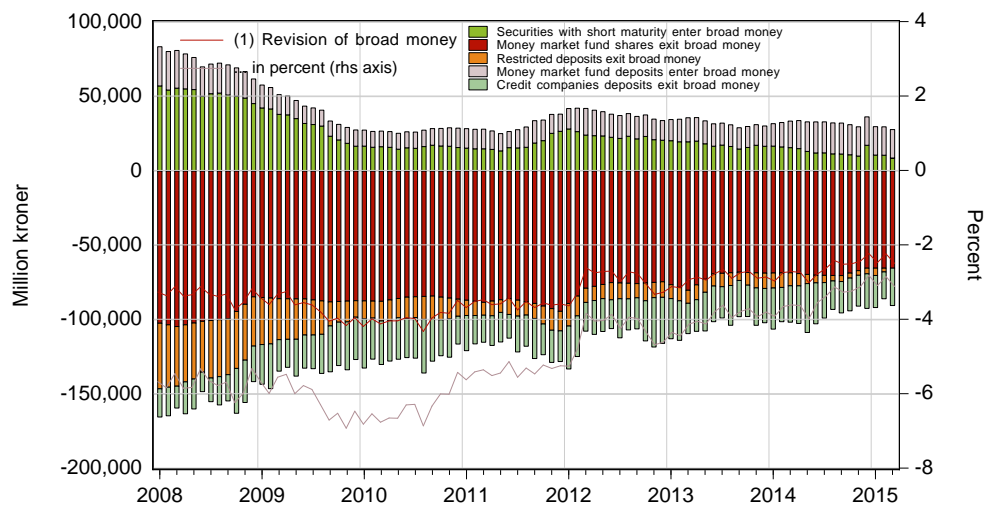


Figure 4.5 The 2015 revision of monetary aggregates. A detailed overview of the implied changes in the official statistics for monetary aggregates published in Høstmark et al. (2016).

These revisions are shown in Figure 4.5. The most important one of these changes, in terms of their size, is the redefinition of money market funds from being considered as a money creating sector to that of a money holding sector. Money market fund shares held by the general public is therefore not defined as part of the money stock anymore. On the other hand, we now consider credit companies issuing short-term bonds or certificates with short maturity as part of the money creating sector. The general public's holding of such short-term bonds and certificates securities are now part of the money stock.

Furthermore, as a consequence of these swaps between money creating and money holding sectors, bank deposits held by money market funds will now be a part of the money stock, whereas bank deposits held by credit companies will not. Another change was that the general public's holdings of repos (repurchase agreements) are treated as deposits and included in the money stock. A final

change which has pushed the aggregate stock of money in the downwards direction is that of a more inclusive definition of restricted deposits that are not to be included as part of the money stock, similar to the treatment of frozen bank deposits between 1923 and 1935 and in 1945 after World War II. These changes are explained in detail in Tangen (2014).¹⁶

Revisions and breaks in money aggregates 1960 onwards

We have used the 2015 revision as our main guide for the construction of break-adjusted historical data for broad money. One alternative could have been to make a downward adjustment in the old measure of M2 using a constant multiplier scaled with the ratio of new M3 to old M2 in January 2008, which is the first month we can observe both measures of broad money.

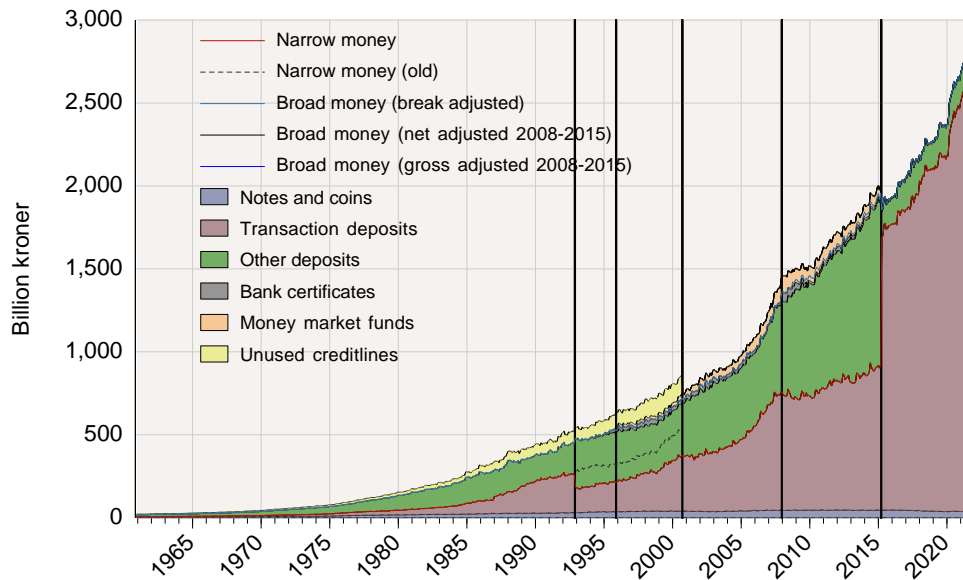
This is a simple adjustment that would preserve the growth rate in the broad money aggregate. But this method has a disadvantage in that all historical data are subject to the same downward adjustment, for which there may be no substantive reason. Instead we have chosen a method which puts more emphasis on being able to compare our preferred break-adjusted composite measure of broad money with the historical statistical sources.

Figure 4.6 shows monthly data for the main broad money aggregates and their decomposition from January 1960 onwards. We note that there have been several changes in the definitions of M1, M2 and M3 over this period. We will mention the most important changes in the following. Unused credit lines were for example removed from Norges Bank's monetary aggregates in the October 2000 revision, in accordance with international guidelines (IMF 2000, Monetary and Financial Statistics Manual). The result was a downward revision of M2 from January 1960 onwards.

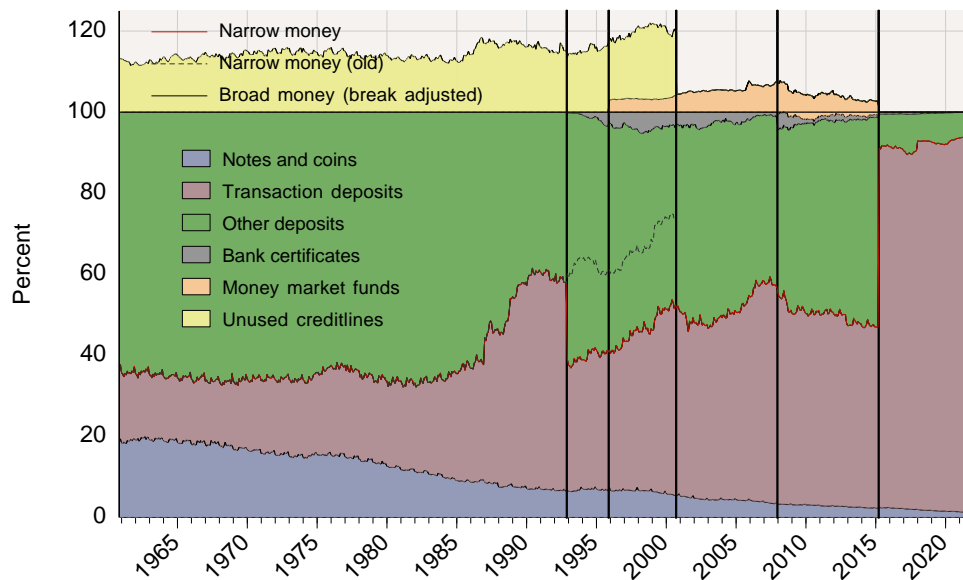
The solid blue line in Figure 4.6(a) shows our preferred break-adjusted composite measure of broad money. Figure 4.6(b) shows the different components of the monetary aggregates measured in percent of our preferred break-adjusted composite measure of broad money, which excludes unused credit lines and shares in money market funds in the years we have available data for these components. That is from January 1960 for unused credit lines and from December 1995 onwards for bank certificates and money market funds.

¹⁶ A more recent revision of the official money stock data in Norway was introduced after changes in the reporting of data from financial institutions in Norway from 2018 onwards. These changes and the revisions of data have been documented in Tangen (2019).

4.3 Money



(a) Million kroner



(b) Percentage shares

Figure 4.6 Monetary aggregates, 1960-2020. Monthly data for M1, M2 and M3, their main components and break-adjustments. In million kroner (top) and in percent of our preferred broad money aggregate (bottom).

4.4 Credit

4.4.1 Credit aggregates

Eitrheim, Gerdrup and Klovland (2004) in HMS I (2004) provided an overview of historical data for the total supply of credit from domestic financial sectors based on available sources at that time. Bank lending from savings banks were available only with five year intervals from 1840 through 1865 and thereafter for every year from 1869 onwards. Bank lending from commercial banks were available on an annual basis from 1848 onwards, although the coverage was incomplete. Total lending to the general public from each of the two groups of banks were only available from the early 1950s, notably for savings banks from 1952 and from commercial banks from 1953 onwards.

Estimates of the total amount of credit to the general public (household sector, private non-financial sector and local communities) were available on an annual basis from 1899 onwards, and with ten year intervals from 1820 onwards. The main sources for these data were publications from Statistics Norway and a couple of special studies such as Skånland (1967), Matre (1992a,b) and Gerdrup (2003).

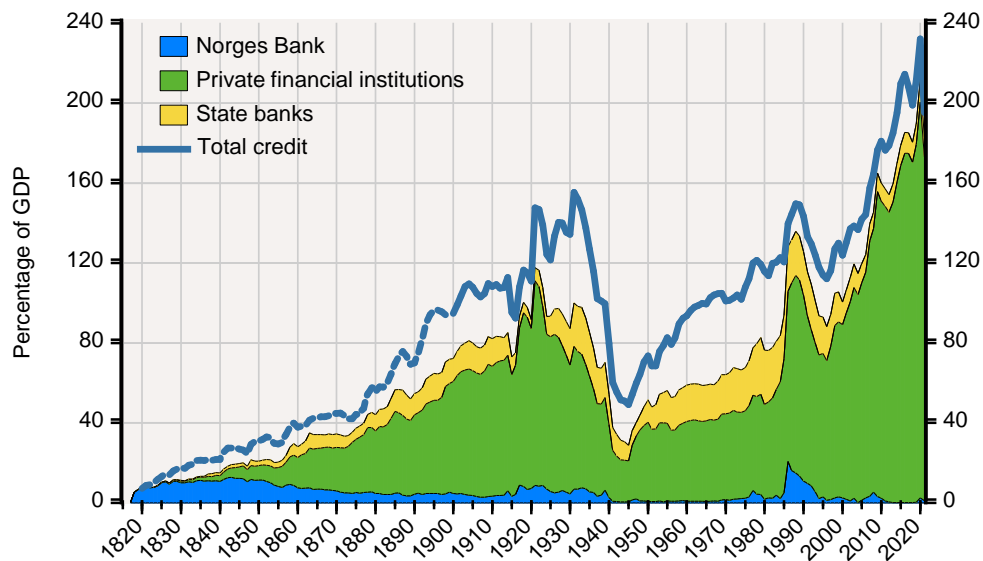


Figure 4.7 Aggregate credit, 1820-2021, as a percentage of GDP.

The blue line shows estimates of the total amount of credit to the general public from domestic and foreign sources, including bond market credit, loans from financial institutions like Norges Bank, savings banks, commercial banks and state banks, plus loans from other sectors such as insurance companies and public funds. In background the total supply of loans from Norges Bank (blue area) private financial institutions (green area) and state banks (yellow area).

A more complete coverage of the supply of loans from savings banks and commercial banks in Norway was achieved in 2007 when a fairly complete set of annual balance sheet data for individ-

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ual banks during the 19th century appeared in the second volume of Historical Monetary Statistics (Klovland, 2007a,b; Eitrheim, Grytten and Klovland, 2007).

In this volume we present annual data for the total supply of loans from the key financial institutions in Norway from 1817, including total lending from Norges Bank from 1817 onwards (Chapter 2), savings bank lending from 1822, state bank lending from 1828 and commercial bank lending from 1848 onwards. We have also included annual data for the total supply of loans from new types of financial institutions which emerged in Norway during the 20th century, such as Credit companies (from 1909 onwards) and Financial companies (from 1965 onwards).

Figure 4.7 shows the developments in aggregate credit to the general public from domestic and foreign sources in percent of GDP. We note that Norges Bank emerges as the main supplier of credit during the first years from 1818 onwards. The aggregate credit indicator shows however that a significant amount of credit to the general public must have originated from other sources than from loans from these domestic financial institutions.¹⁷

Notwithstanding this uncertainty with respect to the completeness of our coverage of total credit supply in this chapter we see clearly from Figure 4.7 that Norges Bank was surpassed as the main provider of loans during the 1850s when the growth in private banking surged. Later on towards the end of the 19th century we note that there was also strong growth in credit to the general public from these other sources (foreign and domestic).

The strong growth in private bank lending during World War I peaked around 1920 and was soon followed by two decades with decline in private banking in Norway. The 1920s were characterized by a severe systemic bank crisis that led to widespread failures of commercial banks, including many of the largest ones. In the 1930s growth in nominal GDP surpassed the growth in private bank lending, as many savings banks struggled in the deflationary environment.¹⁸ On the other hand, we see from Figure 4.7 that aggregate credit to the general public increased throughout the 1930s, in part because of strong growth in local communities' borrowing.

After World War II we note a similar development as the aggregate credit indicator shows significantly higher growth rates during the 1950s than the growth in loan supply from domestic financial institutions. Our interpretation is that this can be explained in part from strong growth in credit to the non-financial sector and to local communities from other foreign and domestic sources in this period.

In the following we will focus on the total supply of loans from Norges Bank, savings banks, commercial banks, state banks, credit companies and financial companies. This will allow us to present a more detailed picture of the historical evolution of the total supply of loans from these domestic financial institutions. A table with annual historical data for the total supply of loans from 1817 to 2020 is presented in Appendix 4.D.

¹⁷ We have discussed some of these sources above, such as credit from abroad, credit from the bond market and loans from other domestic sources like insurance companies, public funds and within the private sector.

¹⁸ See t Eitrheim, Klovland and Øksendal (2016, Ch. 8 and 9) for a detailed discussion.

4.4.2 Private banks' balance sheets across two centuries

Annual data for private banks' balance sheet across two centuries

Private bank lending in Norway was only briefly summarized in HMS I (Eitrheim et al., 2004). A reconstruction of the balance sheets of savings banks, 1822-1875, and of commercial banks, 1848-1900, was presented in detail in two chapters in HMS I (2007), Klovland (2007a,b).

Klovland (2007b) reconstructed end-of-year data for the balance sheets of individual savings banks from 1822 to 1875. The quinquennial savings bank statistics was supplemented by annual data from various sources, including the National Archive in Oslo, contemporary newspapers and books written about individual banks. Revised estimates of aggregate deposits, equity, total assets and loans for all years through 1918 can be found here. These data were corrected for errors and omissions in the published savings bank statistics of this period.

Similarly, Klovland (2007a) reconstructed the main end-of-year balance sheet items of individual commercial banks from 1848 to 1900. The coverage of the statistics on commercial banks published by Statistics Norway before 1900 is very incomplete, both with respect to banks included and balance sheet items. Additional data has been presented by Matre (1992a), and the new series in Klovland (2007a) on deposits, equity and loans further improve her estimates, in particular leading to higher growth rates during the early 1870s and the late 1890s.

In contrast to savings banks, which published reasonably complete balance sheets in this period, many commercial banks seem to have adopted a policy of secrecy, giving the public only partial or, sometimes, no information at all on their balance sheet items. Due to the incompleteness of published balance sheets for many commercial banks before 1900 estimates of total assets thus rest on an uncertain basis. In 2009 some crude estimates of the aggregated total balance for commercial banks were produced in order to estimate equity shares for all private banks from 1875 onwards. These estimates were made available in Norges Bank's HMS database in the section on money and credit data. In this subsection of the chapter we provide revised estimates for the aggregated total balance of commercial banks and some revisions of their total loans before 1918. The differences between these estimates and the previous ones are generally quite small, although with some exceptions. During periods where data points previously were interpolated in (Matre, 1992a), these data have been replaced by observed values. In comparison with Matre (1992a) the new estimates are in particular somewhat higher in the 1870s and in the late 1890s, reflecting the new information on individual banks in Klovland (2007a).

A stylized representation of private banks' balance sheet

One goal with this exercise is to present historical data matching a simple but yet coherent version of the balance sheet of savings banks and commercial banks since these financial institutions were established in the 19th century.

We consider the following stylized representation of assets and liabilities in the balance sheet of savings banks and commercial banks:

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$$\underbrace{L_t + OA_t}_{\text{Uses of funds}} = \underbrace{D_t + OF_t + EQ_t}_{\text{Sources of funds}} \quad (4.1)$$

On the liability side we distinguish between *deposits* D_t , *other funds* OF_t and *equity* EQ_t as *sources of funds* for the two bank groups. On the asset side their *uses of funds* distinguish between *loans* L_t and *other assets* OA_t , which are typically considered as being more liquid than bank loans.

The primary sources mentioned in Klovland (2007a,b) supplied information about deposits, equity and loans. Because the total balance was also known with a reasonable degree of precision for savings banks, this made it possible to estimate the residual items, *other assets* and *other funds*. On the basis of this representation of the balance sheet we can express the liquid asset ratio as $OA_t/(L_t + OA_t)$. We will comment more on this in a later paragraph.

In this study we present new and revised historical data for the total balance of commercial banks before 1918, which also allows us to present estimates of the two residual items, *other assets* and *other funds*, for commercial banks.

In some instances we have also noted that the amount of detail regarding bank deposits in the sources from which we have collected data after 1918 has been subject to changes, which we need to take into account to maintain consistency. One example is from Historical Statistics 1994 (Statistics Norway, 1995), which only reports one broad measure of total bank deposits, whereas earlier publications like e.g. Historical Statistics 1978 (Statistics Norway, 1978) reported up to five different types of deposits. We have maintained a definition of deposits that includes both demand deposits and time (savings) deposits held by the general public. Deposits from foreign and domestic financial institutions are included as part of *other funds*.

Another challenge regarding banking statistics in the 20th century is the frequent mergers and acquisitions which brought the number of banks down from around 750 in the 1920s to around 150 at the turn into the 21st century. There were frequent changes in Statistics Norway's publications on banking statistics during this period too. One problem was that it was not until the early 1950s that banking statistics covered all banks, for a long time the published monthly statistics represented 97-98 percent of commercial banks' balances and around 75-80 percent of savings banks' balances. The total balances for the two banking groups had to be estimated using adjustment factors. In Statistics Norway (1978) it is stated that the annual balances for commercial banks cover all banks from 1924 onwards.

Changes and revisions in banking statistics continued in the 1990s, in part because of the restructuring of banks which took place during and after the banking crisis 1988-1993. One example is the merger between *Norges Postsparebank* and *Postgiro* to form a new commercial bank *Postbanken* from 1 January 1995. In the sources we have used when compiling historical data series for the composition of the balance sheet of savings banks and commercial banks *Postbanken* was included as a commercial bank from 1991 onwards, causing an upward shift in the balance sheet.

We recall that the distinction between savings banks and commercial banks is only maintained up to and including 2002. From 2003 onwards we only publish balances for the sum of these two

groups, which we have called *private banks* to distinguish them from *state banks*. We also need to join *credit companies* (also called mortgage companies) together with *private banks* after the global financial crisis. We have therefore added tables with balance sheets for *private banks* and the joint *private banks plus credit companies* sector in Appendix 4.C.

Liquid asset ratios for savings banks and commercial banks

The incomplete reporting of the balance sheet of commercial banks in Klovland (2007a) presents a problem for the estimation of the liquid asset ratio for this group. However, for some of the major commercial banks, for which a complete set of annual accounts has been preserved, it would have been possible to reconstruct other items such as balances due to and from other domestic and foreign banks as well as their portfolios of securities.

Crude estimates of liquid assets held by commercial banks can be calculated in a similar way as those which were reported for savings banks in Klovland (2007b, p. 120). Liquid assets are estimated as the residual when we deduct outstanding loans from the total balance of commercial banks. Liquid assets consist of cash plus deposits with other banks (interbank deposits) plus securities. We note that these estimates will contain some items which ideally should have been handled separately, such as the bank's holdings of real estate, furniture and miscellaneous items like money boxes and other minor items. For savings banks it was reported in Klovland (2007b) that such assets only amounted to 0.8 percent of total assets in 1882.

Since we now have estimates of the total balances for both banking groups we can make comparisons such as in Figure 4.8, which shows the ratio of liquid assets to the total balance for savings banks and commercial banks from 1822 to 1914. One observation in Klovland (2007b, p. 120) was that savings banks adjusted their liquidity ratio upwards only gradually during the 1860s and 1870s, starting from a low level of 3-4 percent before the early 1850s. The liquidity ratio then fluctuated around 15-20 percent until the eve of World War I, although with a lower level in the 1880s. The main difference we observe between the two bank groups in Figure 4.8 is that the time of transition to a higher liquidity ratio is much shorter for commercial banks. We note that it only took until the middle of the 1850s before the liquidity ratio fluctuated around the 20 percent level and this lasted until World War I as it did for savings banks. But what happened with the ratio of liquid assets in the following part of the 20th century?

In Figure 4.9 we have merged the two groups of private banks together and we compare the aggregate liquid asset ratio for private banks alone (blue line) and merged with credit companies (red line). We note that the liquid asset ratio showed large fluctuations during the 20th century. The peak ratio was observed during the German occupation when ordinary bank lending almost stopped completely. During the period with financial repression after World War II the liquid asset ratio fluctuated between 30 and 40 percent. It was not until the rapid expansion of private bank lending following the deregulation of credit markets in Norway from the late 1970s onwards that the liquid asset ratio came down again to a level below 30 percent of the total balance of private banks. Interestingly, since the early 1990s the ratio hovered within the 20 to 30 percent range, which is not

4.4 Credit

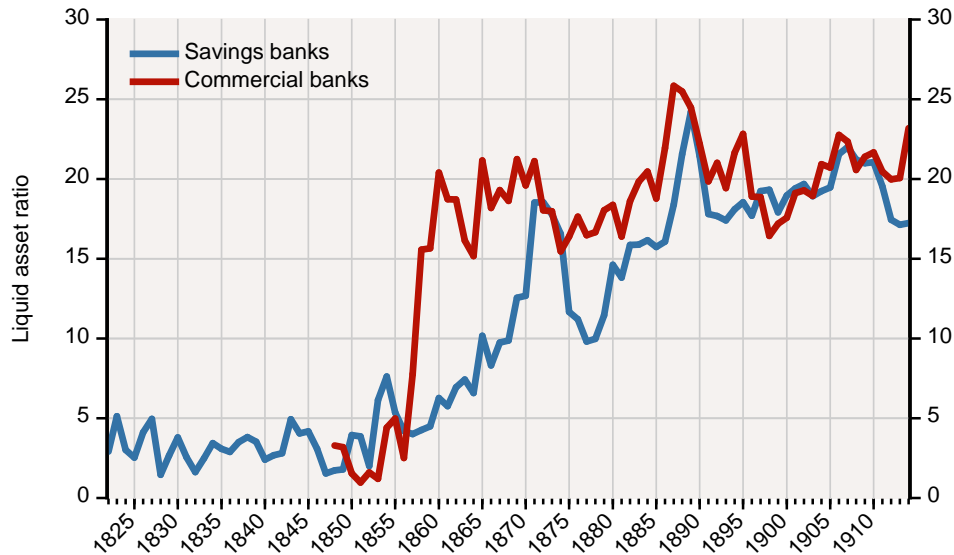


Figure 4.8 Liquid assets in percentage of total balances for savings banks and commercial banks, 1822-1914.

far from the level we observed in the beginning of the 20th century, around the eve of World War I, after the banking sector had finished a long period of expansion during the second half of the 19th century.

We now take a closer look at the historical balance sheet data for savings banks and commercial banks which are shown in the tables in Appendix 4.B. There are two sets of tables, first for the aggregated balance sheets of savings banks and commercial banks separately. These tables show assets and liabilities, respectively, from 1822 onwards until 2003 (assets in Table 4.A.3 and liabilities in Table 4.A.4). We have also included tables with historical data for all private banks (with and without the balance of credit companies included), see tables 4.A.5 (assets) and 4.A.6 (liabilities), respectively.

Figure 4.10 shows the main decomposition of assets and liabilities in savings banks (top) and commercial banks (bottom) across two centuries. Figure 4.11 shows the composition of assets and liabilities for the aggregated private banking sector alone (top) and when the balance of credit companies is included (bottom).

We see that the loan share of total assets largely develops in line with the deposit share throughout the 19th century, except during some short periods in the early 1850s and 1870s and in the 1890s when the loan share (the blue line) was higher than the deposit share (green area) and we observe a higher share of *other funding*. During the period of financial repression of private banks after World War II the deposit share fluctuated around a relatively stable level somewhat below 80 percent, but deposits then climbed to more than 80 percent of the total balance when credit policy was tightened

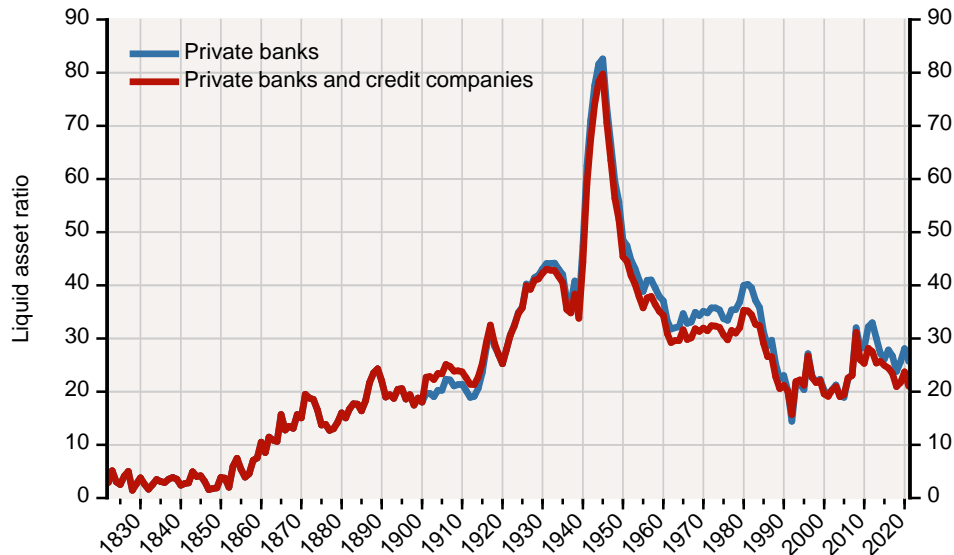


Figure 4.9 Liquid assets in percentage of total balances for private banks alone (blue line), and for private banks plus credit companies (red line), 1822-2021.

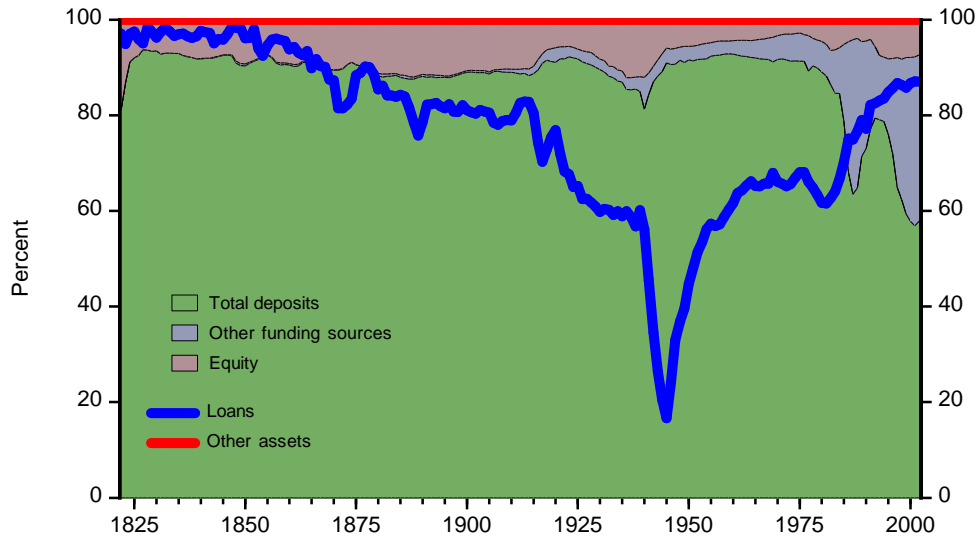
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

in the early 1970s. Financial deregulation changed this and we then observe a huge downward shift in the deposit share, starting in the late 1970.

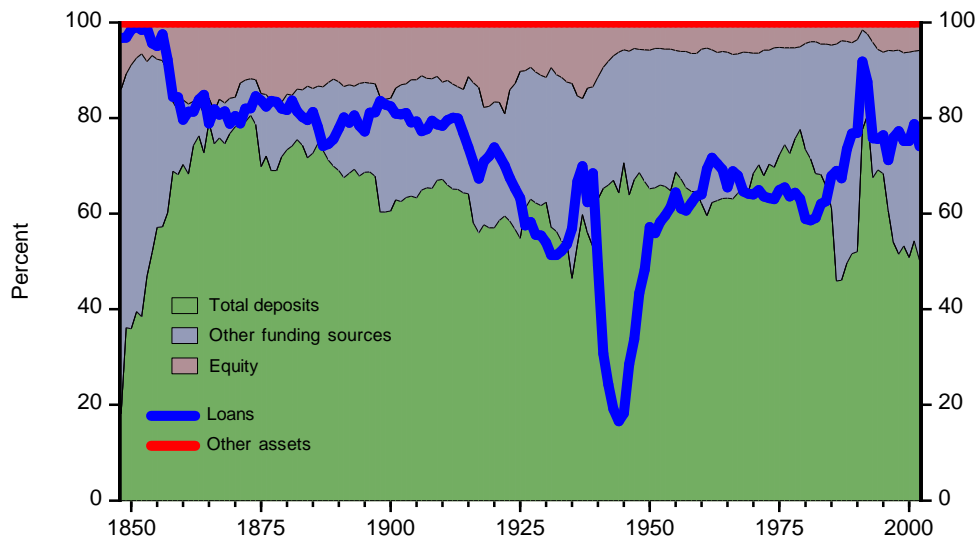
Around this time we note that the loan share increased rapidly. In part this loan expansion was funded in the short term money market (*other funding* increased its share from around 15 percent in 1975 to 40 percent in 1985). These developments can be observed for both savings banks and commercial banks, but are more pronounced for the latter group. For savings banks we only observe small shares of other funding than deposits until the mid-1970s. We may also note that around the end of the 20th century there were only minor differences in the funding structure of the two bank groups. And from 2003 onwards we have observed that it is not meaningful to distinguish between savings banks and commercial banks when forming these aggregates.¹⁹

¹⁹ See Section 4.1 for a brief overview of the private banking sector in Norway.

4.4 Credit



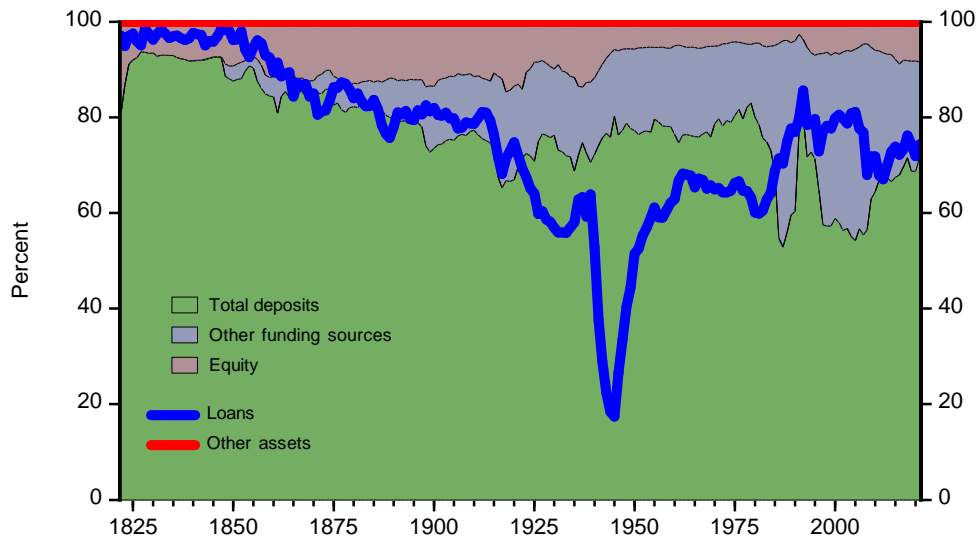
(a) Savings banks (i)



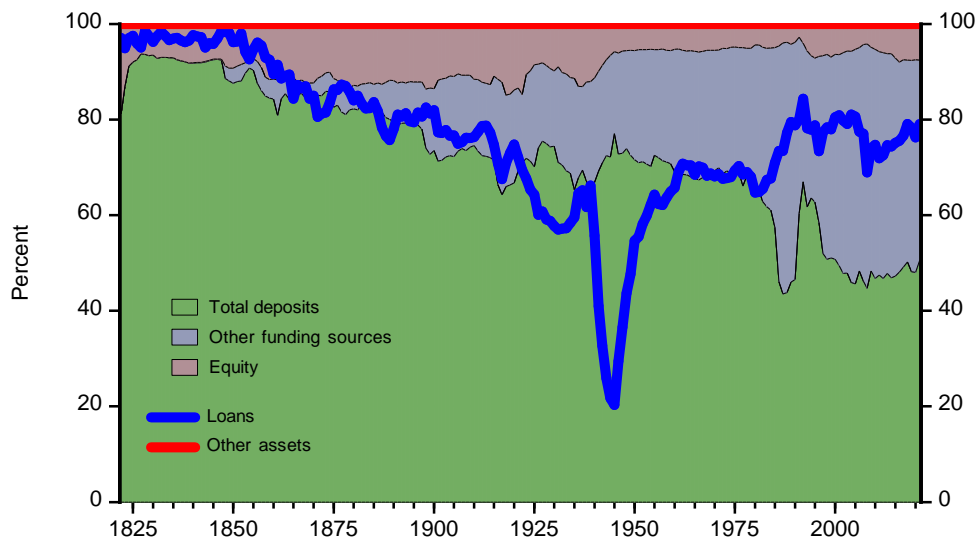
(b) Commercial banks (ii)

Figure 4.10 Estimates of the aggregated balance sheet for savings banks and commercial banks, respectively, across two centuries. Assets consist of loans (blue line) and other assets. Liabilities consist of customer deposits (green area), other sources of funding (blue area) and equity (red area).

Money and credit, composite historical data series spanning two centuries



(a) Private banks (i) + (ii)



(b) Private banks (iii) and credit companies (iv)

Figure 4.11 Estimates of the aggregated balance sheet for private banks (savings banks and commercial banks) across two centuries. Credit companies have been included in the 20C (bottom figure). Assets consist of loans (blue line) and other assets. Liabilities consist of customer deposits (green area), other sources of funding (blue area) and equity (red area).

4.4 Credit

Monthly data for deposits and loans from January 1913 onwards

We have collected monthly data for deposits and loans from the aggregated balance sheet of private banks for a period which goes back to January 1913. The data have mainly been recorded by Statistics Norway and were published in their publications on banking statistics for *savings banks* and *commercial banks* (originally denoted as limited liability banks ("aksjebanker") until they were denoted as *commercial banks* ("forretningsbanker") in Statistics Norway's publications from 1956 onwards). From 2003 onwards we only observe aggregated balance sheet data for the sum of the two banking groups and we denote these as *private banks*.²⁰

The data are shown in Figure 4.12. In the early years Statistics Norway only reported total loans and deposits for the major savings banks and commercial banks. In the late 1940s and early 1950s the rate of coverage of the monthly banking statistics was 97-98 percent of the total balances for commercial banks and 75-78 percent of the total balances for savings banks. On the basis of the monthly figures Statistics Norway published tables with estimates of the aggregated total balance sheet of all private banks. From 1953 onwards Statistics Norway provided estimates of loans and deposits for all banks in each of the two groups.

We have constructed composite monthly data series for total deposits and total loans from the aggregated balance sheet of all private banks as well as for each of the two banking groups separately, starting in January 1913. We have taken into account the changes and revisions we have observed in the reports on banking statistics from Statistics Norway throughout this period.²¹

We have illustrated these changes and revisions in the reported levels of monthly deposits and loans to the general public in the blue-shaded areas shown in Figure 4.12(a) and Figure 4.12(b). The shaded areas denote the spread between the highest and lowest estimates of loans and deposits, respectively, in each month since January 1913. We note that the revisions over the past century seems to have been of a relatively smaller order of magnitude for loans than for deposits.

For deposits these revisions were on a couple of occasions of a larger order of magnitude. We have also observed examples of both upward and downward revisions in aggregated bank deposits. For a period in the 1970s, for example, Statistics Norway changed the definitions of deposits and reported deposits for a group called "private persons and businesses", starting around 1977. End-of-year adjustments were made for earlier years back to 1967.²²

From 1980 onwards the definitions of deposits were changed again and were reported for a group called "customers". End-of-year adjustments were made for earlier years back to 1969.²³ The size of these revisions are shown in Figure 4.12 and Figure 4.13.

The average level of deposits was reduced with between 15 and 25 percent for all private banks

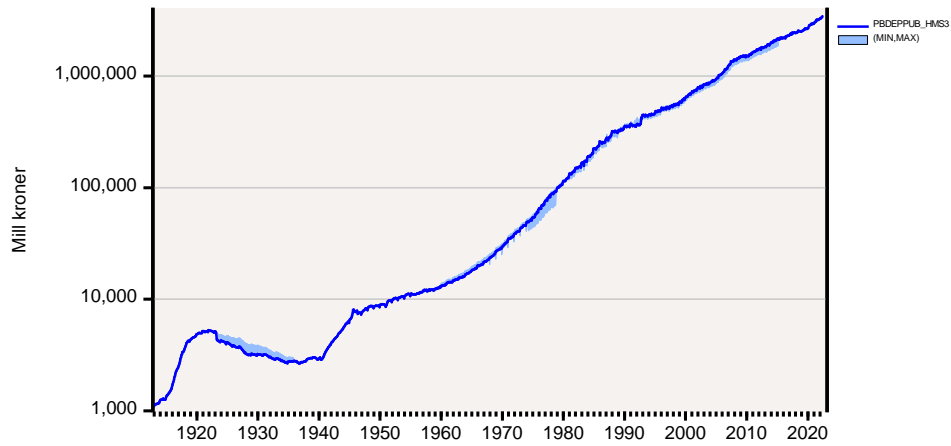
²⁰ The reason for this was that the distinction between the two banking groups became meaningless after DNB, Norway's largest financial services group, was created in 2003 through a merger between the largest commercial bank in Norway at the time (DnB) and Gjensidige NOR, which originated from a previous merger between a savings banks and a life insurer.

²¹ For this study we evaluated revisions of loans and deposits reported for the 1970s, 1980s and 1990s based on the following monthly statistical bulletins from Statistics Norway: 1971:01,1972:01,1973:01,1974:01,1975:01,1976:01, 1977:01,1980:01,1990:01,1997:01.

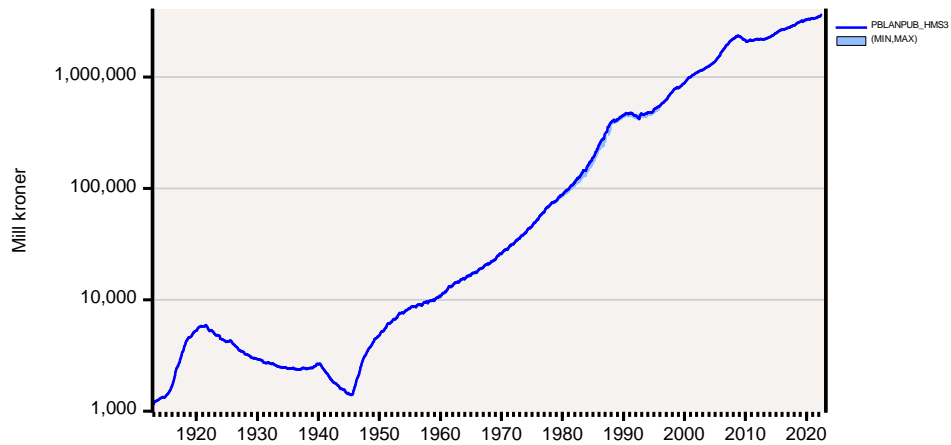
²² Statistics Norway, monthly statistical bulletin 1977:01

²³ Statistics Norway, monthly statistical bulletin 1980:01

Money and credit, composite historical data series spanning two centuries



(a) Deposits



(b) Loans

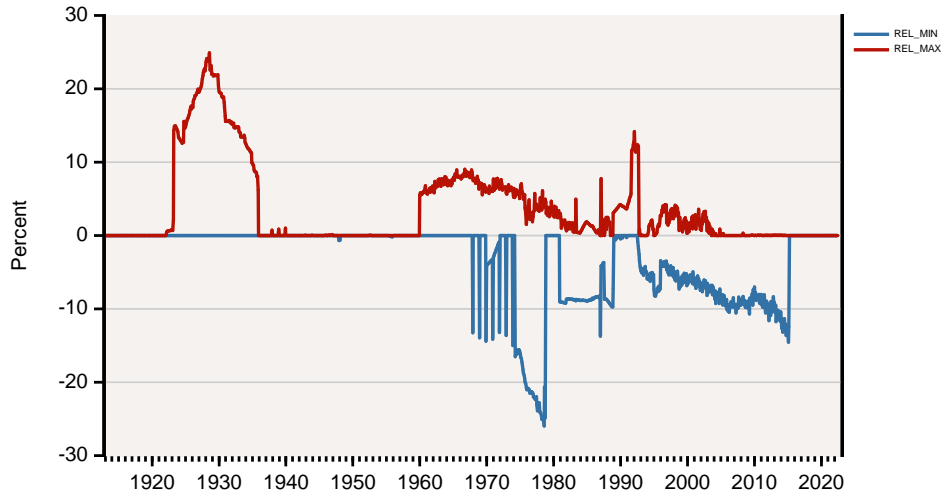
Figure 4.12 Deposits (top) and loans (bottom) from private banks (savings banks and commercial banks). Monthly data since January 1913.

as a group between 1967 and 1978. For commercial banks the reduction was from around 25 to 35 percent whereas the reduction was only around 3-4 percent for savings banks.

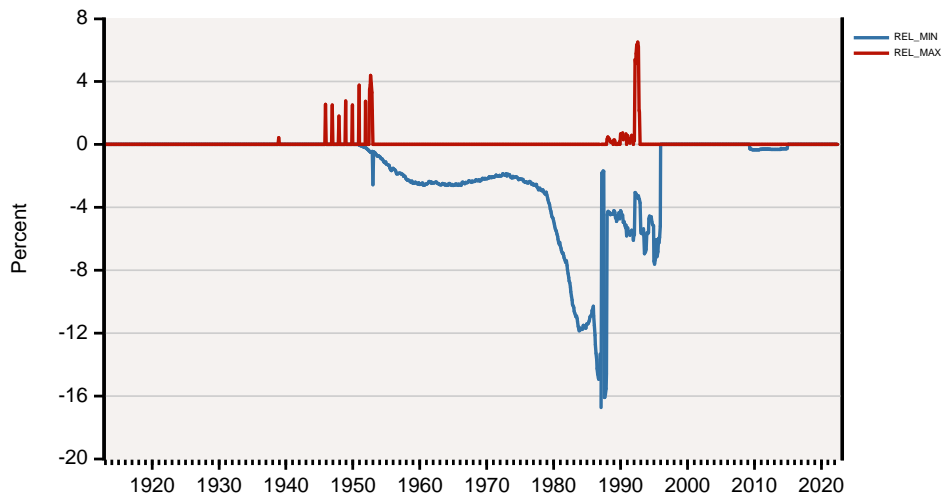
The quality of banking statistics came in particular under scrutiny during the middle of the 1980s after several years with rapid expansion of bank loans following the deregulation of private banks in Norway during the late 1970s and early 1980s. There were numerous examples of banks underreporting lending, and for some of these years the data were later subject to large upward revisions.

Changes and revisions in banking statistics continued in the early 1990s. This was in part because

4.4 Credit



(a) Deposits



(b) Loans

Figure 4.13 Relative deviations between the largest and smallest observations of aggregated deposits (top) and aggregated loans (bottom), respectively, and our preferred measure of composite time series data for these variables. Monthly data for deposits and loans from private banks (savings banks and commercial banks) since January 1913.

of the restructuring of banks which took place during and after the banking crisis 1988-1993. One example is the merger between *Norges Postsparebank* and *Postgiro* to form a new commercial bank *Postbanken* from 1 January 1995. We have constructed separate monthly data series for loans from

Money and credit, composite historical data series spanning two centuries

each of these three different financial institutions, i.e. from savings banks, commercial banks and from Postbanken. The composite break-adjusted loan series in Figure 4.12(b) shows an aggregated data series which combines all loans to the general public from these financial institutions.

4.4 Credit

4.4.3 The rise and fall of state banks

The first state bank in Norway was established by the government already in 1828 to ease credit conditions following the international 1825 crisis. In an extraordinary session of the parliament that year it was decided to raise a foreign loan to help boost domestic lending through state discount commissions, which in turn were established in the major cities (Egge, 1988). The remaining part of the government loan was used to increase Norges Bank's silver reserves and hence its lending capacity. We have commented on this episode in Chapter 2. In addition to the silver deposits made by the government, which had an instant effect on the bank's lending capacity, it was also decided to increase Norges Bank's equity. We recall that this increase in the bank's equity took time and was not finished until 1835.

A major addition to state bank lending started in the early 1850s when *Hypotekbanken* was established (Kaartvedt and Hartsang, 1952). Hypotekbanken would soon take over as the main provider of mortgage loans in the country. When Hypotekbanken was established in 1851, this was a remedy to fix the lack of long-term credit supply. Similarly, the government's remedy for some of the later state banks was also to establish new institutions for particular purposes and goals. These were typically set up with some equity and entrusted with a state guarantee. Thereafter it was pretty much market-based banking.²⁴

Before the World War II state banks had funded their lending activities mainly by issuing bonds in the market. The subsidy element was limited and indirect, confined to passing on the advantage that their state guarantee rendered when placing bonds. The state banks were able to fund their lending during the early postwar years through the same channel, at least as long as there was a huge monetary overhang in the economy. As this source dried out however, the state banks were in need of new funding channels. In the beginning the government could help out by drawing on their folio deposits in Norges Bank, which were used to fund state banks through 1949-1951 in part by ear-marking deposits for this purpose.

However, as Figure 4.14 shows, this was not sufficient to fund the huge increase in state bank lending, which brought state bank loans, measured in percent of GDP from around eight percent during the late 1940s to around 20 percent from 1960 onwards.

We conclude that state banks after 1945 increasingly relied on government funding. In practice the government would run a budget surplus before lending operations and channel this surplus into state bank through deposits. Figure 4.14 shows that funding through government deposits was the dominating source of funding for state bank expansion already from the early 1950s onwards.

During the first postwar years, reflecting the impact of monetary ease, state banks lost out relatively to private banking. The new state banks established after 1945, however, were used actively as government instruments to direct credit into prioritized sectors. The recipients were not only privileged in the sense that they gained access to lending resources, they also received considerable direct

²⁴ This section describes the main trends of development in the Norwegian state bank sector across the past two centuries on the basis of material from different chapters in Eitrheim, Klovland and Øksendal (2016). Our main goal is to present some background and context for the development in the historical data on state bank lending over this period, which shows the rise and fall of state banks.

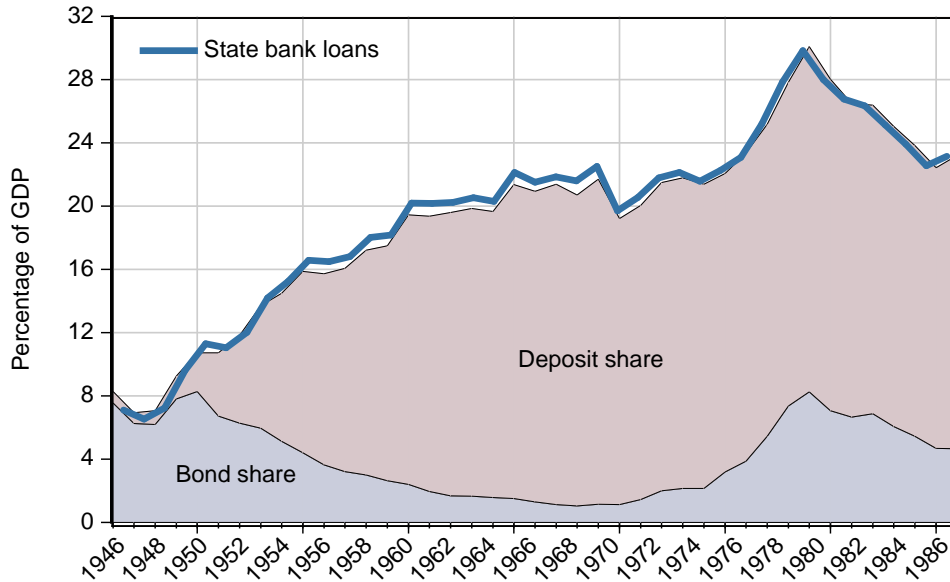


Figure 4.14 State bank funding and loans (in per cent of GDP) 1946-85
Source: Statistics Norway

subsidies in the form of low interest rates for the areas of highest priority like education and housing, in addition to indirect subsidies from state guarantees.

From 1950 onwards state banks steadily captured market shares at the expense of private banks until their peak market share was reached around 1980. This was achieved by active credit policy measures which strongly promoted state bank lending at the expense of restricted lending by private banks. In the beginning this was achieved through coercion in negotiations with the government, later on also through new regulatory instruments in the 1965 Credit Act, which was used actively in the 1970s inducing private banks to restrict their direct lending and instead purchase government bonds.

Figure 4.15 shows how bond holdings by private banks increased after the introduction of the Credit Act, in particular from 1969 onwards when the use of the new regulatory instruments were tightened. Commercial banks' share of bond holdings increased (in per cent of their total balance) from 6.2 per cent in 1962 to a peak at 26.3 per cent in 1979. This happened to coincide with the timing of the peak of state bank lending, measured in per cent of total lending, indicating how the private banks' lending capacity, in particular with respect to the commercial banks, was repressed in this period.

To get a feeling for how these subsidies developed over time, Figure 4.16 shows that until 1955 the weighted average lending rate on state bank loans was around 50 basis points below the long-term government bond rate. As we have noted above, however, the government tightened monetary policy

4.4 Credit

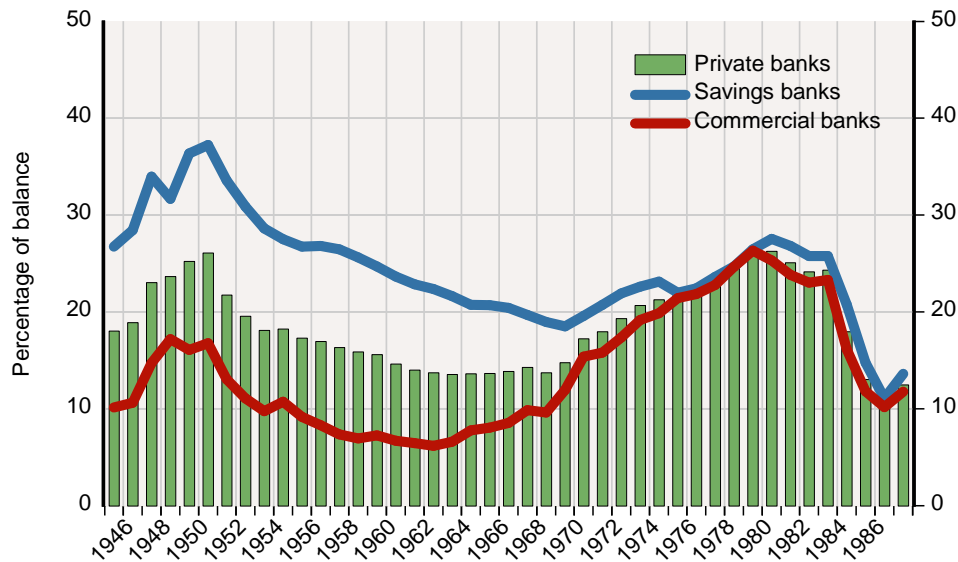


Figure 4.15 Private banks' holdings of state and state guaranteed bonds, in per cent of their balance.

in February 1955, allowing the bond rates to increase, but we see that the state bank lending rates were adjusted upwards only slowly, and this increased the direct subsidies. The difference varied around one percentage point in the 1960s and hovered around two in the 1970s.

Historical data for state bank lending, measured in percent of GDP, is shown in Figure 4.17. We have collected data on outstanding loans from the early state banks (the state discount commissions and the state mortgage bank (Hypotekbanken)), from Egge (1988) and Kaartvedt and Hartsang (1952), respectively. For state banks which were established in the 20th century we have collected data on their lending from Statistics Norway's publications. We report data for outstanding loans from each individual state bank from the year they started lending until 1976. In the more recent versions of publications from Statistics Norway, however, only aggregated data are available for total loans from all state banks.

In the early years the total amount of state bank lending was very limited. When Hypotekbanken appeared in 1852 it specialized in mortgage lending and eventually became the largest single provider of long-term credit in the country. The main period of growth in state bank lending started however first after World War II. Figure 4.17 shows the strong growth in aggregated state bank lending which took place then, with the state housing bank as the main contributor to this development, in particular in the 1950s.

State bank lending turned out to be the dominating factor behind credit growth in the post World War II era. This reflects both that the state banks became important instruments to provide loans to prioritized sectors in this period but also that the period involved financial repression of private banks. The state bank sector encompasses many different types of institutions, which were estab-

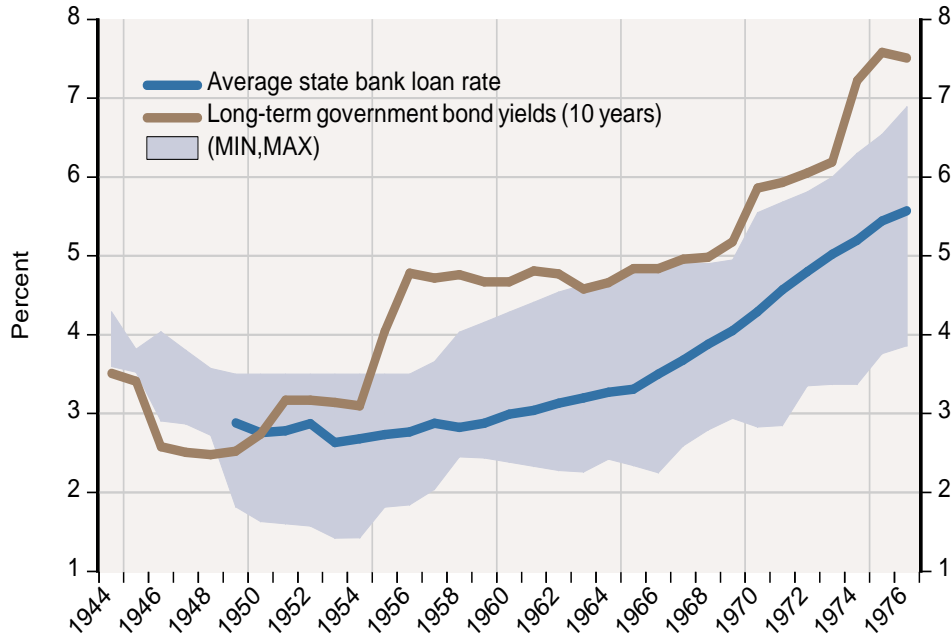


Figure 4.16 State bank interest rates 1944-76. Source: Statistics Norway

lished at different times and for different purposes. We have provided a brief overview of these institutions in Table 4.1 below, indicating the main sector for which these institutions were established and the first year in which lending took place.

A *State housing bank*, which was established short time after World War II (Reiersen and Thue, 1996), soon became the dominating bank which financed housing investments. Soon other state banks followed, one important example is the *State education bank*. Table 4.1 list the main state banks for which we have collected data in this study.

The peak of aggregated state bank lending was reached around 1980 and the decline had already started from a level between 20 and 25 percent of GDP when the change in government policies mentioned above were implemented after 1995. In recent years state bank lending has fluctuated around 10 percent of GDP.

The lending activities of state banks has in recent years primarily concentrated on student loans, some municipal credits and housing for those with special needs. This came after a change in government policies following a 1995 Royal Commission inquiry into the state bank system.²⁵

²⁵ Norwegian Official Reports no. 11 (1995), *A new framework for state banks* [authors' translation of the Norwegian title "Statsbankene under endrede rammevilkår"].

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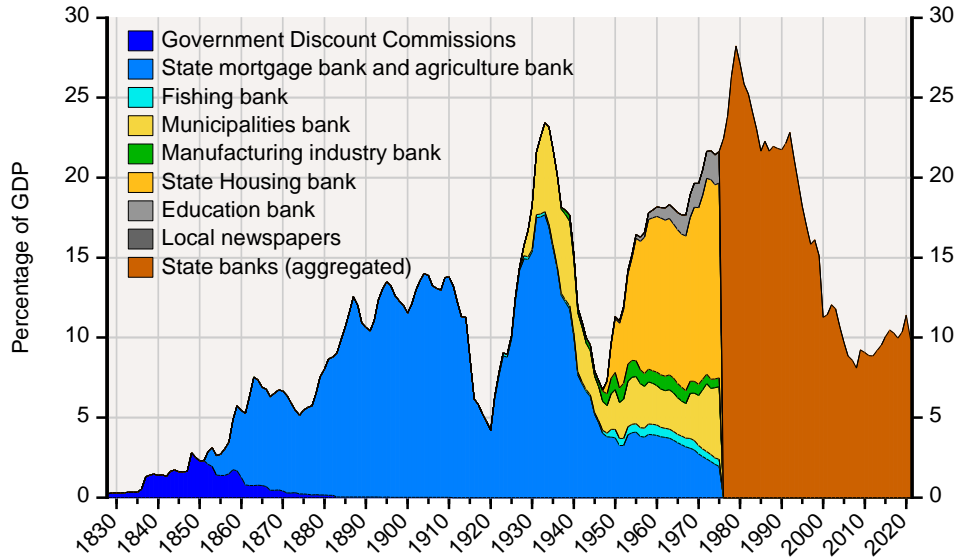


Figure 4.17 State bank lending, 1828-2021. Sources: Egge (1988), Kaartvedt and Hartsang (1952) and Reiersen and Thue (1996), Statistics Norway, Table 07880: Balance sheet of state lending institutions (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Table 4.1 *State banks in Norway, 1828-2021*

Abbrev.	First year	State bank
GDC	1828	Government Discount Commissions
HYP	1852	State mortgage bank (Hypotekbanken) and agriculture bank
WHB	1903	Workers' housing bank
SFH	1918	Small farmers' housing bank
FSH	1921	Fishing bank
MUN	1928	Municipality bank
FAB	1933	Farmers' bank
FIB	1936	Fishermens' bank
MAN	1936	Manufacturing industry bank
FOC	1928	Farmers' Overdraft Credit
HOU	1947	State housing bank
EDU	1948	State education bank
AGR	1966	Agriculture bank (merger with Hypotekbanken)
RUD	1968	Rural districts' development fund
NWS	1973	Local newspaper bank

4.4.4 Loans from financial institutions

We have provided quite detailed accounts of the lending activities of a wide range of financial institutions, starting with loans from Norges Bank from 1818 onwards in Chapter 2. In this chapter we have followed up on this and provided an overview of the development in loans from state banks and private banks in previous sub-sections in Chapter 3. *Private banks* consist in our terminology simply of aggregating *savings banks* and *commercial banks* and we have noted above that the distinction between these two groups became meaningless, at least from the perspective of collecting data for their aggregated balance sheet, from 2003 onwards. In addition we have observed from the global financial crisis in 2007-2008 onwards that we need to combine the balance sheets of *private banks* and *credit companies* since many banks at that time changed the composition of their portfolio and placed a large part of their mortgage lending in bank-owned credit companies, which are to a large extent funded by covered bonds issued by the *credit companies* and held by these banks. It is therefore necessary to look at the combined balance sheet of private banks and credit companies to gauge the total lending development originating from private banks after 2007-2008.²⁶

The figures 4.18 and 4.19 show the major historical developments in total loans from different types of financial institutions in Norway since Norges Bank was established as the first bank in the country in 1816. The two figures show the decomposition of the supply of loans in percent of GDP and in percentage shares of the total supply of loans, respectively.

The first loan entry in Norges Bank's books was made in late 1817 when its first batch of banknotes made in the new currency unit *speciedaler* was sent to the Temporary Riksbank and the substitution of old riksbankdaler banknotes with new speciedaler banknotes could begin.²⁷

I Before 1850: Norges Bank the main supplier of loans

Norges Bank was established as a bank of issue but was also the first Norwegian bank to provide credit to the general public in the aftermath of a long fight with Denmark about the right to establish a Norwegian bank, an issue which had been on the table during the final decades of the Dano-Norwegian union (Austnes, 2016). Figure 4.19 shows how Norges Bank started out as the dominating provider of credit in the early years covered by part I (1816-1850), with a market share of 90 per cent of total (institutional) credit in 1830, before it gradually developed into one bank among other banks during the period of rapid expansion of private banks around the middle of the 19th century.

²⁶ At the time of the global financial crisis in 2007-2008 the regulations of banks had very recently been changed and many banks had therefore both the opportunity and incentives to adapt to this new business model. An important instrument used by the monetary authorities to help banks with medium-term funding during this crisis was a swap arrangement whereby banks could exchange covered bonds (denoted as OMFs in Norwegian) for treasury bills. We refer readers to Eitrheim, Klovland and Øksendal (2016, pp. 571-572) for more details about this arrangement which was referred to by contemporary observers by the moniker "gold card", which became available for banks which had access to sufficient amounts of covered bonds issued by bank-owned credit companies and secured in the portfolio of mortgage loans which were transferred from private banks to these credit companies.

²⁷ See Chapter 2 for details, cf. e.g. Figure 2.11.

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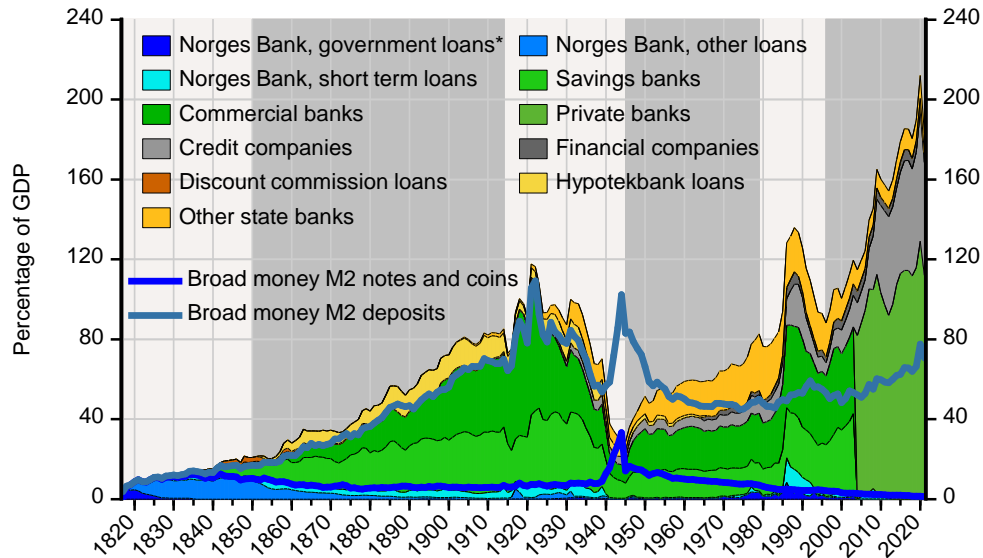


Figure 4.18 Total supply of loans from financial institutions, 1817-2021, in percentage of GDP. Norges Bank's loans to the government exclude the occupation account during WW2 but include *domestic securities*, and its short-term loans include *domestic FX claims*. The shaded areas refer to the periods described in the text. Broad money M2 is shown as a stacked sum of currency (notes and coins) and bank deposits.

II 1850 - 1914: The coming of private banks

In 1850 the total volume of credit in the economy still amounted to only 20 per cent of GDP, with Norges Bank as the provider of more than half of that amount. Norges Bank had started to increase her supply of discount credit at the expense of building down her stock of mortgages. This trend was reinforced in the following decades. A state bank, *Hypotekbanken*, was established in 1851 and became the main provider of mortgage credit only a decade later. Private banks soon expanded their credit to such an extent that at the turn of the century, when the total amount of credit had risen to 70 per cent of GDP, an amount equivalent to 55 per cent of GDP was private bank credit. Figure 4.18 shows that this credit expansion was closely mapped by a similar growth in bank deposits, and henceforth in broad money M2, which had increased to around 70 per cent of GDP at the eve of the World War I. Norges Bank was at this stage only a marginal supplier of credit to the general public. The amount of notes and coins in circulation among the general public varied in the interval 5-9 per cent of GDP from 1860 until World War I. When the war came Norges Bank had developed from being the bank of issue and dominating domestic supplier of credit to become a bank *for* the other banks, and Norges Bank had also, in connection with the financial crisis in Kristiania at the turn of the century, taken on the role as *lender of last resort*. Norges Bank had become a *central bank*.

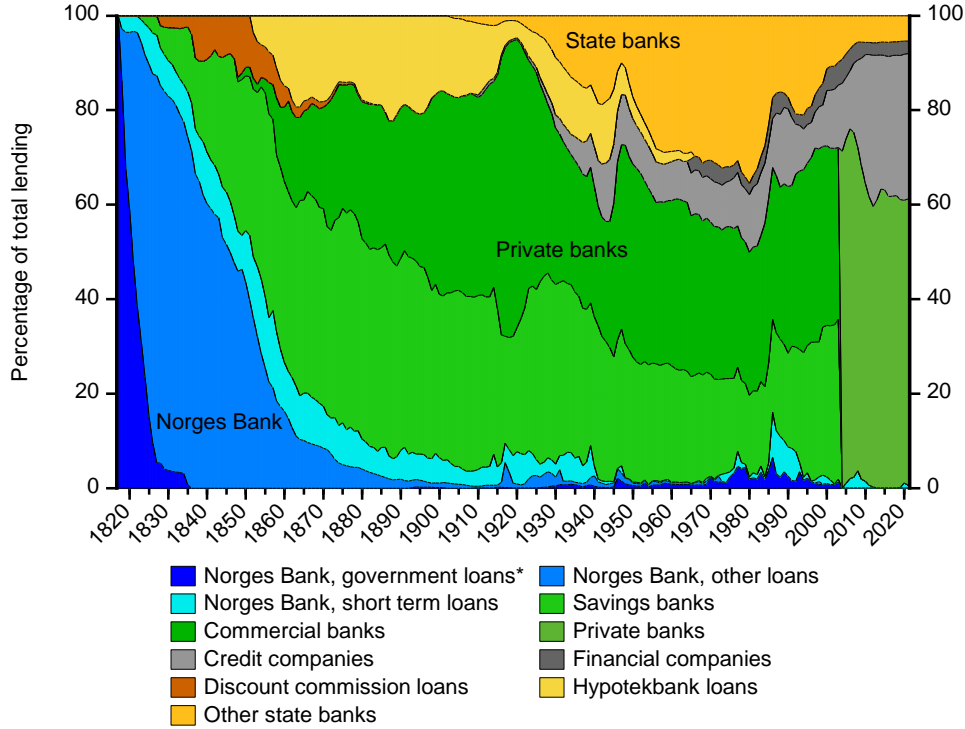


Figure 4.19 Total supply of loans from financial institutions, 1817-2021. Distribution (in percentages) of total loans from different sources. Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

III 1914 - 1945: Turbulent times for the banks

The period during World War I and the interwar period was a turbulent period for banks. First came a period with rapid build-up of new banks during the war years, fueling a speculative bubble with easy credit, which eventually tapered off towards the end of the war. When the post-war recession hit, the bubble burst. The banking crises of the 1920s and early 1930s resulted in a rapid decline in bank credit. We have also seen that deposits in banks under administration were frozen and excluded from M2 deposits. Total loans, measured in per cent of nominal GDP, had reached a peak in the early 1920s around 110 per cent. Over the next 25 years the credit to GDP ratio declined to a level below 25 per cent at the end of the war in 1945. The decline came in three phases, first during the systemic banking crisis in the 1920s, second when GDP growth picked up in the 1930s without a

4.4 Credit

corresponding growth in credit, and third, when credit dropped sharply during the five war years 1940-1945.

IV 1945-1980: The heydays of state banks

During the years of financial repression the main sources of credit growth from 1950 onwards were loans from state banks, which grew from 7.8 % of GDP in 1945 to 28.2 % of GDP in 1979. In the same period credit from private banks hovered around 35 % of GDP following a rapid catch up in private bank lending in the years 1945-1950 before financial repression gradually kicked in.²⁸ Figure 4.18 shows that loans from private banks increased at around the same rate as nominal GDP during most of this period, it was primarily loans from the state banks which brought the total level of loans above 70 percent of GDP around the middle of the 1970s. At this time loans from non-bank private financial institutions also became more important, in particular lending from credit companies in the 1970s and from finance companies in the 1980s. These sources of credit are indicated with the gray-coloured areas in Figure 4.18.

V 1980 - 1995: Liberalization and decoupling

A gradual liberalisation of credit markets started in the late 1970s and laid the ground for a rapid build up of bank credit. The old credit rationing instruments which had been used in the years of financial repression were not effective when the government tried to stem the pent-up demand for bank credit and the result was a massive boom to bust cycle. From the late 1970s onwards we also note the decoupling of private bank lending from M2 bank deposits held by the general public (Figure 4.18). The rapid growth in bank lending was fuelled by short-term domestic and foreign borrowing by banks in a growing interbank money market. But these sources of short-term borrowing exposed the banks to liquidity risks and in 1986 foreign lending to Norwegian banks fell significantly following collapsing oil prices. A massive injection of short term central bank liquidity to the private banks was then made by Norges Bank.²⁹ Figure 4.18 shows how central bank loans quadrupled (in percent of GDP) from five percent in 1985 to more than 20 percent in 1986. Additional liquidity was supplied during the systemic banking crisis during the period 1988-1993 before the central bank credit balance was reduced again to a level below 3 % in the middle of the 1990s.

VI After 1995: Consolidation and internationalization

State bank lending decreased gradually from around 20 percent of total loans in the mid-1990s to a level which stabilized around five percent of total loans from the 2010s onwards. During the

²⁸ See Chapter 11-12 in Eitrheim et al. (2016) for details and discussion of the policy regime characterized by low interest rates and credit rationing in a system based on financial repression, primarily of private banks, and the rise of the state bank sector.

²⁹ See Chapter 13-14 in Eitrheim et al. (2016) for details and discussion of the transition from regulation to markets in this period and the change in the policy regime that took place from 1986 onwards. After a decade with frequent devaluations of the Norwegian krone the monetary policy regime was changed in 1986 to a commitment to maintain fixed exchange rates. Norges Bank was given the task of defending the exchange rate target and regained operational independence with respect to determining the interest rate level. The main instrument used by the bank to achieve this end is through the setting of the key policy rate and the use of liquidity-regulating instruments to implement this interest rate level in the short-term (interbank) money market.

global financial crisis from 2007 we saw a temporary increase in central bank credit that amounted to 5.5 percent of GDP in 2008. After the global financial crisis we have also seen a shift in the distribution of loans from private banks to credit companies, which in many cases are owned by banks. It is therefore necessary to adopt a consolidated view on total lending incorporating the joint sector of private banks and credit companies. We have provided aggregate balance sheet data that serves this purpose in this study and refer to the data appendix for a detailed overview. From the mid 1990s onwards there have also been important changes in the ownership structure of some of the largest banks in Norway. Norway's oldest bank, started as Christiania Bank og Kreditkasse, became a daughter bank within one of the largest Nordic bank groups Nordea. Fokus Bank became a subsidiary of Danske Bank whereas DNB maintained its position as Norway's largest financial services group.

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4.A Appendix, Money aggregates and their components

We have discussed monetary aggregates and their subcomponents in Section 4.3, cf. figures 4.3, 4.4, and 4.6. Table 4.A.2 shows the development in these components from 1813 onwards. All data series are measured in million kroner, although we need to be reminded of the conversion between kroner and speciedaler in 1874 (1 speciedaler = 4 kroner) and the conversion between speciedaler and riksbankdaler in 1816 (1 speciedaler = 10 riksbankdaler). Table 4.A.2 is also set up such that the columns contain different types of monetary instruments in different time periods. This is indicated in Table 4.A.1, which shows the use of these different monetary instruments. One category of instruments is the old bank notes from the union period, and the riksbankdaler bank notes issued by the Temporary Riksbank before Norges Bank was established. Most of these bank notes were out of circulation by the end of 1820, with the exception of some *discount notes* that were out of circulation in 1824 (cf. Section 2.3). We have chosen abbreviation codes for all the monetary instruments for which we have collected data in this study.

Table 4.A.1 *Monetary instruments, 1813-2021*

Abbrev.	First year	Last year	Monetary instrument
CO	1813	2021	Coins
UN	1813	1819	Union Notes (in Danish Courant and Assignates)
RBD	1813	1819	Riksbankdaler
RN	1814	1815	Regency Notes
DN	1816	1824	Discount notes (in speciedaler)
SPD	1818	1876	Norges Bank's bank notes in speciedaler
NOK	1877	2021	Norges Bank's bank notes in kroner
TD	1822	2021	Time Deposits/other deposits
DD	1848	2021	Demand Deposits/transaction deposits
FD	1923	1945	Frozen Deposits
UC	1960	1999	Unused credit lines
CD	1992	2021	Certificates of Deposits
MM	1995	2014	Money Market funds
			Monetary aggregates
M1	1813	2021	Narrow money
M2/M3	1813	2021	Broad money (break-adjusted)

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank SPD NOK		TD	DD	FD	UC	CD	MM	M1	M2
1813	1.200	1.545	1.275											2.475	2.475
1814	1.272	1.536	7.319	0.535										8.591	8.591
1815	1.343	0.597	10.140	0.207										11.483	11.483
1816	1.415	0.193	10.883		3.228									12.298	12.298
1817	1.487	0.094	9.523		2.990									11.010	11.010
1818	1.559	0.081	0.582		2.100	10.146								12.287	12.287
1819	1.630	0.068	0.036		1.365	12.460								14.158	14.158
1820	1.803				0.608	13.304								15.107	15.107
1821	2.176				0.416	13.978								16.154	16.154
1822	2.210				0.278	14.034		0.017						16.244	16.261
1823	2.229				0.181	14.033		0.123						16.262	16.385
1824	2.690				0.020	14.472		0.268						17.162	17.430
1825	2.636					15.871		0.455						18.507	18.962
1826	2.583					16.065		0.701						18.648	19.349
1827	3.147					16.318		0.801						19.465	20.266
1828	2.996					17.040		0.993						20.036	21.029
1829	2.896					17.655		1.243						20.551	21.794
1830	2.852					19.288		1.531						22.140	23.671
1831	2.828					19.326		1.744						22.154	23.898
1832	2.867					18.969		2.116						21.836	23.952
1833	2.712					19.875		2.480						22.587	25.067
1834	3.072					20.376		2.941						23.448	26.389
1835	3.073					20.807		3.491						23.880	27.371
1836	3.112					21.531		3.882						24.643	28.525
1837	2.930					20.972		4.555						23.902	28.457
1838	2.759					20.222		5.075						22.981	28.056
1839	2.609					22.182		5.727						24.791	30.518
1840	2.499					22.064		6.688						24.563	31.251
1841	2.381					22.395		7.573						24.776	32.349
1842	2.441					23.179		8.784						25.620	34.404
1843	2.297					22.384		10.217						24.681	34.898

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank		TD	DD	FD	UC	CD	MM	M1	M2
						SPD	NOK								
1844	3.380					22.157		11.730						25.537	37.267
1845	4.162					23.014		13.547						27.176	40.723
1846	4.875					23.123		15.650						27.998	43.648
1847	5.566					21.921		17.001						27.487	44.488
1848	5.827					18.723		16.139	0.009					24.559	40.698
1849	5.948					18.671		16.139	0.026					24.645	40.784
1850	6.418					19.560		17.085	0.032					26.010	43.095
1851	6.112					20.538		19.225	0.045					26.695	45.920
1852	6.075					20.858		21.646	0.052					26.985	48.631
1853	6.127					26.912		25.543	0.053					33.092	58.635
1854	6.129					30.352		32.003	0.073					36.554	68.557
1855	6.533					30.528		36.802	0.136					37.197	73.999
1856	6.921					28.765		41.629	0.323					36.009	77.638
1857	7.137					26.211		40.725	0.412					33.760	74.485
1858	6.664					25.634		47.775	0.965					33.263	81.038
1859	6.268					23.541		52.124	1.063					30.872	82.996
1860	5.846					24.889		59.499	1.497					32.232	91.731
1861	5.678					24.267		64.246	1.674					31.619	95.865
1862	5.705					25.921		75.025	2.239					33.865	108.890
1863	5.324					25.348		84.350	2.492					33.164	117.514
1864	5.512					24.357		86.180	2.177					32.046	118.226
1865	5.622					27.045		99.218	2.983					35.650	134.868
1866	5.253					26.277		97.641	2.535					34.065	131.706
1867	5.094					27.236		105.674	2.976					35.306	140.980
1868	5.230					24.542		108.686	3.044					32.816	141.502
1869	5.219					25.290		113.620	3.427					33.936	147.556
1870	5.018					26.478		119.597	3.642					35.138	154.735
1871	4.902					31.554		135.614	4.686					41.142	176.756
1872	4.772					36.173		147.979	5.229					46.174	194.153
1873	4.713					44.024		168.546	5.755					54.492	223.038
1874	4.418					42.602		189.032	6.202					53.222	242.254

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank		TD	DD	FD	UC	CD	MM	M1	M2
						SPD	NOK								
1875	4.242					34.328		184.296	5.446					44.016	228.312
1876	4.266					36.008		198.370	6.223					46.497	244.867
1877	4.424						32.126	199.046	5.984					42.534	241.580
1878	4.161						28.014	199.416	6.105					38.280	237.696
1879	3.832						29.161	200.151	6.459					39.452	239.603
1880	3.720						33.493	215.803	7.496					44.710	260.513
1881	3.863						33.831	225.166	7.437					45.131	270.298
1882	3.829						34.528	244.420	7.914					46.270	290.691
1883	4.122						36.704	253.211	7.573					48.400	301.611
1884	4.116						34.139	262.983	7.278					45.532	308.516
1885	4.164						32.225	266.561	6.942					43.330	309.891
1886	4.216						34.116	265.314	6.696					45.028	310.342
1887	4.031						33.590	269.729	6.914					44.535	314.264
1888	4.592						38.460	278.993	7.074					50.126	329.119
1889	4.549						42.400	299.593	7.644					54.593	354.186
1890	4.592						42.218	309.227	7.705					54.515	363.742
1891	4.664						39.623	307.050	7.875					52.162	359.212
1892	4.732						37.437	319.546	8.941					51.110	370.656
1893	4.746						38.542	329.078	9.632					52.920	381.998
1894	4.967						38.762	347.357	10.739					54.468	401.825
1895	5.539						43.328	368.367	12.267					61.134	429.501
1896	5.797						44.025	381.624	11.677					61.499	443.123
1897	6.637						50.782	424.598	12.925					70.344	494.942
1898	6.880						53.984	468.237	13.952					74.816	543.053
1899	6.665						53.833	499.150	14.309					74.807	573.957
1900	6.892						56.071	553.687	16.143					79.106	632.793
1901	6.799						55.815	595.438	17.448					80.062	675.500
1902	6.914						54.867	605.828	16.924					78.705	684.533
1903	7.301						54.006	629.723	17.125					78.432	708.155
1904	7.443						52.804	652.800	17.192					77.439	730.239
1905	8.095						57.246	665.983	17.097					82.438	748.421

Money and credit, composite historical data series spanning two centuries

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes					Deposits and other monetary instruments						Monetary aggregates		
	CO	UN	RBD	RN	DN	Norges Bank		TD	DD	FD	UC	CD	MM	M1	M2
						SPD	NOK								
1906	8.392					60.324		736.411	17.740					86.456	822.867
1907	8.636					64.339		796.100	18.054					91.029	887.129
1908	9.330					64.089		837.677	17.712					91.131	928.808
1909	9.747					67.280		898.705	18.182					95.209	993.914
1910	10.109					73.989		949.653	18.020					102.118	1 051.771
1911	10.677					81.335		1 000.671	31.748					123.760	1 124.431
1912	11.263					87.297		1 070.861	45.582					144.142	1 215.003
1913	11.582					94.324		1 153.353	58.947					164.853	1 318.206
1914	12.657					118.720		1 213.054	70.046					201.423	1 414.477
1915	12.386					139.962		1 492.824	102.976					255.324	1 748.148
1916	13.544					210.803		2 280.147	136.353					360.700	2 640.847
1917	14.929					272.353		3 292.288	180.512					467.794	3 760.082
1918	18.625					389.223		4 116.535	202.865					610.713	4 727.248
1919	19.522					375.178		4 604.257	207.043					601.743	5 206.000
1920	21.496					419.704		4 959.433	205.967					647.167	5 606.600
1921	22.071					349.329		5 062.012	214.588					585.988	5 648.000
1922	22.941					321.559		4 935.454	199.246	41.900				543.746	5 479.200
1923	18.756					349.844		4 110.960	136.840	569.900				505.440	4 616.400
1924	13.554					347.646		3 984.045	128.055	601.400				489.255	4 473.300
1925	15.678					315.822		3 750.634	114.766	666.600				446.266	4 196.900
1926	13.301					290.599		3 633.721	133.628	735.100				437.528	4 071.249
1927	14.667					291.433		3 242.170	89.143	746.700				395.243	3 637.413
1928	14.762					271.738		3 157.296	91.704	712.400				378.204	3 535.500
1929	15.503					276.997		3 128.060	102.140	631.400				394.640	3 522.700
1930	16.074					271.726		3 086.665	108.035	519.900				395.835	3 482.500
1931	15.933					286.467		2 946.840	97.860	462.100				400.260	3 347.100
1932	16.467					278.233		2 844.507	83.993	417.400				378.693	3 223.200
1933	17.167					288.133		2 739.640	76.060	357.200				381.360	3 121.000
1934	17.622					289.578		2 647.267	92.933	270.900				400.133	3 047.400
1935	18.903					304.297		2 672.814	139.586	41.600				462.786	3 135.600
1936	20.904					383.096		2 537.095	146.805					550.805	3 087.900

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank SPD NOK		TD	DD	FD	UC	CD	MM	M1	M2
1937	22.652					401.748		2 651.963	156.837					581.237	3 233.200
1938	23.891					427.709		2 789.725	167.675					619.275	3 409.000
1939	25.804					521.096		2 678.128	204.472					751.372	3 429.500
1940	31.769					891.810		2 491.333	730.067					1 653.646	4 144.979
1941	41.079					1 365.985		2 716.016	1 194.084					2 601.148	5 317.164
1942	49.241					1 986.950		3 075.837	1 508.763					3 544.954	6 620.791
1943	52.989					2 407.024		3 524.952	1 867.948					4 327.961	7 852.913
1944	57.123					2 854.167		3 963.317	2 144.083					5 055.373	9 018.690
1945	51.843					1 303.634		3 881.908	2 948.062	490.105				4 303.539	8 185.447
1946	52.909					1 689.982		4 870.605	2 389.295	940.938				4 132.186	9 002.791
1947	56.531					1 875.514		5 243.869	2 751.986	846.877				4 684.031	9 927.900
1948	61.113					1 947.134		5 636.156	2 736.497	750.258				4 744.744	10 380.900
1949	67.933					2 045.643		6 050.023	2 571.901	579.773				4 685.477	10 735.500
1950	74.976					2 084.858		6 284.594	2 419.272	515.265				4 579.106	10 863.700
1951	79.873					2 275.757		6 872.831	2 745.239					5 100.869	11 973.700
1952	87.553					2 707.085		7 331.961	2 654.401					5 449.039	12 781.000
1953	90.719					2 894.388		7 851.349	2 608.545					5 593.651	13 445.000
1954	93.679					3 062.162		8 369.914	2 649.245					5 805.086	14 175.000
1955	97.383					3 036.809		8 994.554	2 572.253					5 706.446	14 701.000
1956	102.931					3 207.682		9 678.088	2 487.300					5 797.912	15 476.000
1957	106.156					3 165.998		10 274.216	2 590.630					5 862.784	16 137.000
1958	108.278					3 193.938		10 652.239	2 743.545					6 045.761	16 698.000
1959	111.489					3 329.452		11 073.090	3 074.969					6 515.910	17 589.000
1960	115.747					3 460.253		11 493.000	3 375.026			2 446.000		6 951.026	18 444.025
1961	121.688					3 662.312		12 218.000	3 468.868			2 337.000		7 252.868	19 470.867
1962	133.500					4 012.500		13 152.000	3 627.811			2 509.000		7 773.811	20 925.810
1963	141.480					4 223.520		14 142.000	3 753.082			2 928.000		8 118.082	22 260.082
1964	197.705					4 471.295		15 400.000	3 906.470			3 446.000		8 575.470	23 975.470
1965	217.196					4 831.804		16 974.000	4 421.754			3 609.000		9 470.754	26 444.754
1966	231.399					5 187.601		18 427.000	4 786.309			4 056.000		10 205.309	28 632.310
1967	244.316					5 583.684		20 322.000	5 020.762			4 246.000		10 848.762	31 170.760

Money and credit, composite historical data series spanning two centuries

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank SPD NOK		TD	DD	FD	UC	CD	MM	M1	M2
1968	257.249					5 878.751		22 333.000	6 182.344		5 068.000			12 318.344	34 651.344
1969	273.892					6 250.108		24 438.000	6 809.582		5 762.000			13 333.582	37 771.580
1970	300.783					6 977.217		28 170.000	7 745.492		6 430.000			15 023.492	43 193.490
1971	328.486					7 660.514		31 562.000	8 657.711		7 525.000			16 646.711	48 208.710
1972	355.455					8 398.545		34 810.000	10 320.820		8 355.000			19 074.820	53 884.820
1973	380.711					9 063.289		39 111.000	11 789.720		8 901.000			21 233.720	60 344.720
1974	420.315					10 358.685		43 004.000	13 210.790		9 930.000			23 989.790	66 993.790
1975	480					11 912		48 210	16 146		11 868			28 538	76 748
1976	541					13 716		56 782	19 170		13 663			33 427	90 209
1977	595					15 494		67 364	22 329		14 743			38 418	105 782
1978	659					16 401		76 323	24 408		15 796			41 468	117 791
1979	703					17 028		88 354	27 317		18 804			45 048	133 402
1980	750					18 072		100 128	32 324		19 769			51 146	151 274
1981	806					19 344		113 185	34 710		22 804			54 860	168 045
1982	852					20 077		123 725	40 818		25 411			61 747	185 472
1983	892					20 854		134 026	47 688		27 217			69 434	203 460
1984	1 091					21 690		157 319	64 665		31 447			87 446	244 765
1985	1 381					23 691		174 594	78 783		39 492			103 855	278 449
1986	1 594					24 996		177 034	80 503		48 288			107 093	284 127
1987	1 695					26 551		175 261	125 099		53 900			153 345	328 606
1988	1 720					27 000		158 891	157 470		59 383			186 190	345 081
1989	1 831					27 372		157 206	188 362		60 230			217 565	374 771
1990	1 886					28 234		153 966	211 011		64 800			241 131	395 097
1991	1 972					29 866		181 976	228 906		65 093			260 744	442 720
1992	2 032					30 421		291 212	154 727		65 090	828		187 180	479 220
1993	2 099					33 645		288 396	149 616		69 115	2 260		185 360	476 016
1994	2 303					35 651		286 082	172 153		78 712	5 116		210 107	501 305
1995	2 483					36 591		297 337	178 288		80 100	12 123	15 751	217 362	526 822
1996	2 643					37 222		294 741	207 245		83 297	15 752	17 942	247 110	557 603
1997	2 867					39 348		278 740	226 539		99 881	23 390	19 228	268 754	570 884
1998	2 957					39 185		292 820	236 574		110 266	26 990	18 391	278 716	598 526

Table 4.A.2: Monetary aggregates and their components, end-of-year 1813-2021. Million kroner.
 Sources: Klovland (1984), Klovland (2004), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 10947,
 Monetary aggregate M3, by financial instrument (NOK million) 2008M01 - 2022M11 (<https://www.ssb.no/en/statbank/table/10947>).

	Coins	Notes						Deposits and other monetary instruments						Monetary aggregates	
	CO	UN	RBD	RN	DN	Norges Bank SPD NOK		TD	DD	FD	UC	CD	MM	M1	M2
1999	3 081					40 284		295 820	298 996		118 740	23 529	22 142	342 361	661 710
2000	3 253					39 270		326 350	327 855			24 582	31 959	370 378	721 310
2001	3 501					38 537		370 171	342 592			25 576	38 481	384 630	780 377
2002	3 690					36 593		409 704	359 429			30 751	42 748	399 712	840 167
2003	3 858					37 827		407 457	386 004			22 260	46 812	427 689	857 406
2004	4 009					39 331		423 184	428 718			29 054	47 717	472 058	924 296
2005	4 192					42 338		435 483	505 716			19 885	77 716	552 246	1 007 614
2006	4 103					44 144		473 108	631 256			9 179	71 959	679 503	1 161 790
2007	4 064					45 479		559 351	710 905			19 337	101 069	760 448	1 339 136
2008	4 121					45 011		644 257	680 706			41 132	84 524	729 838	1 426 812
2009	4 232					44 169		678 266	689 421			14 860	87 095	737 822	1 453 752
2010	4 376					44 345		722 428	735 892			15 520	86 068	784 613	1 536 888
2011	4 390					44 590		768 377	775 780			26 325	94 223	824 760	1 626 501
2012	3 814					44 589		851 690	771 672			20 092	74 402	820 075	1 712 495
2013	3 896					44 558		919 127	826 092			16 058	68 587	874 546	1 826 393
2014	4 015					43 865		997 652	862 442			16 785	65 244	910 322	1 934 442
2015	4 120					44 388		153 208	1 718 349			8 484		1 766 857	1 928 549
2016	4 205					42 460		174 773	1 795 989			7 909		1 842 654	2 025 335
2017	4 200					40 706		193 965	1 899 778			9 470		1 944 684	2 148 119
2018	4 152					37 587		155 814	2 055 030			6 887		2 096 769	2 259 471
2019	4 060					34 588		185 775	2 123 312			3 701		2 161 960	2 351 436
2020	4 051					34 241		167 840	2 426 617			2 565		2 464 909	2 635 313
2021	4 046					33 381		184 200	2 686 141			3 836		2 723 568	2 911 604

4.B Appendix, Balance sheet for savings banks and commercial banks

4.B Appendix, Balance sheet for savings banks and commercial banks

Table 4.A.3: Savings banks' and commercial banks' assets, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007)

Year	Savings banks			Commercial banks		
	Total	Loans	Other assets	Total	Loans	Other assets
1822	0.022	0.021	0.001			
1823	0.141	0.134	0.007			
1824	0.295	0.286	0.009			
1825	0.494	0.482	0.012			
1826	0.758	0.727	0.031			
1827	0.855	0.812	0.042			
1828	1.061	1.046	0.015			
1829	1.331	1.296	0.035			
1830	1.637	1.575	0.062			
1831	1.879	1.831	0.048			
1832	2.275	2.238	0.037			
1833	2.668	2.602	0.066			
1834	3.165	3.056	0.109			
1835	3.757	3.642	0.115			
1836	4.198	4.077	0.121			
1837	4.937	4.765	0.172			
1838	5.514	5.303	0.210			
1839	6.239	6.020	0.219			
1840	7.282	7.108	0.174			
1841	8.245	8.026	0.219			
1842	9.561	9.293	0.268			
1843	11.107	10.560	0.547			
1844	12.714	12.199	0.515			
1845	14.641	14.031	0.610			
1846	16.903	16.384	0.520			
1847	18.393	18.110	0.283			
1848	17.656	17.355	0.302	0.579	0.560	0.019
1849	17.563	17.250	0.314	0.786	0.761	0.025
1850	18.558	17.827	0.730	0.986	0.971	0.015
1851	20.665	19.870	0.795	1.252	1.240	0.012
1852	23.132	22.669	0.463	1.497	1.473	0.024
1853	27.278	25.608	1.670	1.249	1.234	0.015
1854	33.773	31.207	2.566	1.566	1.497	0.069
1855	38.271	36.223	2.048	2.638	2.507	0.131
1856	41.683	39.938	1.745	6.269	6.112	0.157
1857	40.231	38.626	1.605	7.609	7.019	0.591
1858	41.981	40.199	1.782	15.568	13.145	2.423
1859	45.687	43.638	2.049	17.323	14.611	2.712
1860	49.001	45.934	3.067	23.687	18.858	4.829
1861	52.466	49.450	3.016	27.230	22.133	5.097
1862	57.992	53.968	4.024	33.491	27.227	6.263
1863	64.984	60.169	4.815	36.298	30.447	5.851
1864	70.436	65.802	4.634	33.264	28.219	5.045
1865	75.904	68.191	7.713	41.876	33.015	8.861
1866	79.385	72.794	6.591	37.760	30.894	6.866
1867	83.570	75.428	8.142	43.615	35.199	8.417
1868	86.691	78.140	8.551	45.340	36.901	8.439
1869	88.202	77.146	11.056	49.615	39.075	10.540
1870	92.574	80.846	11.727	51.783	41.641	10.142
1871	98.687	80.415	18.272	66.402	52.383	14.020
1872	106.027	86.376	19.651	73.371	60.150	13.220
1873	121.824	100.162	21.661	79.360	65.099	14.261

Money and credit, composite historical data series spanning two centuries

Table 4.A.3: Savings banks' and commercial banks' assets, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007)

Year	Savings banks			Commercial banks		
	Total	Loans	Other assets	Total	Loans	Other assets
1874	138.720	115.764	22.956	87.622	74.072	13.549
1875	142.694	126.046	16.647	86.606	72.410	14.196
1876	150.021	133.241	16.780	95.957	79.051	16.906
1877	154.138	139.042	15.096	96.319	80.462	15.856
1878	154.191	138.831	15.360	98.319	81.938	16.381
1879	151.750	134.392	17.358	99.804	81.822	17.982
1880	158.441	135.305	23.136	113.764	92.882	20.882
1881	164.221	141.544	22.677	118.877	99.401	19.476
1882	173.273	145.799	27.474	132.050	107.495	24.556
1883	180.985	152.246	28.739	136.221	109.210	27.011
1884	189.394	158.822	30.572	143.628	114.259	29.369
1885	192.850	162.515	30.335	143.002	116.161	26.841
1886	194.487	163.251	31.236	135.686	105.926	29.760
1887	195.190	159.285	35.905	144.365	107.058	37.307
1888	201.970	158.434	43.536	153.402	114.329	39.073
1889	213.907	162.103	51.804	170.445	128.756	41.689
1890	222.213	174.627	47.586	175.506	136.579	38.926
1891	225.614	185.454	40.160	172.499	138.260	34.239
1892	230.570	189.811	40.759	183.391	144.871	38.520
1893	238.539	197.027	41.512	186.455	150.238	36.217
1894	249.771	204.580	45.191	203.873	159.754	44.119
1895	259.282	211.214	48.068	222.405	171.650	50.755
1896	270.236	222.404	47.832	226.816	183.965	42.850
1897	288.965	233.399	55.566	269.457	218.647	50.810
1898	310.933	250.846	60.087	343.495	287.106	56.389
1899	328.875	270.009	58.866	367.282	304.172	63.110
1900	348.894	282.768	66.126	428.121	352.911	75.209
1901	366.885	295.684	71.201	455.104	368.208	86.896
1902	381.796	306.672	75.124	453.298	365.959	87.339
1903	398.812	323.384	75.428	461.256	373.898	87.358
1904	417.118	336.917	80.201	469.912	371.608	98.304
1905	428.991	345.537	83.454	478.384	379.361	99.023
1906	463.522	363.626	99.896	525.387	405.828	119.559
1907	493.576	385.028	108.548	571.227	443.641	127.586
1908	519.885	409.547	110.338	600.760	477.268	123.492
1909	548.731	433.609	115.122	639.901	503.085	136.816
1910	582.122	459.605	122.517	669.495	524.502	144.993
1911	620.422	499.239	121.183	729.235	580.029	149.206
1912	654.311	540.217	114.094	823.164	658.807	164.357
1913	698.583	578.955	119.628	909.860	727.337	182.523
1914	738.044	610.880	127.164	980.209	753.029	227.180
1915	832.329	669.631	162.698	1 333.993	985.430	348.563
1916	1 086.518	806.966	279.552	2 485.027	1 756.433	728.594
1917	1 395.331	980.603	414.728	3 934.159	2 648.055	1 286.104
1918	1 741.930	1 268.527	473.403	4 720.477	3 346.218	1 374.259
1919	2 015	1 520	495	5 211	3 755	1 456
1920	2 253	1 732	521	5 461	4 034	1 427
1921	2 500	1 799	701	5 089	3 668	1 421
1922	2 657	1 812	845	4 532	3 176	1 356
1923	2 742	1 856	886	3 868	2 609	1 259
1924	2 776	1 805	971	3 644	2 377	1 267
1925	2 768	1 805	963	3 635	2 299	1 336
1926	2 771	1 730	1 041	3 259	1 875	1 384
1927	2 668	1 669	999	2 802	1 632	1 170
1928	2 597	1 603	994	2 643	1 468	1 175
1929	2 540	1 547	993	2 586	1 433	1 153

4.B Appendix, Balance sheet for savings banks and commercial banks

Table 4.A.3: Savings banks' and commercial banks' assets, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007)

Year	Savings banks			Commercial banks		
	Total	Loans	Other assets	Total	Loans	Other assets
1930	2 495	1 491	1 004	2 401	1 295	1 106
1931	2 414	1 458	956	2 401	1 233	1 168
1932	2 399	1 444	955	2 213	1 136	1 077
1933	2 335	1 381	954	2 096	1 093	1 003
1934	2 272	1 361	911	1 949	1 045	904
1935	2 288	1 347	941	1 859	1 058	801
1936	2 181	1 307	874	1 569	1 047	522
1937	2 213	1 298	915	1 571	1 098	473
1938	2 307	1 309	998	1 807	1 127	680
1939	2 267	1 364	903	1 855	1 269	586
1940	2 239	1 257	982	2 222	1 094	1 128
1941	2 450	1 115	1 335	2 825	868	1 957
1942	2 785	964	1 821	3 275	795	2 480
1943	3 216	850	2 366	3 817	728	3 089
1944	3 731	765	2 966	4 321	717	3 604
1945	4 529	754	3 775	5 012	910	4 102
1946	4 418	1 065	3 353	5 091	1 453	3 638
1947	4 433	1 466	2 967	5 830	1 968	3 862
1948	4 678	1 723	2 955	5 814	2 521	3 293
1949	4 930	1 953	2 977	5 999	2 894	3 105
1950	5 021	2 244	2 777	6 016	3 441	2 575
1951	5 203	2 500	2 703	7 083	3 958	3 125
1952	5 463	2 803	2 660	7 289	4 246	3 043
1953	5 820	3 115	2 705	7 355	4 381	2 974
1954	6 176	3 472	2 704	7 645	4 688	2 957
1955	6 455	3 701	2 754	7 489	4 825	2 664
1956	6 837	3 883	2 954	7 812	4 770	3 042
1957	7 260	4 150	3 110	8 192	4 967	3 225
1958	7 569	4 445	3 124	8 257	5 137	3 120
1959	7 983	4 812	3 171	8 716	5 557	3 159
1960	8 510	5 246	3 264	9 733	6 231	3 502
1961	9 011	5 741	3 270	10 607	7 356	3 251
1962	9 631	6 192	3 439	11 058	7 924	3 134
1963	10 212	6 667	3 545	11 877	8 359	3 518
1964	10 783	7 135	3 648	13 161	9 108	4 053
1965	11 704	7 629	4 075	14 785	9 681	5 104
1966	12 792	8 331	4 461	15 808	10 885	4 923
1967	13 927	9 146	4 781	17 235	11 706	5 529
1968	15 355	10 082	5 273	19 581	12 651	6 930
1969	16 768	11 396	5 372	22 473	14 408	8 065
1970	19 180	12 669	6 511	24 620	15 762	8 858
1971	21 556	14 156	7 400	27 311	17 722	9 589
1972	24 070	15 674	8 396	31 622	20 110	11 512
1973	26 817	17 603	9 214	35 608	22 508	13 100
1974	29 869	19 981	9 888	40 168	25 312	14 856
1975	33 661	22 917	10 744	45 228	29 374	15 854
1976	38 912	26 498	12 414	51 773	33 905	17 868
1977	46 261	30 551	15 710	62 178	39 537	22 641
1978	51 916	33 677	18 239	67 267	43 284	23 983
1979	59 816	37 892	21 924	75 907	47 897	28 010
1980	68 278	42 093	26 185	92 675	54 566	38 109
1981	78 554	48 369	30 185	109 960	64 400	45 560
1982	88 678	55 543	33 135	129 893	76 703	53 190
1983	101 249	64 889	36 360	147 865	91 693	56 172
1984	120 694	80 505	40 189	190 348	119 183	71 165
1985	158 272	111 073	47 199	224 089	152 128	71 961

Money and credit, composite historical data series spanning two centuries

Table 4.A.3: Savings banks' and commercial banks' assets, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007)

Year	Savings banks			Commercial banks		
	Total	Loans	Other assets	Total	Loans	Other assets
1986	195 017	146 547	48 470	295 276	203 608	91 668
1987	231 000	173 068	57 932	359 746	242 352	117 394
1988	242 320	185 688	56 632	340 713	250 544	90 169
1989	243 664	192 511	51 153	361 042	276 961	84 081
1990	243 369	187 734	55 635	371 269	285 402	85 867
1991	239 896	197 049	42 847	338 194	310 573	27 621
1992	238 787	197 040	41 747	371 924	325 770	46 154
1993	249 176	207 038	42 138	430 269	325 957	104 312
1994	264 758	221 049	43 709	430 421	325 484	104 937
1995	284 289	241 112	43 177	452 087	345 214	106 873
1996	319 565	273 709	45 856	555 293	395 345	159 948
1997	362 016	313 955	48 061	617 370	468 745	148 625
1998	403 381	348 111	55 270	679 567	524 763	154 804
1999	488 411	418 765	69 646	709 280	533 252	176 028
2000	560 121	485 661	74 460	795 993	598 400	197 593
2001	625 183	544 478	80 705	826 252	650 296	175 956
2002	681 308	592 839	88 469	887 914	657 849	230 065

4.B Appendix, Balance sheet for savings banks and commercial banks

Table 4.A.4: Savings banks' and commercial banks' liabilities, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007).

Year	Savings banks				Commercial banks			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1822	0.022	0.017	0.000	0.004				
1823	0.141	0.123	0.000	0.019				
1824	0.295	0.269	0.000	0.026				
1825	0.494	0.455	0.000	0.039				
1826	0.758	0.701	0.000	0.057				
1827	0.855	0.801	0.000	0.054				
1828	1.061	0.993	0.000	0.068				
1829	1.331	1.243	0.000	0.088				
1830	1.637	1.531	0.000	0.106				
1831	1.879	1.743	0.000	0.135				
1832	2.275	2.116	0.000	0.159				
1833	2.668	2.481	0.000	0.188				
1834	3.165	2.941	0.000	0.223				
1835	3.757	3.491	0.000	0.266				
1836	4.198	3.882	0.000	0.316				
1837	4.937	4.555	0.001	0.382				
1838	5.514	5.075	0.000	0.438				
1839	6.239	5.727	0.000	0.512				
1840	7.282	6.688	0.003	0.591				
1841	8.245	7.573	0.008	0.664				
1842	9.561	8.784	0.003	0.774				
1843	11.107	10.216	0.017	0.873				
1844	12.714	11.730	0.014	0.969				
1845	14.641	13.547	0.014	1.080				
1846	16.903	15.650	0.006	1.248				
1847	18.393	17.001	0.035	1.357				
1848	17.656	16.043	0.081	1.533	0.579	0.105	0.393	0.081
1849	17.563	15.881	0.065	1.617	0.786	0.284	0.417	0.085
1850	18.558	16.763	0.073	1.722	0.986	0.354	0.544	0.088
1851	20.665	18.774	0.046	1.844	1.252	0.495	0.664	0.093
1852	23.132	21.122	0.025	1.985	1.497	0.576	0.823	0.098
1853	27.278	25.009	0.053	2.216	1.249	0.587	0.560	0.102
1854	33.773	31.265	0.026	2.482	1.566	0.812	0.645	0.109
1855	38.271	35.432	0.057	2.782	2.638	1.506	0.929	0.203
1856	41.683	38.362	0.065	3.257	6.269	3.590	2.179	0.500
1857	40.231	36.561	0.102	3.569	7.609	4.577	2.247	0.786
1858	41.981	38.018	0.173	3.790	15.568	10.722	2.252	2.594
1859	45.687	41.381	0.179	4.127	17.323	11.806	2.333	3.184
1860	49.001	44.359	0.145	4.497	23.687	16.637	3.206	3.844
1861	52.466	47.323	0.221	4.923	27.230	18.597	3.993	4.641
1862	57.992	52.387	0.210	5.395	33.491	24.877	3.087	5.527
1863	64.984	59.157	0.200	5.627	36.298	27.685	2.588	6.025
1864	70.436	64.170	0.194	6.072	33.264	24.187	2.701	6.376
1865	75.904	69.058	0.165	6.681	41.876	33.143	2.101	6.632
1866	79.385	72.005	0.151	7.230	37.760	28.172	2.594	6.994
1867	83.570	75.584	0.127	7.859	43.615	33.066	3.540	7.010
1868	86.691	77.907	0.205	8.579	45.340	33.823	3.888	7.630
1869	88.202	78.975	0.069	9.159	49.615	38.073	3.678	7.865
1870	92.574	82.775	0.084	9.715	51.783	40.464	3.219	8.101
1871	98.687	88.237	0.125	10.325	66.402	52.064	5.887	8.451
1872	106.027	95.108	0.061	10.858	73.371	58.100	6.406	8.864
1873	121.824	110.355	0.053	11.416	79.360	63.946	6.071	9.343
1874	138.720	126.327	0.043	12.351	87.622	68.907	8.171	10.544
1875	142.694	129.236	0.006	13.451	86.606	60.505	13.234	12.867
1876	150.021	135.446	0.044	14.531	95.957	69.147	12.351	14.459
1877	154.138	138.542	0.042	15.554	96.319	66.489	14.053	15.777

Money and credit, composite historical data series spanning two centuries

Table 4.A.4: Savings banks' and commercial banks' liabilities, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007).

Year	Savings banks				Commercial banks			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1878	154.191	137.683	0.007	16.501	98.319	67.838	13.551	16.930
1879	151.750	134.845	0.009	16.896	99.804	71.765	11.365	16.673
1880	158.441	139.815	0.768	17.858	113.764	83.484	13.197	17.083
1881	164.221	144.462	1.039	18.720	118.877	88.141	12.641	18.095
1882	173.273	152.684	0.950	19.639	132.050	99.650	13.937	18.464
1883	180.985	159.628	0.885	20.472	136.221	101.156	15.845	19.220
1884	189.394	167.285	0.700	21.409	143.628	102.976	21.479	19.173
1885	192.850	169.587	0.994	22.269	143.002	103.916	19.305	19.780
1886	194.487	170.659	1.184	22.644	135.686	101.351	16.258	18.076
1887	195.190	170.902	0.972	23.316	144.365	105.741	19.134	19.491
1888	201.970	176.818	0.951	24.201	153.402	109.249	24.913	19.241
1889	213.907	188.078	0.694	25.135	170.445	119.159	31.065	20.221
1890	222.213	195.788	1.030	25.395	175.506	121.144	32.545	21.817
1891	225.614	198.449	1.025	26.140	172.499	116.476	32.870	23.152
1892	230.570	202.996	1.088	26.486	183.391	125.491	33.909	23.990
1893	238.539	209.516	1.166	27.857	186.455	129.194	32.455	24.806
1894	249.771	219.653	1.106	29.012	203.873	138.443	39.433	25.997
1895	259.282	227.956	0.787	30.539	222.405	152.678	41.740	27.988
1896	270.236	237.479	0.904	31.853	226.816	155.822	42.172	28.822
1897	288.965	254.752	0.916	33.297	269.457	182.771	52.076	34.609
1898	310.933	274.989	0.904	35.040	343.495	207.200	82.463	53.832
1899	328.875	291.849	1.146	35.880	367.282	221.610	86.713	58.959
1900	348.894	310.535	1.185	37.174	428.121	259.295	101.003	67.823
1901	366.885	326.614	1.537	38.734	455.104	286.272	106.069	62.763
1902	381.796	339.381	1.581	40.834	453.298	283.371	110.640	59.287
1903	398.812	354.491	1.776	42.545	461.256	292.357	109.724	59.175
1904	417.118	370.979	1.746	44.393	469.912	299.013	114.467	56.432
1905	428.991	380.368	1.826	46.797	478.384	302.712	118.232	57.440
1906	463.522	413.168	1.473	48.881	525.387	340.983	125.690	58.714
1907	493.576	440.422	1.726	51.428	571.227	373.732	130.404	67.091
1908	519.885	463.111	2.824	53.950	600.760	392.278	137.809	70.673
1909	548.731	488.482	3.518	56.731	639.901	428.405	139.188	72.308
1910	582.122	518.169	3.623	60.330	669.495	449.504	136.234	83.757
1911	620.422	551.302	4.801	64.319	729.235	481.117	159.750	88.368
1912	654.311	580.153	6.286	67.872	823.164	536.290	180.335	106.539
1913	698.583	620.051	6.939	71.593	909.860	592.212	194.782	122.866
1914	738.044	651.396	10.455	76.193	980.209	630.831	211.948	137.430
1915	832.329	738.393	12.633	81.303	1 333.993	855.749	326.932	151.312
1916	1 086.518	971.842	23.973	90.703	2 485.027	1 442.278	728.390	314.359
1917	1 395.331	1 267.866	28.013	99.452	3 934.159	2 203.790	1 194.258	536.111
1918	1 741.930	1 594.746	37.423	109.761	4 720.477	2 720.750	1 160.110	839.617
1919	2 015	1 838	55	122	5 211	2 973	1 323	915
1920	2 253	2 053	67	133	5 461	3 113	1 440	908
1921	2 500	2 295	64	141	5 089	2 982	1 255	852
1922	2 657	2 439	68	150	4 532	2 697	970	865
1923	2 742	2 528	61	153	3 868	2 261	1 061	546
1924	2 776	2 555	59	162	3 644	2 065	1 113	466
1925	2 768	2 541	56	171	3 635	1 993	1 270	372
1926	2 771	2 527	64	180	3 259	1 993	938	328
1927	2 668	2 423	65	180	2 802	1 765	773	264
1928	2 597	2 352	66	179	2 643	1 645	723	275
1929	2 540	2 287	61	192	2 586	1 596	703	287
1930	2 495	2 234	54	207	2 401	1 498	626	277
1931	2 414	2 150	58	206	2 401	1 373	801	227
1932	2 399	2 114	51	234	2 213	1 245	726	242
1933	2 335	2 051	55	229	2 096	1 137	718	241

4.B Appendix, Balance sheet for savings banks and commercial banks

Table 4.A.4: Savings banks' and commercial banks' liabilities, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007).

Year	Savings banks				Commercial banks			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1934	2 272	1 980	53	239	1 949	1 048	658	243
1935	2 288	1 990	52	246	1 859	864	757	238
1936	2 181	1 863	53	265	1 569	840	488	241
1937	2 213	1 889	55	269	1 571	939	382	250
1938	2 307	1 971	60	276	1 807	1 011	548	248
1939	2 267	1 926	70	271	1 855	985	620	250
1940	2 239	1 820	149	270	2 222	1 401	567	254
1941	2 450	2 066	110	274	2 825	1 844	716	265
1942	2 785	2 424	90	271	3 275	2 161	847	267
1943	3 216	2 838	108	270	3 817	2 555	996	266
1944	3 731	3 325	140	266	4 321	2 782	1 270	269
1945	4 529	4 118	142	269	5 012	3 538	1 186	288
1946	4 418	4 004	141	273	5 091	3 255	1 529	307
1947	4 433	4 019	146	268	5 830	3 914	1 598	318
1948	4 678	4 280	130	268	5 814	3 987	1 499	328
1949	4 930	4 488	166	276	5 999	3 998	1 659	342
1950	5 021	4 600	140	281	6 016	3 923	1 743	350
1951	5 203	4 753	163	287	7 083	4 633	2 066	384
1952	5 463	5 008	160	295	7 289	4 807	2 083	399
1953	5 820	5 338	185	297	7 355	4 831	2 112	412
1954	6 176	5 671	200	305	7 645	4 952	2 264	429
1955	6 455	5 961	182	312	7 489	5 146	1 901	442
1956	6 837	6 325	198	314	7 812	5 252	2 087	473
1957	7 260	6 723	214	323	8 192	5 359	2 336	497
1958	7 569	7 023	209	337	8 257	5 335	2 385	537
1959	7 983	7 414	214	355	8 716	5 629	2 522	565
1960	8 510	7 898	235	377	9 733	6 047	3 142	544
1961	9 011	8 345	274	392	10 607	6 316	3 718	573
1962	9 631	8 898	314	419	11 058	6 887	3 533	638
1963	10 212	9 423	345	444	11 877	7 455	3 678	744
1964	10 783	9 928	383	472	13 161	8 312	4 048	801
1965	11 704	10 769	435	500	14 785	9 350	4 509	926
1966	12 792	11 741	523	528	15 808	9 969	4 773	1 066
1967	13 927	12 773	595	559	17 235	11 074	5 030	1 131
1968	15 355	14 070	699	586	19 581	12 823	5 532	1 226
1969	16 768	15 282	872	614	22 473	14 488	6 571	1 414
1970	19 180	17 583	951	646	24 620	16 858	6 184	1 578
1971	21 556	19 786	1 089	681	27 311	19 174	6 372	1 765
1972	24 070	22 050	1 298	722	31 622	21 493	8 290	1 839
1973	26 817	24 493	1 504	820	35 608	25 042	8 501	2 065
1974	29 869	27 290	1 699	880	40 168	27 994	10 040	2 134
1975	33 661	30 737	1 984	940	45 228	32 674	10 180	2 374
1976	38 912	35 520	2 187	1 205	51 773	38 530	10 501	2 742
1977	46 261	41 290	3 414	1 557	62 178	45 142	13 714	3 322
1978	51 916	46 909	2 992	2 015	67 267	50 925	12 787	3 555
1979	59 816	53 771	3 498	2 547	75 907	58 872	13 170	3 865
1980	68 278	60 808	4 394	3 076	92 675	67 995	20 582	4 098
1981	78 554	69 304	5 213	4 037	109 960	78 595	26 918	4 447
1982	88 678	76 633	6 322	5 723	129 893	88 817	35 840	5 236
1983	101 249	85 661	9 197	6 391	147 865	100 775	40 405	6 685
1984	120 694	102 075	11 485	7 134	190 348	125 241	56 451	8 656
1985	158 272	124 774	25 321	8 177	224 089	137 290	76 092	10 707
1986	195 017	132 487	53 482	9 048	295 276	135 619	146 338	13 319
1987	231 000	146 689	74 681	9 630	359 746	165 777	180 048	13 921
1988	242 320	156 979	75 895	9 446	340 713	169 189	158 024	13 500
1989	243 664	174 022	58 437	11 205	361 042	186 288	159 487	15 267

Money and credit, composite historical data series spanning two centuries

Table 4.A.4: Savings banks' and commercial banks' liabilities, end-of-year 1822–2002. Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007).

Year	Savings banks				Commercial banks			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1990	243 369	177 698	54 854	10 817	371 269	193 183	164 591	13 495
1991	239 896	185 173	44 791	9 932	338 194	262 340	70 552	5 302
1992	238 787	189 698	35 528	13 561	371 924	299 548	63 249	9 127
1993	249 176	196 946	33 484	18 746	430 269	290 431	121 807	18 031
1994	264 758	208 367	35 667	20 724	430 421	297 474	108 582	24 365
1995	284 289	216 073	44 811	23 405	452 087	308 993	114 824	28 270
1996	319 565	230 069	63 496	26 000	555 293	336 144	186 556	32 593
1997	362 016	234 886	98 513	28 617	617 370	333 625	247 165	36 580
1998	403 381	251 292	118 598	33 491	679 567	350 201	289 872	39 494
1999	488 411	290 021	159 692	38 698	709 280	377 436	286 639	45 205
2000	560 121	323 652	192 162	44 307	795 993	404 860	341 750	49 383
2001	625 183	355 595	221 133	48 455	826 252	448 661	327 930	49 661
2002	681 308	394 716	236 263	50 329	887 914	446 007	389 711	52 196

4.C Appendix, Balance sheet for private banks plus credit companies

4.C Appendix, Balance sheet for private banks plus credit companies

Table 4.A.5: Private banks' assets, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks			Private banks plus credit companies		
	Total	Loans	Other assets	Total	Loans	Other assets
1822	0.022	0.021	0.001	0.022	0.021	0.001
1823	0.141	0.134	0.007	0.141	0.134	0.007
1824	0.295	0.286	0.009	0.295	0.286	0.009
1825	0.494	0.482	0.012	0.494	0.482	0.012
1826	0.758	0.727	0.031	0.758	0.727	0.031
1827	0.855	0.812	0.042	0.855	0.812	0.042
1828	1.061	1.046	0.015	1.061	1.046	0.015
1829	1.331	1.296	0.035	1.331	1.296	0.035
1830	1.637	1.575	0.062	1.637	1.575	0.062
1831	1.879	1.831	0.048	1.879	1.831	0.048
1832	2.275	2.238	0.037	2.275	2.238	0.037
1833	2.668	2.602	0.066	2.668	2.602	0.066
1834	3.165	3.056	0.109	3.165	3.056	0.109
1835	3.757	3.642	0.115	3.757	3.642	0.115
1836	4.198	4.077	0.121	4.198	4.077	0.121
1837	4.937	4.765	0.172	4.937	4.765	0.172
1838	5.514	5.303	0.210	5.514	5.303	0.210
1839	6.239	6.020	0.219	6.239	6.020	0.219
1840	7.282	7.108	0.174	7.282	7.108	0.174
1841	8.245	8.026	0.219	8.245	8.026	0.219
1842	9.561	9.293	0.268	9.561	9.293	0.268
1843	11.107	10.560	0.547	11.107	10.560	0.547
1844	12.714	12.199	0.515	12.714	12.199	0.515
1845	14.641	14.031	0.610	14.641	14.031	0.610
1846	16.903	16.384	0.520	16.903	16.384	0.520
1847	18.393	18.110	0.283	18.393	18.110	0.283
1848	18.235	17.915	0.321	18.235	17.915	0.321
1849	18.349	18.011	0.339	18.349	18.011	0.339
1850	19.544	18.798	0.745	19.544	18.798	0.745
1851	21.918	21.110	0.808	21.918	21.110	0.808
1852	24.629	24.142	0.487	24.629	24.142	0.487
1853	28.527	26.842	1.685	28.527	26.842	1.685
1854	35.339	32.704	2.635	35.339	32.704	2.635
1855	40.909	38.730	2.179	40.909	38.730	2.179
1856	47.917	46.050	1.867	47.917	46.050	1.867
1857	47.812	45.645	2.168	47.812	45.645	2.168
1858	57.398	53.335	4.063	57.398	53.335	4.063
1859	62.939	58.208	4.730	62.939	58.208	4.730
1860	72.369	64.771	7.597	72.369	64.771	7.597
1861	81.496	74.535	6.960	81.496	74.535	6.960
1862	91.646	81.159	10.486	91.646	81.159	10.486
1863	101.654	90.592	11.062	101.654	90.592	11.062
1864	104.950	93.833	11.117	104.950	93.833	11.117
1865	117.906	99.460	18.446	117.906	99.460	18.446
1866	117.578	102.574	15.003	117.578	102.574	15.003
1867	127.150	110.046	17.104	127.150	110.046	17.104
1868	132.101	114.851	17.250	132.101	114.851	17.250
1869	137.708	116.103	21.604	137.708	116.103	21.604
1870	144.024	122.373	21.651	144.024	122.373	21.651
1871	164.906	132.806	32.100	164.906	132.806	32.100
1872	180.313	146.528	33.786	180.313	146.528	33.786

Money and credit, composite historical data series spanning two centuries

Table 4.A.5: Private banks' assets, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880:
Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks			Private banks plus credit companies		
	Total	Loans	Other assets	Total	Loans	Other assets
1873	202.905	165.287	37.618	202.905	165.287	37.618
1874	227.405	189.799	37.606	227.405	189.799	37.606
1875	229.830	198.398	31.432	229.830	198.398	31.432
1876	246.392	212.257	34.135	246.392	212.257	34.135
1877	251.331	219.484	31.846	251.331	219.484	31.846
1878	253.692	220.742	32.950	253.692	220.742	32.950
1879	251.899	216.147	35.752	251.899	216.147	35.752
1880	271.623	228.132	43.492	271.623	228.132	43.492
1881	283.685	240.970	42.715	283.685	240.970	42.715
1882	303.840	253.144	50.696	303.840	253.144	50.696
1883	317.512	261.418	56.094	317.512	261.418	56.094
1884	331.358	273.020	58.338	331.358	273.020	58.338
1885	333.146	278.576	54.570	333.146	278.576	54.570
1886	329.227	269.158	60.069	329.227	269.158	60.069
1887	339.248	265.691	73.557	339.248	265.691	73.557
1888	355.854	272.293	83.561	355.854	272.293	83.561
1889	383.823	290.581	93.242	383.823	290.581	93.242
1890	398.773	311.028	87.745	398.773	311.028	87.745
1891	399.128	323.526	75.602	399.128	323.526	75.602
1892	414.862	334.493	80.369	414.862	334.493	80.369
1893	427.151	347.200	79.951	427.151	347.200	79.951
1894	454.673	361.922	92.751	454.673	361.922	92.751
1895	481.848	382.811	99.036	481.848	382.811	99.036
1896	498.846	406.305	92.540	498.846	406.305	92.540
1897	560.722	452.058	108.664	560.722	452.058	108.664
1898	651.622	537.819	113.803	651.622	537.819	113.803
1899	706.118	573.811	132.307	706.118	573.811	132.307
1900	775.438	635.679	139.759	775.438	635.679	139.759
1901	825.307	663.892	195.076	858.968	663.892	195.076
1902	836.987	672.631	199.040	871.671	672.631	199.040
1903	860.958	697.282	199.250	896.532	697.282	199.250
1904	888.170	708.525	216.535	925.060	708.525	216.535
1905	908.685	724.898	220.694	945.592	724.898	220.694
1906	990.792	769.454	258.072	1 027.526	769.454	258.072
1907	1 064.648	828.669	272.363	1 101.032	828.669	272.363
1908	1 123.307	886.815	277.225	1 164.040	886.815	277.225
1909	1 190.406	936.694	295.060	1 235.754	940.694	295.060
1910	1 251.818	984.107	307.775	1 297.882	990.107	307.775
1911	1 352.143	1 079.268	317.253	1 407.521	1 090.268	317.253
1912	1 478.041	1 199.024	328.596	1 541.620	1 212.024	329.596
1913	1 613.821	1 306.292	355.510	1 675.802	1 319.292	356.510
1914	1 718.359	1 363.909	403.970	1 780.879	1 375.909	404.970
1915	2 166.425	1 655.061	562.413	2 229.474	1 666.061	563.413
1916	3 571.633	2 563.399	1 059.852	3 639.251	2 576.399	1 062.852
1917	5 321.681	3 628.658	1 750.463	5 401.121	3 645.658	1 755.463
1918	6 462.734	4 614.745	1 899.156	6 537.901	4 633.745	1 904.156
1919	7 226	5 275	1 951	7 254	5 296	1 958
1920	7 714	5 766	1 948	7 743	5 789	1 954
1921	7 589	5 467	2 122	7 619	5 491	2 128
1922	7 189	4 988	2 201	7 239	5 028	2 211
1923	6 610	4 465	2 145	6 665	4 511	2 154
1924	6 420	4 182	2 238	6 476	4 230	2 246
1925	6 403	4 104	2 299	6 468	4 159	2 309
1926	6 030	3 605	2 425	6 102	3 667	2 435
1927	5 470	3 301	2 169	5 548	3 371	2 177

4.C Appendix, Balance sheet for private banks plus credit companies

Table 4.A.5: Private banks' assets, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks			Private banks plus credit companies		
	Total	Loans	Other assets	Total	Loans	Other assets
1928	5 240	3 071	2 169	5 333	3 152	2 181
1929	5 126	2 980	2 146	5 227	3 074	2 153
1930	4 896	2 786	2 110	5 015	2 896	2 119
1931	4 815	2 691	2 124	4 957	2 825	2 132
1932	4 612	2 580	2 032	4 766	2 725	2 041
1933	4 431	2 474	1 957	4 600	2 632	1 968
1934	4 221	2 406	1 815	4 401	2 570	1 831
1935	4 147	2 405	1 742	4 366	2 598	1 768
1936	3 750	2 354	1 396	3 986	2 574	1 412
1937	3 784	2 396	1 388	4 075	2 657	1 418
1938	4 114	2 436	1 678	4 444	2 741	1 703
1939	4 122	2 633	1 489	4 468	2 958	1 510
1940	4 461	2 351	2 110	4 815	2 681	2 134
1941	5 275	1 983	3 292	5 652	2 317	3 335
1942	6 060	1 759	4 301	6 466	2 114	4 352
1943	7 033	1 578	5 455	7 446	1 933	5 513
1944	8 052	1 482	6 570	8 460	1 838	6 622
1945	9 541	1 664	7 877	9 941	2 019	7 922
1946	9 509	2 518	6 991	9 970	2 935	7 035
1947	10 263	3 434	6 829	10 874	3 974	6 900
1948	10 492	4 244	6 248	11 180	4 885	6 295
1949	10 929	4 847	6 082	11 697	5 579	6 118
1950	11 037	5 685	5 352	11 905	6 504	5 401
1951	12 286	6 458	5 828	13 219	7 339	5 880
1952	12 752	7 049	5 703	13 792	8 023	5 769
1953	13 175	7 496	5 679	14 380	8 604	5 776
1954	13 821	8 160	5 661	15 136	9 414	5 722
1955	13 944	8 526	5 418	15 311	9 845	5 466
1956	14 649	8 653	5 996	16 073	10 021	6 052
1957	15 452	9 117	6 335	15 452	10 518	6 335
1958	15 826	9 582	6 244	15 826	11 066	6 244
1959	16 699	10 369	6 330	16 699	11 963	6 330
1960	18 243	11 477	6 766	20 196	13 266	6 930
1961	19 618	13 097	6 521	21 791	15 066	6 725
1962	20 689	14 116	6 573	23 047	16 315	6 732
1963	22 089	15 026	7 063	24 652	17 358	7 294
1964	23 944	16 243	7 701	26 831	18 896	7 935
1965	26 489	17 310	9 179	29 737	20 341	9 396
1966	28 600	19 216	9 384	32 217	22 621	9 596
1967	31 162	20 852	10 310	35 126	24 559	10 567
1968	34 936	22 733	12 203	39 289	26 793	12 496
1969	39 241	25 804	13 437	44 184	30 354	13 830
1970	43 800	28 431	15 369	49 689	33 835	15 854
1971	48 867	31 878	16 989	55 747	38 242	17 505
1972	55 692	35 784	19 908	63 521	42 940	20 581
1973	62 425	40 111	22 314	71 466	48 386	23 080
1974	70 037	45 293	24 744	80 549	54 742	25 807
1975	78 889	52 291	26 598	91 657	63 564	28 093
1976	90 685	60 403	30 282	107 283	75 395	31 888
1977	108 439	70 088	38 351	130 709	89 553	41 156
1978	119 183	76 961	42 222	143 117	98 737	44 380
1979	135 723	85 789	49 934	162 933	110 816	52 117
1980	160 953	96 659	64 294	193 757	125 423	68 334
1981	188 514	112 769	75 745	227 203	147 375	79 828
1982	218 571	132 246	86 325	263 543	172 641	90 902

Money and credit, composite historical data series spanning two centuries

Table 4.A.5: Private banks' assets, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880:
Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks			Private banks plus credit companies		
	Total	Loans	Other assets	Total	Loans	Other assets
1983	249 114	156 582	92 532	301 930	203 512	98 418
1984	311 042	199 688	111 354	372 562	252 065	120 497
1985	382 361	263 201	119 160	455 912	323 619	132 293
1986	490 293	350 155	140 138	582 064	427 472	154 592
1987	590 746	415 420	175 326	717 618	527 162	190 456
1988	583 033	436 232	146 801	744 848	575 539	169 309
1989	604 706	469 472	135 234	783 418	622 684	160 734
1990	614 638	473 136	141 502	797 052	628 115	168 937
1991	578 090	461 461	116 629	741 322	592 988	148 334
1992	610 711	522 810	87 901	730 890	616 567	114 323
1993	679 445	532 995	146 450	789 007	616 608	172 399
1994	695 179	546 533	148 646	795 647	619 318	176 329
1995	736 376	586 326	150 050	836 531	659 171	177 360
1996	874 858	637 414	237 444	969 314	710 827	258 487
1997	979 386	755 538	223 848	1 084 495	839 371	245 124
1998	1 082 646	846 464	236 182	1 220 220	955 935	264 285
1999	1 197 690	930 264	267 426	1 345 368	1 048 892	296 475
2000	1 331 139	1 062 342	268 797	1 542 858	1 241 276	301 581
2001	1 451 437	1 168 989	282 448	1 702 852	1 377 706	325 145
2002	1 568 700	1 250 066	318 634	1 847 495	1 473 475	374 020
2003	1 725 093	1 358 339	366 754	2 046 145	1 617 819	428 326
2004	1 805 276	1 458 765	346 511	2 165 439	1 754 229	411 210
2005	2 137 694	1 733 829	403 865	2 541 674	2 048 013	493 661
2006	2 624 895	2 037 703	587 192	3 078 482	2 383 792	694 690
2007	3 120 776	2 398 093	722 683	3 743 387	2 882 991	860 395
2008	3 817 185	2 594 932	1 222 253	4 817 776	3 319 264	1 498 512
2009	3 697 621	2 655 595	1 042 026	4 821 352	3 569 193	1 252 159
2010	3 639 617	2 613 709	1 025 908	5 017 881	3 748 652	1 269 229
2011	3 950 544	2 679 220	1 271 324	5 566 317	3 999 768	1 566 549
2012	4 046 836	2 713 476	1 333 360	5 760 216	4 177 706	1 582 510
2013	4 270 968	2 988 307	1 282 661	6 017 673	4 491 231	1 526 442
2014	4 641 488	3 379 242	1 262 246	6 586 586	4 895 699	1 690 887
2015	4 754 426	3 512 188	1 242 238	6 784 749	5 094 845	1 689 904
2016	4 913 794	3 546 043	1 367 751	6 941 712	5 245 885	1 695 827
2017	5 144 023	3 771 417	1 372 606	7 292 134	5 587 525	1 704 609
2018	5 214 651	3 973 907	1 240 744	7 432 021	5 875 263	1 556 758
2019	5 534 547	4 116 681	1 417 866	7 891 259	6 179 601	1 711 658
2020	6 010 529	4 322 199	1 688 330	8 600 215	6 560 157	2 040 058
2021	6 196 331	4 606 455	1 589 876	8 786 889	6 945 742	1 841 147

4.C Appendix, Balance sheet for private banks plus credit companies

Table 4.A.6: Private banks' liabilities and equity, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks				Private banks plus credit companies			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1822	0.022	0.017		0.004	0.022	0.017		0.004
1823	0.141	0.123		0.019	0.141	0.123		0.019
1824	0.295	0.269		0.026	0.295	0.269		0.026
1825	0.494	0.455		0.039	0.494	0.455		0.039
1826	0.758	0.701		0.057	0.758	0.701		0.057
1827	0.855	0.801		0.054	0.855	0.801		0.054
1828	1.061	0.993		0.068	1.061	0.993		0.068
1829	1.331	1.243		0.088	1.331	1.243		0.088
1830	1.637	1.531		0.106	1.637	1.531		0.106
1831	1.879	1.743		0.135	1.879	1.743		0.135
1832	2.275	2.116		0.159	2.275	2.116		0.159
1833	2.668	2.481		0.188	2.668	2.481		0.188
1834	3.165	2.941		0.223	3.165	2.941		0.223
1835	3.757	3.491		0.266	3.757	3.491		0.266
1836	4.198	3.882		0.316	4.198	3.882		0.316
1837	4.937	4.555	0.001	0.382	4.937	4.555	0.001	0.382
1838	5.514	5.075	0.000	0.438	5.514	5.075	0.000	0.438
1839	6.239	5.727	0.000	0.512	6.239	5.727	0.000	0.512
1840	7.282	6.688	0.003	0.591	7.282	6.688	0.003	0.591
1841	8.245	7.573	0.008	0.664	8.245	7.573	0.008	0.664
1842	9.561	8.784	0.003	0.774	9.561	8.784	0.003	0.774
1843	11.107	10.216	0.017	0.873	11.107	10.216	0.017	0.873
1844	12.714	11.730	0.014	0.969	12.714	11.730	0.014	0.969
1845	14.641	13.547	0.014	1.080	14.641	13.547	0.014	1.080
1846	16.903	15.650	0.006	1.248	16.903	15.650	0.006	1.248
1847	18.393	17.001	0.035	1.357	18.393	17.001	0.035	1.357
1848	18.235	16.148	0.474	1.614	18.235	16.148	0.474	1.614
1849	18.349	16.165	0.482	1.702	18.349	16.165	0.482	1.702
1850	19.544	17.117	0.617	1.810	19.544	17.117	0.617	1.810
1851	21.918	19.269	0.711	1.937	21.918	19.269	0.711	1.937
1852	24.629	21.698	0.848	2.083	24.629	21.698	0.848	2.083
1853	28.527	25.596	0.613	2.318	28.527	25.596	0.613	2.318
1854	35.339	32.077	0.671	2.591	35.339	32.077	0.671	2.591
1855	40.909	36.938	0.986	2.985	40.909	36.938	0.986	2.985
1856	47.917	41.952	2.209	3.757	47.917	41.952	2.209	3.757
1857	47.812	41.137	2.321	4.354	47.812	41.137	2.321	4.354
1858	57.398	48.740	2.274	6.384	57.398	48.740	2.274	6.384
1859	62.939	53.187	2.441	7.311	62.939	53.187	2.441	7.311
1860	72.369	60.996	3.032	8.340	72.369	60.996	3.032	8.340
1861	81.496	65.919	6.012	9.564	81.496	65.919	6.012	9.564
1862	91.646	77.264	3.460	10.922	91.646	77.264	3.460	10.922
1863	101.654	86.842	3.160	11.652	101.654	86.842	3.160	11.652
1864	104.950	88.357	4.145	12.448	104.950	88.357	4.145	12.448
1865	117.906	102.201	2.393	13.313	117.906	102.201	2.393	13.313
1866	117.578	100.176	3.177	14.224	117.578	100.176	3.177	14.224
1867	127.150	108.650	3.632	14.868	127.150	108.650	3.632	14.868
1868	132.101	111.729	4.162	16.209	132.101	111.729	4.162	16.209
1869	137.708	117.047	3.636	17.024	137.708	117.047	3.636	17.024
1870	144.024	123.239	2.970	17.816	144.024	123.239	2.970	17.816
1871	164.906	140.301	5.829	18.776	164.906	140.301	5.829	18.776
1872	180.313	153.208	7.383	19.722	180.313	153.208	7.383	19.722
1873	202.905	174.301	7.845	20.759	202.905	174.301	7.845	20.759
1874	227.405	195.234	9.276	22.895	227.405	195.234	9.276	22.895
1875	229.830	189.742	13.770	26.318	229.830	189.742	13.770	26.318
1876	246.392	204.593	12.809	28.990	246.392	204.593	12.809	28.990

Money and credit, composite historical data series spanning two centuries

Table 4.A.6: Private banks' liabilities and equity, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks				Private banks plus credit companies			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1877	251.331	205.031	14.969	31.331	251.331	205.031	14.969	31.331
1878	253.692	205.521	14.740	33.431	253.692	205.521	14.740	33.431
1879	251.899	206.610	11.720	33.569	251.899	206.610	11.720	33.569
1880	271.623	223.299	13.383	34.941	271.623	223.299	13.383	34.941
1881	283.685	232.603	14.267	36.815	283.685	232.603	14.267	36.815
1882	303.840	252.334	13.403	38.103	303.840	252.334	13.403	38.103
1883	317.512	260.784	17.036	39.692	317.512	260.784	17.036	39.692
1884	331.358	270.261	20.515	40.582	331.358	270.261	20.515	40.582
1885	333.146	273.503	17.593	42.049	333.146	273.503	17.593	42.049
1886	329.227	272.010	16.496	40.720	329.227	272.010	16.496	40.720
1887	339.248	276.643	19.799	42.807	339.248	276.643	19.799	42.807
1888	355.854	286.067	26.346	43.442	355.854	286.067	26.346	43.442
1889	383.823	307.237	31.230	45.356	383.823	307.237	31.230	45.356
1890	398.773	316.932	34.629	47.212	398.773	316.932	34.629	47.212
1891	399.128	314.925	34.911	49.293	399.128	314.925	34.911	49.293
1892	414.862	328.487	35.898	50.476	414.862	328.487	35.898	50.476
1893	427.151	338.710	35.778	52.663	427.151	338.710	35.778	52.663
1894	454.673	358.096	41.568	55.009	454.673	358.096	41.568	55.009
1895	481.848	380.634	42.687	58.527	481.848	380.634	42.687	58.527
1896	498.846	393.301	44.870	60.675	498.846	393.301	44.870	60.675
1897	560.722	437.523	55.292	67.906	560.722	437.523	55.292	67.906
1898	651.622	482.189	80.561	88.872	651.622	482.189	80.561	88.872
1899	706.118	513.459	97.820	94.839	706.118	513.459	97.820	94.839
1900	775.438	569.830	100.612	104.997	775.438	569.830	100.612	104.997
1901	825.307	612.886	110.924	101.497	858.968	612.886	144.585	101.497
1902	836.987	622.752	114.114	100.121	871.671	622.752	148.798	100.121
1903	860.958	646.848	112.390	101.720	896.532	646.848	147.964	101.720
1904	888.170	669.992	117.353	100.825	925.060	669.992	154.243	100.825
1905	908.685	683.080	121.368	104.237	945.592	683.080	158.275	104.237
1906	990.792	754.151	129.046	107.595	1 027.526	754.151	165.780	107.595
1907	1 064.648	814.154	131.975	118.519	1 101.032	814.154	168.359	118.519
1908	1 123.307	855.389	143.295	124.623	1 164.040	855.389	184.028	124.623
1909	1 190.406	916.887	144.480	129.039	1 235.754	916.887	185.828	129.039
1910	1 251.818	967.673	140.058	144.087	1 297.882	967.673	180.122	144.087
1911	1 352.143	1 032.419	167.037	152.687	1 407.521	1 032.419	211.415	152.687
1912	1 478.041	1 116.443	187.187	174.411	1 541.620	1 116.443	236.766	174.411
1913	1 613.821	1 212.263	207.099	194.459	1 675.802	1 212.263	255.080	194.459
1914	1 718.359	1 282.227	222.509	213.623	1 780.879	1 282.227	272.029	213.623
1915	2 166.425	1 594.142	339.668	232.615	2 229.474	1 594.142	390.717	232.615
1916	3 571.633	2 414.120	752.451	405.062	3 639.251	2 414.120	804.069	405.062
1917	5 321.681	3 471.656	1 214.462	635.563	5 401.121	3 471.656	1 271.902	635.563
1918	6 462.734	4 315.496	1 197.860	949.378	6 537.901	4 315.496	1 249.027	949.378
1919	7 226	4 811	1 378	1 037	7 254	4 811	1 378	1 037
1920	7 714	5 166	1 507	1 041	7 743	5 166	1 507	1 041
1921	7 589	5 277	1 319	993	7 619	5 277	1 319	993
1922	7 189	5 136	1 038	1 015	7 239	5 136	1 038	1 015
1923	6 610	4 789	1 122	699	6 665	4 789	1 171	705
1924	6 420	4 620	1 172	628	6 476	4 620	1 221	635
1925	6 403	4 534	1 326	543	6 468	4 534	1 383	551
1926	6 030	4 520	1 002	508	6 102	4 520	1 069	513
1927	5 470	4 188	838	444	5 548	4 188	911	449
1928	5 240	3 997	789	454	5 333	3 997	872	464
1929	5 126	3 883	764	479	5 227	3 883	857	487
1930	4 896	3 732	680	484	5 015	3 732	791	492
1931	4 815	3 523	859	433	4 957	3 523	990	444

4.C Appendix, Balance sheet for private banks plus credit companies

Table 4.A.6: Private banks' liabilities and equity, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880:
Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks				Private banks plus credit companies			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1932	4 612	3 359	777	476	4 766	3 359	922	485
1933	4 431	3 188	773	470	4 600	3 188	931	481
1934	4 221	3 028	711	482	4 401	3 028	880	493
1935	4 147	2 854	809	484	4 366	2 854	1 015	497
1936	3 750	2 703	541	506	3 986	2 703	763	520
1937	3 784	2 828	437	519	4 075	2 828	713	534
1938	4 114	2 982	608	524	4 444	2 982	921	541
1939	4 122	2 911	690	521	4 468	2 911	1 019	538
1940	4 461	3 221	716	524	4 815	3 221	1 050	544
1941	5 275	3 910	826	539	5 652	3 910	1 183	559
1942	6 060	4 585	937	538	6 466	4 585	1 320	561
1943	7 033	5 393	1 104	536	7 446	5 393	1 495	558
1944	8 052	6 107	1 410	535	8 460	6 107	1 794	559
1945	9 541	7 656	1 328	557	9 941	7 656	1 705	580
1946	9 509	7 259	1 670	580	9 970	7 259	2 104	607
1947	10 263	7 933	1 744	586	10 874	7 933	2 325	616
1948	10 492	8 267	1 629	596	11 180	8 267	2 288	625
1949	10 929	8 486	1 825	618	11 697	8 486	2 561	650
1950	11 037	8 523	1 883	631	11 905	8 523	2 716	666
1951	12 286	9 386	2 229	671	13 219	9 386	3 125	708
1952	12 752	9 815	2 243	694	13 792	9 815	3 238	739
1953	13 175	10 169	2 297	709	14 380	10 169	3 441	770
1954	13 821	10 623	2 464	734	15 136	10 623	3 710	803
1955	13 944	11 107	2 083	754	15 311	11 107	3 377	827
1956	14 649	11 577	2 285	787	16 073	11 577	3 633	863
1957	15 452	12 082	2 550	820	15 452	12 082	2 550	820
1958	15 826	12 358	2 594	874	15 826	12 358	2 594	874
1959	16 699	13 043	2 736	920	16 699	13 043	2 736	920
1960	18 243	13 945	3 377	921	20 196	13 945	5 171	1 080
1961	19 618	14 661	3 992	965	21 791	14 661	5 995	1 135
1962	20 689	15 785	3 847	1 057	23 047	15 785	5 987	1 275
1963	22 089	16 878	4 023	1 188	24 652	16 878	6 370	1 404
1964	23 944	18 240	4 431	1 273	26 831	18 240	7 097	1 494
1965	26 489	20 119	4 944	1 426	29 737	20 119	7 917	1 701
1966	28 600	21 710	5 296	1 594	32 217	21 710	8 618	1 889
1967	31 162	23 847	5 625	1 690	35 126	23 847	9 267	2 012
1968	34 936	26 893	6 231	1 812	39 289	26 893	10 220	2 176
1969	39 241	29 770	7 443	2 028	44 184	29 770	11 970	2 444
1970	43 800	34 441	7 135	2 224	49 689	34 441	12 501	2 747
1971	48 867	38 960	7 461	2 446	55 747	38 960	13 741	3 046
1972	55 692	43 543	9 588	2 561	63 521	43 543	16 747	3 231
1973	62 425	49 535	10 005	2 885	71 466	49 535	18 256	3 675
1974	70 037	55 284	11 739	3 014	80 549	55 284	21 302	3 963
1975	78 889	63 411	12 164	3 314	91 657	63 411	23 807	4 439
1976	90 685	74 050	12 688	3 947	107 283	74 050	27 921	5 312
1977	108 439	86 432	17 128	4 879	130 709	86 432	37 810	6 467
1978	119 183	97 834	15 779	5 570	143 117	97 834	38 029	7 254
1979	135 723	112 643	16 668	6 412	162 933	112 643	41 934	8 356
1980	160 953	128 803	24 976	7 174	193 757	128 803	56 490	8 464
1981	188 514	147 899	32 131	8 484	227 203	147 899	69 329	9 975
1982	218 571	165 450	42 162	10 959	263 543	165 450	85 176	12 917
1983	249 114	186 436	49 602	13 076	301 930	186 436	100 022	15 472
1984	311 042	227 316	67 936	15 790	372 562	227 316	126 434	18 812
1985	382 361	262 064	101 413	18 884	455 912	262 064	171 121	22 727
1986	490 293	268 106	199 820	22 367	582 064	268 106	287 301	26 657

Money and credit, composite historical data series spanning two centuries

Table 4.A.6: Private banks' liabilities and equity, end-of-year 1822-2021, and including credit companies (right). Million kroner.
Sources: Skånland (1967), Matre (1992a,b), Klovland (2007a,b); Eitheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of banks and mortgage companies, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Private banks				Private banks plus credit companies			
	Total	Deposits	Other liabilities	Equity	Total	Deposits	Other liabilities	Equity
1987	590 746	312 466	254 729	23 551	717 618	312 466	376 675	28 477
1988	583 033	326 168	233 919	22 946	744 848	326 168	390 038	28 642
1989	604 706	360 310	217 924	26 472	783 418	360 310	390 028	33 080
1990	614 638	370 881	219 445	24 312	797 052	370 881	395 439	30 732
1991	578 090	447 513	115 343	15 234	741 322	447 513	273 074	20 735
1992	610 711	489 246	98 777	22 688	730 890	489 246	212 160	29 484
1993	679 445	487 377	155 291	36 777	789 007	487 377	256 743	44 887
1994	695 179	505 841	144 249	45 089	795 647	505 841	237 023	52 783
1995	736 376	525 066	159 635	51 675	836 531	525 066	251 933	59 532
1996	874 858	566 213	250 052	58 593	969 314	566 213	337 453	65 648
1997	979 386	563 707	350 483	65 196	1 084 495	563 707	448 646	72 143
1998	1 082 646	619 550	394 449	68 647	1 220 220	619 550	523 362	77 307
1999	1 197 690	686 873	426 914	83 903	1 345 368	686 873	564 779	93 716
2000	1 331 139	783 497	461 505	86 137	1 542 858	783 497	661 577	97 783
2001	1 451 437	841 246	512 076	98 115	1 702 852	841 246	751 609	109 996
2002	1 568 700	883 300	586 814	98 586	1 847 495	883 300	853 646	110 549
2003	1 725 093	979 228	642 147	103 718	2 046 145	979 228	950 434	116 483
2004	1 805 276	994 219	700 457	110 600	2 165 439	994 219	1 047 561	123 658
2005	2 137 694	1 159 637	855 927	122 130	2 541 674	1 159 637	1 246 884	135 153
2006	2 624 895	1 487 020	997 632	140 243	3 078 482	1 487 020	1 438 163	153 299
2007	3 120 776	1 729 542	1 245 416	145 818	3 743 387	1 729 542	1 851 970	161 874
2008	3 817 185	2 155 851	1 486 092	175 242	4 817 776	2 155 851	2 460 459	201 466
2009	3 697 621	2 328 078	1 174 301	195 242	4 821 352	2 328 078	2 256 185	237 089
2010	3 639 617	2 345 523	1 076 113	217 981	5 017 881	2 345 523	2 405 307	267 051
2011	3 950 544	2 641 470	1 069 759	239 315	5 566 317	2 641 470	2 599 825	325 022
2012	4 046 836	2 694 245	1 088 792	263 799	5 760 216	2 694 245	2 719 604	346 367
2013	4 270 968	2 878 731	1 103 032	289 205	6 017 673	2 878 731	2 763 201	375 741
2014	4 641 488	3 087 442	1 235 719	318 327	6 586 586	3 087 442	3 089 167	409 977
2015	4 754 426	3 205 333	1 177 435	371 658	6 784 749	3 205 333	3 095 808	483 608
2016	4 913 794	3 339 164	1 139 916	434 714	6 941 712	3 339 164	3 049 312	553 236
2017	5 144 023	3 583 403	1 145 080	415 540	7 292 134	3 583 403	3 160 224	548 507
2018	5 214 651	3 732 028	1 056 989	425 634	7 432 021	3 732 028	3 137 136	562 857
2019	5 534 547	3 803 643	1 273 191	457 713	7 891 259	3 803 643	3 482 897	604 719
2020	6 010 529	4 132 012	1 383 970	494 547	8 600 215	4 132 012	3 821 282	646 921
2021	6 196 331	4 436 434	1 238 093	521 804	8 786 889	4 436 434	3 682 692	667 763

4.D Appendix, Loans from financial institutions

4.D Appendix, Loans from financial institutions

Table 4.A.7 *Financial institutions in Norway 1813-2021*

Abbrev.	First year	Financial institution
TRB	1813	Temporary Riksbank (from 1814)
NB	1817	Norges Bank (total)
NBG	1817	Norges Bank's loans to government (excl. occupation account)
NBP	1817	Norges Bank's mortgage loans and other loans
NBD	1817	Norges Bank's discount loans and other short term loans
PB	1822	Private banks (total)
SB	1822	Savings banks
CB	1848	Commercial banks
PO	1944	Postal bank and Postgiro
CR	1909	Credit companies (mortgage companies)
FI	1965	Financial companies
ST	1903	State banks (total)
DC	1828	Discount commission loans
HB	1852	Hypotekbank loans
ST	1903	Other state banks

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1817	0.712	0.712	0.712												
1818	11.014	11.014	9.504	1.198	0.312										
1819	13.745	13.745	9.264	3.994	0.487										
1820	13.916	13.916	8.211	5.213	0.492										
1821	14.966	14.966	7.062	7.405	0.499										
1822	14.810	14.789	5.686	8.590	0.514	0.021	0.021								
1823	15.302	15.168	4.719	9.707	0.743	0.134	0.134								
1824	16.087	15.801	3.748	10.988	1.065	0.286	0.286								
1825	18.378	17.896	2.758	13.717	1.421	0.482	0.482								
1826	19.668	18.941	1.861	15.373	1.708	0.727	0.727								
1827	19.931	19.119	1.063	16.327	1.729	0.812	0.812								
1828	21.751	20.254	1.156	17.368	1.729	1.046	1.046					0.451	0.451		
1829	22.236	20.397	0.900	17.758	1.738	1.296	1.296					0.543	0.543		
1830	22.505	20.366	0.846	17.821	1.698	1.575	1.575					0.565	0.565		
1831	23.381	20.954	0.820	18.401	1.732	1.831	1.831					0.596	0.596		
1832	24.067	21.199	0.815	18.675	1.710	2.238	2.238					0.629	0.629		
1833	24.326	21.057	0.803	18.425	1.829	2.602	2.602					0.668	0.668		
1834	25.376	21.677	0.775	18.898	2.003	3.056	3.056					0.642	0.642		
1835	26.606	22.321	0.176	19.585	2.560	3.642	3.642					0.643	0.643		
1836	28.059	22.900		20.054	2.846	4.077	4.077					1.082	1.082		
1837	31.544	23.935		20.956	2.979	4.765	4.765					2.845	2.845		
1838	33.263	24.773		21.598	3.175	5.303	5.303					3.187	3.187		
1839	35.188	25.780		21.801	3.979	6.020	6.020					3.389	3.389		
1840	36.056	25.634		21.722	3.912	7.108	7.108					3.315	3.315		
1841	36.238	25.145		21.422	3.723	8.026	8.026					3.067	3.067		
1842	38.010	25.984		22.012	3.972	9.293	9.293					2.732	2.732		
1843	42.214	28.027		24.156	3.871	10.560	10.560					3.627	3.627		
1844	44.460	28.321		23.585	4.736	12.199	12.199					3.940	3.940		
1845	48.253	30.229		24.867	5.363	14.031	14.031					3.993	3.993		
1846	52.390	31.802		26.148	5.654	16.384	16.384					4.204	4.204		
1847	54.245	31.266		25.848	5.417	18.110	18.110					4.869	4.869		

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1848	54.900	29.845		25.188	4.658	17.915	17.355	0.560				7.140	7.140		
1849	52.412	28.070		24.284	3.785	18.011	17.250	0.761				6.332	6.332		
1850	54.431	29.684		23.734	5.950	18.798	17.827	0.971				5.949	5.949		
1851	59.272	31.744		23.566	8.177	21.110	19.870	1.240				6.418	6.418		
1852	63.688	31.118		22.880	8.238	24.142	22.669	1.473				8.427	6.077	2.350	
1853	69.505	32.569		22.229	10.340	26.842	25.608	1.234				10.094	6.252	3.842	
1854	76.902	34.123		21.941	12.182	32.704	31.207	1.497				10.075	5.346	4.729	
1855	84.039	34.113		21.415	12.698	38.730	36.223	2.507				11.196	5.678	5.518	
1856	92.578	33.429		20.827	12.602	46.050	39.938	6.112				13.099	5.993	7.106	
1857	95.413	35.866		20.283	15.583	45.645	38.626	7.019				13.903	5.926	7.976	
1858	107.571	35.518		19.774	15.744	53.335	40.199	13.136				18.718	6.698	12.021	
1859	113.317	33.121		19.494	13.626	58.208	43.638	14.570				21.988	6.397	15.591	
1860	119.871	31.891		19.500	12.391	64.772	45.934	18.838				23.208	5.373	17.835	
1861	130.151	32.137		19.123	13.014	74.535	49.450	25.085				23.479	3.477	20.002	
1862	144.327	33.812		18.443	15.369	81.159	53.968	27.191				29.357	3.482	25.875	
1863	159.173	34.335		17.472	16.863	90.592	60.169	30.423				34.246	3.418	30.828	
1864	159.421	31.219		16.380	14.839	93.833	65.802	28.031				34.368	3.596	30.772	
1865	166.772	33.586		16.780	16.806	99.460	68.191	31.269				33.727	3.614	30.113	
1866	170.775	34.398		16.509	17.889	102.574	72.794	29.780				33.803	3.376	30.428	
1867	177.000	34.163		16.607	17.556	110.046	75.428	34.618				32.790	2.407	30.384	
1868	184.246	34.400		16.693	17.707	114.851	78.140	36.711				34.996	2.445	32.551	
1869	186.289	33.536		16.455	17.080	116.103	77.146	38.957				36.651	2.602	34.049	
1870	193.405	33.563		16.341	17.222	122.373	80.846	41.527				37.469	2.258	35.210	
1871	202.190	31.488		16.443	15.045	132.806	80.415	52.391				37.896	1.739	36.157	
1872	217.233	32.209		15.684	16.524	146.528	86.376	60.152				38.496	1.828	36.668	
1873	240.099	35.821		14.567	21.254	165.286	100.162	65.124				38.992	2.170	36.823	
1874	263.109	34.934		13.885	21.048	189.798	115.764	74.034				38.378	1.574	36.804	
1875	277.418	38.340		13.737	24.603	198.398	126.046	72.352				40.680	1.606	39.074	
1876	290.773	36.028		13.817	22.211	212.257	133.241	79.016				42.488	1.457	41.030	
1877	302.209	39.126		13.614	25.512	219.484	139.042	80.442				43.599	1.241	42.359	
1878	301.716	36.520		13.165	23.355	220.742	138.831	81.911				44.454	1.157	43.296	

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1879	303.670	36.784		13.341	23.443	216.147	134.392	81.755				50.739	1.046	49.693	
1880	319.381	33.043		12.918	20.125	228.132	135.305	92.827				58.206	1.132	57.075	
1881	336.067	32.932		12.215	20.718	240.970	141.544	99.426				62.165	0.967	61.198	
1882	349.363	30.706		11.649	19.057	253.144	145.799	107.345				65.513	0.972	64.540	
1883	360.433	31.292		11.272	20.020	261.418	152.246	109.172				67.724	0.173	67.551	
1884	372.567	29.104		10.451	18.653	273.020	158.822	114.198				70.443	0.174	70.269	
1885	384.306	33.003		9.727	23.275	278.576	162.515	116.061				72.727	0.175	72.553	
1886	379.824	32.976		8.414	24.562	269.158	163.251	105.907				77.691	0.173	77.518	
1887	374.702	25.533		7.426	18.107	265.691	159.285	106.406				83.478	0.169	83.309	
1888	381.300	23.892		6.539	17.353	272.293	158.434	113.859				85.115	0.173	84.942	
1889	401.422	26.675		7.282	19.392	290.581	162.103	128.478				84.166	0.169	83.998	
1890	428.762	34.217		8.238	25.979	311.028	174.627	136.401				83.517	0.169	83.347	
1891	446.077	38.748		6.991	31.757	323.526	185.454	138.072				83.803	0.176	83.627	
1892	455.138	32.960		6.792	26.167	334.493	189.811	144.682				87.685	0.172	87.513	
1893	479.108	36.327	0.558	7.565	28.204	347.200	197.027	150.173				95.581	0.169	95.412	
1894	501.280	36.274	1.140	7.864	27.270	361.922	204.580	157.342				103.084	0.164	102.921	
1895	532.043	38.318	1.125	7.608	29.585	382.811	211.214	171.597				110.914	0.174	110.740	
1896	561.561	39.870	1.117	7.200	31.553	406.305	222.404	183.901				115.386	0.172	115.214	
1897	607.995	38.553	1.117	6.624	30.812	452.058	233.399	218.659				117.384	0.174	117.211	
1898	704.862	44.048	1.094	6.312	36.642	537.819	250.846	286.973				122.995	0.171	122.824	
1899	756.111	55.833	1.049	7.261	47.523	573.811	270.009	303.802				126.467	0.173	126.293	
1900	819.856	53.099	0.983	7.407	44.709	635.679	282.768	352.911				131.078	0.226	130.852	
1901	849.003	49.965	0.855	8.850	40.260	663.892	295.684	368.208				135.146	0.222	134.924	
1902	867.952	52.053		9.814	42.239	672.631	306.672	365.959				143.268	0.224	143.045	
1903	894.881	46.599		8.424	38.175	697.282	323.384	373.898				151	0.226	147.627	3.147
1904	907.493	41.968		7.985	33.983	708.525	336.917	371.608				157	0.175	151.599	5.226
1905	928.788	42.890		7.465	35.425	724.898	345.537	379.361				161	0.172	154.990	5.838
1906	973.552	39.098		7.233	31.865	769.454	363.626	405.828				165	0.128	157.407	7.465
1907	1 042.216	37.547		6.237	31.310	828.669	385.028	443.641				176	0.128	164.682	11.190
1908	1 108.829	40.014		5.437	34.577	886.815	409.547	477.268				182	0.128	168.831	13.041
1909	1 179.001	43.307	0.468	4.564	38.275	936.694	433.609	503.085		4		195	0.128	178.816	16.056

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1910	1 249.845	49.738	0.467	4.541	44.730	984.107	459.605	524.502		6		210	0.128	190.026	19.846
1911	1 367.673	60.405	0.456	6.354	53.595	1 079.268	499.239	580.029		11		217		193.126	23.874
1912	1 498.555	66.531	0.446	8.114	57.971	1 199.024	540.217	658.807		13		220		191.986	28.014
1913	1 615.001	74.709	0.427	8.964	65.318	1 306.292	578.955	727.337		13		221		188.290	32.710
1914	1 728.028	123.119	0.830	9.476	112.813	1 363.909	610.880	753.029		12		229		192.796	36.204
1915	1 996.049	89.988	3.656	8.386	77.946	1 655.061	669.631	985.430		11		240		200.500	39.500
1916	2 985.559	161.160	4.285	32.971	123.904	2 563.399	806.966	1 756.433		13		248		204.613	43.387
1917	4 329.938	411.280	4.379	229.885	177.016	3 628.658	980.603	2 648.055		17		273		226.457	46.543
1918	5 352.466	435.721	4.420	175.754	255.547	4 614.745	1 268.527	3 346.218		19		283		229.000	54.000
1919	6 004.9	412.9	3.7	57.8	351.4	5 275	1 520	3 755		21		296		233.9	62.1
1920	6 610.9	511.9	2.7	58.4	450.8	5 766	1 732	4 034		23		310		236.4	73.6
1921	6 304.2	462.2	3.6	37.4	421.3	5 467	1 799	3 668		24		351		251.3	99.7
1922	5 851.4	416.4	3.1	47.6	365.6	4 987	1 812	3 175		40		408		282.2	125.8
1923	5 408.2	431.2	3.1	103.0	325.1	4 465	1 856	2 609		46		466		312.8	153.2
1924	5 100.4	377.4	3.3	128.3	245.8	4 182	1 805	2 377		48		493		320.6	172.4
1925	5 006.2	301.2	3.5	130.2	167.5	4 104	1 805	2 299		55		546		363.9	182.1
1926	4 481.9	227.9	3.2	99.6	125.1	3 605	1 730	1 875		62		587		395.1	191.9
1927	4 237.5	233.5	8.6	115.3	109.7	3 301	1 669	1 632		70		633		428.8	204.2
1928	4 103.9	265.9	7.9	133.3	124.7	3 071	1 603	1 468		81		686		444.4	241.6
1929	4 065.8	240.8	18.3	106.8	115.7	2 980	1 547	1 433		94		751		458.4	292.6
1930	3 916.2	199.2	15.3	76.2	107.7	2 786	1 491	1 295		110		821		475.0	346.0
1931	3 974.3	274.3	28.6	126.0	119.7	2 704	1 458	1 246		134		862		476.6	385.4
1932	3 905.9	271.9	25.1	31.2	215.6	2 592	1 444	1 148		145		897		471.9	425.1
1933	3 863.6	293.6	27.0	30.2	236.5	2 484	1 381	1 103		158		928		468.1	459.9
1934	3 829.6	287.6	30.8	29.1	227.7	2 416	1 361	1 055		164		962		465.5	496.5
1935	3 836.8	244.8	26.1	20.7	198.1	2 416	1 347	1 069		193		983		460.1	522.9
1936	3 852.9	258.9	20.4	22.1	216.4	2 365	1 307	1 058		220		1 009		458.2	550.8
1937	3 897.0	186.0	9.4	28.5	148.1	2 406	1 298	1 108		261		1 044		456.7	587.3
1938	4 049.6	223.6	21.1	29.1	173.4	2 446	1 309	1 137		305		1 075		453.5	621.5
1939	4 508.0	405.0	30.4	72.3	302.3	2 657	1 364	1 293		325		1 121		459.9	661.1
1940	3 981.3	187.3	15.6	89.2	82.5	2 361	1 257	1 104		330		1 103		445.2	657.8

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1941	3 440.4	64.4	6.2	40.4	17.8	1 988	1 115	873		334		1 054		415.7	638.3
1942	3 153.6	47.6	5.2	26.5	15.9	1 762	964	798		355		989		394.7	594.3
1943	2 872.8	40.8	3.9	18.4	18.6	1 581	850	731		355		896		374.6	521.4
1944	2 705.2	40.2	3.5	23.2	13.4	1 487	765	720	2	356		822		349.0	473.0
1945	2 841.6	36.6	7.1	22.7	6.8	1 679	754	910	15	355		771		329.0	442.0
1946	3 911.0	163.0	78.8	81.0	3.2	2 540	1 065	1 453	22	417		791		329.7	461.3
1947	5 079.9	241.9	72.4	93.9	75.6	3 449	1 466	1 968	15	540		849		342.1	506.9
1948	6 074.4	133.4	53.8	72.3	7.3	4 279	1 723	2 521	35	641		1 021		357.5	663.5
1949	7 159.2	142.2	47.8	85.2	9.2	4 877	1 953	2 894	30	732		1 408		373.8	1 034.2
1950	8 493.4	103.4	46.6	43.4	13.4	5 717	2 244	3 441	32	819		1 854		384.9	1 469.1
1951	9 837.8	124.8	45.8	48.5	30.4	6 530	2 500	3 958	72	881		2 302		399.8	1 902.2
1952	11 156.5	118.5	44.8	58.4	15.3	7 315	2 803	4 347	165	974		2 749		415.0	2 334.0
1953	12 542.8	217.8	127.4	73.7	16.8	7 935	3 145	4 509	281	1 108		3 282		439.7	2 842.3
1954	13 891.8	106.8	38.1	54.2	14.5	8 711	3 516	4 835	360	1 254		3 820		449.2	3 370.8
1955	15 099.2	236.2	93.3	119.8	23.1	9 130	3 761	5 005	364	1 319		4 414		451.3	3 962.7
1956	15 983.8	253.8	106.6	115.7	31.5	9 410	3 958	4 976	476	1 368		4 952		454.9	4 497.1
1957	17 262.2	241.2	100.1	82.7	58.4	10 230	4 242	5 187	801	1 401		5 390		461.0	4 929.0
1958	18 440.2	302.2	196.3	99.0	6.9	10 854	4 553	5 366	935	1 484		5 800		464.3	5 335.7
1959	19 992.9	357.9	189.1	99.6	69.2	11 817	4 935	5 789	1 093	1 594		6 224		467.6	5 756.4
1960	21 780.1	265.1	185.8	74.5	4.7	12 998	5 381	6 475	1 142	1 789		6 728		471.7	6 256.3
1961	23 994.1	311.1	199.3	106.4	5.3	14 385	5 741	7 356	1 288	1 969		7 329		475.7	6 853.3
1962	26 070.2	315.2	196.6	113.2	5.4	15 632	6 192	7 924	1 516	2 199		7 924		486.3	7 437.7
1963	27 939.5	343.5	224.9	113.7	5.0	16 636	6 667	8 359	1 610	2 332		8 628		495.9	8 132.1
1964	30 447.8	406.8	231.5	170.0	5.3	18 012	7 135	9 108	1 769	2 653		9 376		504.2	8 871.8
1965	33 718.4	329.4	217.4	80.4	31.5	19 121	7 629	9 681	1 811	3 031	1 023	10 214		508.5	9 705.5
1966	36 826	458	232	202	24	20 933	8 331	10 885	1 717	3 405	1 072	10 958			10 958
1967	40 133	647	272	283	92	22 610	9 146	11 706	1 758	3 707	1 153	12 016			12 016
1968	44 261	522	278	163	82	24 537	10 082	12 651	1 804	4 060	1 359	13 783			13 783
1969	50 843	1 076	409	329	338	27 983	11 396	14 408	2 179	4 550	1 634	15 600			15 600
1970	58 697	1 474	1 257	125	92	31 563	12 669	15 762	3 132	5 404	2 289	17 967			17 967
1971	67 059	1 327	913	209	205	35 795	14 156	17 722	3 917	6 364	2 710	20 863			20 863

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
1972	77 304	2 077	938	1 007	131	40 668	15 674	20 110	4 884	7 156	2 996	24 407			24 407
1973	87 201	2 568	1 144	67	1 357	45 086	17 603	22 508	4 975	8 275	3 115	28 157			28 157
1974	99 867	3 167	1 077	126	1 963	52 046	19 981	25 312	6 753	9 449	3 334	31 871			31 871
1975	116 216	4 025	2 616	141	1 267	60 297	22 917	29 374	8 006	11 273	3 455	37 166			37 166
1976	139 217	5 870	4 324	114	1 432	70 595	26 498	33 905	10 192	14 992	3 775	43 985			43 985
1977	171 544	13 409	7 676	155	5 578	81 854	30 551	39 537	11 766	19 465	4 162	52 654			52 654
1978	194 125	10 436	7 832	244	2 360	92 416	33 677	43 284	15 455	21 776	5 103	64 394			64 394
1979	222 163	11 297	9 532	225	1 540	104 500	37 892	47 897	18 711	25 027	5 395	75 944			75 944
1980	243 185	5 804	4 552	239	1 013	115 774	42 093	54 566	19 115	29 537	5 700	86 370			86 370
1981	278 314	9 094	5 812	270	3 012	132 862	48 369	64 400	20 093	35 286	6 742	94 330			94 330
1982	314 012	9 047	5 758	434	2 855	151 976	55 543	76 703	19 730	41 382	9 682	101 925			101 925
1983	362 831	16 898	11 843	376	4 679	176 996	64 889	91 693	20 414	48 087	12 493	108 357			108 357
1984	423 558	10 352	7 735	380	2 237	227 361	80 505	119 183	27 673	53 671	15 466	116 708			116 708
1985	526 939	27 943	19 267	366	8 310	294 936	111 073	152 128	31 735	61 815	20 458	121 787			121 787
1986	745 871	119 812	48 264	370	71 178	386 225	146 547	203 608	36 070	77 317	32 958	129 559			129 559
1987	836 042	101 665	24 859	406	76 400	451 521	173 068	242 352	36 101	110 421	34 989	137 446			137 446
1988	901 768	98 594	20 574	468	77 552	475 889	185 688	250 544	39 657	139 307	42 201	145 777			145 777
1989	945 500	95 197	32 151	350	62 696	513 645	192 511	276 961	44 173	153 302	28 632	154 724			154 724
1990	942 666	82 044	23 404	178	58 462	519 785	187 734	285 402	46 649	155 160	22 633	163 044			163 044
1991	912 403	76 828	14 219	152	62 456	507 623	197 049	264 412	46 162	131 610	21 392	174 950			174 950
1992	889 593	68 884	12 584	658	55 641	522 810	197 040	277 501	48 269	93 806	18 508	185 586			185 586
1993	863 956	46 793	29 252	637	16 905	532 995	207 038	261 311	64 646	83 952	19 422	180 794			180 794
1994	840 077	19 587	13 691	616	5 280	546 533	221 049	265 009	60 475	72 785	24 545	176 627			176 627
1995	894 226	28 750	18 057	594	10 099	586 326	241 112	345 214		72 844	30 867	175 439			175 439
1996	929 477	13 308	12 413	528	367	637 414	273 709	363 705		68 878	31 321	178 556			178 556
1997	1 075 855	18 666	10 646	515	7 505	755 538	313 955	441 583		81 980	39 090	180 581			180 581
1998	1 219 342	29 245	9 426	7 682	12 137	846 464	348 111	498 353		108 588	47 653	187 392			187 392
1999	1 336 167	36 968	10 772	567	25 630	929 514	418 765			116 999	61 241	191 445			191 445
2000	1 514 557	36 210	13 519	575	22 115	1 061 592	484 835	576 757		176 695	70 250	169 810			169 810
2001	1 662 925	27 309	11 523	603	15 183	1 168 989	544 478	624 511		204 355	83 607	178 665			178 665
2002	1 759 732	15 171	13 443	662	1 066	1 250 066	592 807	657 259		220 020	86 398	188 076			188 076

Table 4.A.8: Loans from financial institutions, end-of-year 1817-2021, Million kroner.

Sources: Chapter 2, Kaartvedt and Hartsang (1952), Skånland (1967), Egge (1988), Matre (1992a,b), Reiersen and Thue (1996), Gerdrup (2003), Eitrheim et al. (2004), Klovland (2007a,b); Eitrheim, Grytten and Klovland (2007), Statistics Norway, Table 07880: Balance sheet of financial institutions in four groups, banks, finance companies, mortgage companies and state lending institutions, respectively, (NOK million) 2009M05 - 2022M11 (<https://www.ssb.no/en/statbank/table/07880>).

Year	Total	Norges Bank				Private banks				Other fin. inst.		State banks			
		NB TOT	NBG	NBP	NBD	PB TOT	SB	CB	PO	CR	FI	ST TOT	DC	HB	STR
2003	1 935 428	36 751	23 281	545	12 925	1 358 339	654 655	703 684		256 358	92 760	191 220			191 220
2004	2 045 988	1 202		494	708	1 458 765				293 270	103 316	189 435			189 435
2005	2 381 831	25 424		487	24 937	1 733 848				311 263	118 354	192 942			192 942
2006	2 754 087	55 668		477	55 191	2 037 703				339 240	125 350	196 126			196 126
2007	3 283 135	75 647		451	75 196	2 396 891				480 228	128 740	201 629			201 629
2008	3 788 618	137 995		496	137 499	2 596 473				698 551	144 864	210 735			210 735
2009	4 006 752	75 983		487	75 496	2 655 595				913 598	137 333	224 722			224 722
2010	4 149 100	60 583		486	60 097	2 613 709				1 134 943	105 276	235 255			234 589
2011	4 386 640	25 812		494	25 318	2 679 220				1 320 548	113 689	248 122			247 371
2012	4 571 491	12 677		594	12 083	2 713 476				1 464 230	118 665	263 176			262 443
2013	4 902 765	1 585		729	856	2 988 307				1 502 924	127 271	283 371			282 678
2014	5 339 920	868		763	105	3 379 242				1 516 457	144 608	299 537			298 745
2015	5 566 510	1 427		544	883	3 512 188				1 582 657	157 376	312 862			312 862
2016	5 744 198	540		408	132	3 546 043				1 699 842	173 601	324 172			324 172
2017	6 102 393	744		337	407	3 771 417				1 816 108	175 346	338 778			338 778
2018	6 414 251	459		285	174	3 973 907				1 901 356	184 856	353 673			353 673
2019	6 755 099	7 259		258	7 001	4 116 681				2 062 920	200 076	368 163			368 163
2020	7 229 421	80 648		183	80 465	4 322 199				2 237 958	199 802	388 814			388 814
2021	7 600 117	45 601		167	45 434	4 606 455				2 339 287	200 099	408 675			408 675

A glimpse into mortgage lending in Norway for selected years,
1823-1865

Vetle Hvidsten

5.1 Introduction

When Norges Bank was established in 1816 it was Norway's first and only bank. In the 1820-ies came the first savings banks, in Christiania [Oslo] in 1822, and in Bergen and Trondhjem the year after. Towards the middle of the century the first commercial banks appeared. Compared with the larger European economies Norway lagged regarding the development of financial institutions.

Obviously, the provision of credit does not only depend on the existence of financial institutions. Long before Norway had banks credit was widespread. Public means, nonprofit institutions, and not at least individuals were important sources of domestic credit. Furthermore, credit was mediated from several different sources abroad, including trading houses in Copenhagen, Altona, Hamburg and London. The extent of non-institutional credit must have been considerable, but we have lacked solid data to shed light on the magnitude of the credit.

This study gives more information about the credit market after the establishment of the first banks. It is based on data for more than 3 000 mortgage loans registered with the district recorders of deeds, at Christiania and Trondhjem, as well as with adjoining rural districts Nedre Romerike and Strinda/Selbu. The study is restricted to registered mortgage loans and it excludes other short term and medium term credit such as trade credits, domestic and international bills of exchange as well as bill bonds, i.e. loans of two to three years maturity based on security by their underwriters, which we know were in widespread use in that period. The study encompasses the years 1825, 1835 and 1845 for all four districts. It also includes an overview of registered mortgage loans in 1855 and 1865 in Nedre Romerike and Strinda/Selbu, respectively.

The study of registered mortgage loans for selected years in the period 1823-65 clearly indicates that the provision of non-institutional credit was still considerable up to the midst of the 19th century. In the years 1825, 1835 and 1845 loans from individuals comprised not far from half of the total amount of registered new mortgage loans. As one might expect mortgage loans given by Norges Bank gradually represented a smaller share. The share was reduced from about one third in 1825 to less than one quarter in 1845. The study confirms also that the savings banks gradually increased their market share, from the insignificant four percent in 1825 to just less than 14 percent in 1845. The public sectors share were about 10 percent or just under these years.

5.2 The mortgage market in Norway, 1820-1850

As part of Norges Bank's bicentenary project it has been desirable to get better insight in the credit flows in Norway after the establishment of the first banks.¹ In this article we try to answer the following questions:

¹ Christiania Sparebank [Christiania savings bank] was founded in 1822. Trondhjems Sparebank and Bergen Sparebank were established in 1823. The commercial bank Kreditkassen was founded in 1848. Bergen Privatbank and Den Norske Creditbank were established in 1855 and 1857, respectively. A state bank, Hypotekbanken (Kongeriget Norges Hypotekbank) was established in 1851 and soon became the main provider of mortgage loans.

5.2 The mortgage market in Norway, 1820-1850

Which sectors gave mortgage loans? Were there large lenders among the institutional and individual lenders?

The study reports the results of a sector analysis of registered mortgage loans with the recorders of deeds in Christiania, Trondhjem, Strinda/Selbu, and Nedre Romerike for selected years. The years 1825, 1835 and 1845 have been covered in the study for all four districts. In addition to these three years, 1823 and 1824 have been covered for Christiania, 1824 for Trondhjem and 1855 and 1865 for Strinda/Selbu and Nedre Romerike. The analysis of total registered mortgage credit in the four districts covers the years 1825, 1835 and 1845.

Totally, we have mapped 3 297 mortgage loans in the four districts. The number of mortgage loans is constituted by 1 157 in Christiania, 791 in Trondhjem, 744 in Strinda and Selbu and 605 in Nedre Romerike. (See Table 5.1). In addition to the data from the four abovementioned districts Table 5.7 shows the sector distribution of 282 mortgage loans in Bergen in 1825. Since we only have data for 1825 for Bergen the city has been excluded from the analysis of total mortgage credit.

Table 5.1 *Number of registered mortgage loans in the survey. Selected years 1823-1865.*

	1823	1824	1825	1835	1845	1855	1865	All years
Christiania	164	171	199	180	443			1157
Trondhjem		169	196	147	279			791
Strinda and Selbu			113	101	172	164	194	744
Nedre Romerike			75	62	125	118	225	605
Total								3297

The source of the information of the mortgage loans are digitalized mortgage books from the district recorders of deeds, published on the web by the National Archives of Norway/the Digital Archives. Short-term credit in the form of discounting credits and trade credits have not been included in our analysis. This article is based on Norges Banks Staff memo no. 2/2016 which documents into more details the lending in the four districts for the selected years (See Hvidsten (2016)).

The main features of the mortgage loan market in the four districts as a whole for the years 1825, 1835 and 1845

There were large movements in the total nominal loan amount between the selected years 1825, 1835 and 1845.² First, total loan amount in the four districts decreased by more than 30 percent from 399 069 speciedaler in 1825 to 277 052 speciedaler in 1835. Fewer and lower average loan amounts contributed approximately equal to the reduction. From 1835 to 1845 the total loan amount increased with 177 percent to 767 310 speciedaler. The number of loans more than doubled and the average loan amount increased by a third. The total amount of the mortgage loans in the four districts were more than 90 percent higher in 1845 than the 1825-level (see Table 5.2 and Figure 5.1).

² Note that the price movements between the selected years were small. The price developments have been documented in Norges Bank's Historical Monetary Statistics. See Eitheim, Klovland and Qvigstad (2004). Revised price indices have been published on Norges Bank's web page www.norges-bank.no. With a base index of 100 in 1825 the consumer price index developed like this: 1835: 110.4, 1845: 104.9, 1855: 140.6 and 1865: 124.3.

A glimpse into mortgage lending in Norway for selected years, 1823-1865

The median loans in Christiania were 500 speciedaler in 1825 and 1835, and 600 speciedaler in 1845. The median loan in Christiania in 1825 was 5.2 times higher than average yearly wages.³ For Trondhjem the median loans were 200 speciedaler for 1825 and 1835, and 275 speciedaler for 1845.

Broadly speaking, the percentage reduction of the total loan amount from 1825 to 1835 was evenly distributed on the four districts. However, the mortgage books show that the upturn between 1835 and 1845 was stronger in the cities Christiania and Trondhjem than in the rural areas Nedre Romerike and Strinda/Selbu.

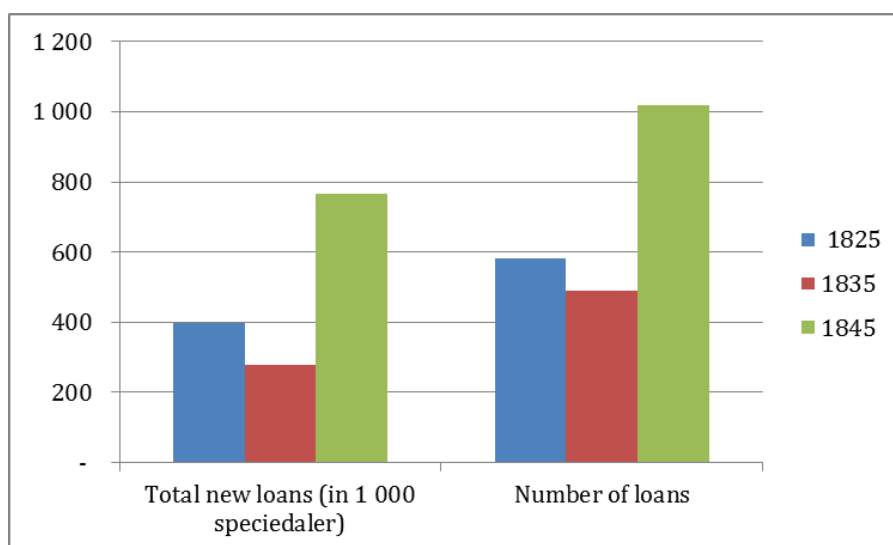


Figure 5.1 Total new mortgage loans in Christiania, Nedre Romerike, Strinda/Selbu and Trondhjem. Years 1825, 1835 and 1845. Thousands of speciedaler and number of loans.

Loans from individuals, "the personal sector", was the dominating source of credit for the four districts in the three years we focus on (see Table 5.2 and Figure 5.2). The personal sector increased its share of the mortgage loans from in excess of 43 percent in 1825 to in excess of 47 percent in 1845. The personal sector's share of the loans varied strongly between the districts. In 1825 the sector accounted for more than 72 percent of the mortgage loans in Nedre Romerike. The personal sector is characterized by many lenders giving only one loan in the years we have studied. Some lenders were more active in the loan market with more loans. For the three years covered by the study in total 19 registered mortgage loans was given by grosserer [wholesaler] Hans Brun to borrowers in Trondhjem and Strinda and Selbu. In the same two districts grocers and wholesalers were the most active lenders measured by the number of loans. Examples are grosserer Frederich Bing, grosserer Chr. A. Lorck (& sønner) and grosserer Carsten Wensell. In Christiania was grosserer Franz Bruun and members of the Anker family active. Some wealthy families were indirect lenders via foundations (see nonprofit institutions below).

Norges Bank was the second largest lender for the years we focus on. Norges Bank's share of

³ Average yearly wages were 385 kroner (96,25 speciedaler) in 1825. See Eitheim, Klovland and Qvigstad (2007), Table 6.A.3.

5.2 The mortgage market in Norway, 1820-1850

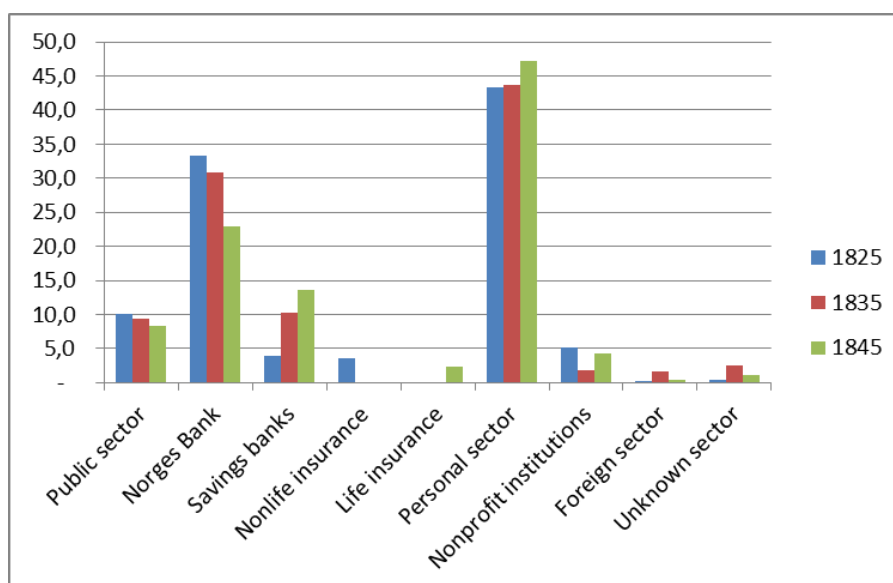


Figure 5.2 New mortgage loans in Christiania, Trondhjem, Strinda and Selbu and Nedre Romerike, by lending sector. Years 1825, 1835 and 1845. Percent.

Table 5.2 *New mortgage loans in Christiania, Nedre Romerike, Strinda/Selbu and Trondhjem, by lending sector. 1825, 1835 and 1845. Speciedaler and percent.*

Lending sector	Speciedaler			Percent		
	1825	1835	1845	1825	1835	1845
Public sector	40214	26028	63963	10.1	9.4	8.3
Norges Bank ^a	132765	85235	175675	33.3	30.8	22.9
Savings banks	15370	28430	103660	3.9	10.3	13.5
Commercial banks						
State banks						
Nonlife insurance companies	14390			3.6		
Life insurance companies			17600			2.3
Personal sector	173307	120875	362640	43.4	43.6	47.3
Nonprofit institutions	20433	5158	32846	5.1	1.9	4.3
Foreign sector	929	4267	2793	0.2	1.5	0.4
Unknown sector	1663	7059	8133	0.4	2.5	1.1
Total	399069	277052	767310	100.0	100.0	100.0
Number of loans	583	490	1019			
Average loan value	685	565	753			
Consumer price index	100.0	110.4	104.9			

^a Norges Banks accounts for 1845 show that new mortgage loans according to the ledger and Laanefondet efter Lov av 8de august 1842 [The Loan Fund of August 8, 1842] constituted 701 790 speciedaler. The registrations in the four districts we study here represented therefore 25 percent of Norges Bank's total new mortgage loans in 1845.

the mortgage loan market fell during the period from in excess of 33 percent in 1825 to just under 23 percent in 1845. In the four districts the median loans from Norges Bank were in general larger than all loans seen together. The mortgage books show that Norges Bank's share of total loans was significantly higher in Trondhjem, where Norges Bank's headquarter was located these years, than

A glimpse into mortgage lending in Norway for selected years, 1823-1865

in Christiania. Mortgage loans from Norges Bank registered in Strinda and Selbu (which is located close to Trondhjem) were also high, especially in 1825 with a market share just under 64 percent.

The public sector reduced its share of the mortgage loan market from in excess of 10 percent in 1825 to in excess of 8 percent in 1845. The offices of the Public Guardian (overformynderier) were the largest group of lenders within the public sector, with a market share varying between one fourth and two thirds of the public loans, all districts seen together. In 1835 the loans from overformynderier constituted more than 6 percent of the total amount of loans in the four districts as a whole. In Nedre Romerike the public sector had a market share that varied around 16 to 19 percent in the period. The Public Guardian constituted more than 11 percent of the mortgage loans in Nedre Romerike in 1835.

The market share of the savings banks increased strongly from just less than 4 percent in 1825 to 13.5 percent in 1845. Christiania Sparebank represented 5.5 percent of the mortgage loans in Christiania in 1825. In 1845 the loans from Trondhjem Sparebank represented just less than 21 percent of the loans in Trondhjem. It seems like the loans from savings banks gradually substituted the loans from Norges Bank in the years we focus on. It was consistently higher median loans from savings banks than for the loans as a whole in each of the districts.

The nonlife insurance sector constituted 3.6 percent of the mortgage loans in 1825, but the sector did not grant any loans in the two other years we have studied. In 1825 only the nonlife insurance sector in Christiania granted mortgage loans. The lender was Christiania Byes Brand Assurance Kasse [Christiania City Fire Insurance Fund] with 25 loans.

The life insurance sector is only represented in 1845 with 2.3 percent of the loans. Den Norske Livrenteforening [The Norwegian Annuity Association] was the lender with five loans.

Lending from nonprofit institutions varied between about 2 percent to about 5 percent, collectively for all districts. The loans were granted by various foundations such as Det Bernt Ankerske Fideikommiss [the Bernt Anker Trusteeship], Det Ankerske Waisenhus [the Anker Orphanage], St. Jørgens stiftelse [St. Jørgen Foundation], Thomas Angells stiftelse [the Thomas Angell Foundation], and Hospitalstiftelsen [the Hospital Foundation]. In terms of market shares the lending from the foundations was consistently larger in Trondhjem and Strinda and Selbu than in the southern districts we study. In Strinda and Selbu nonprofit institutions represented 21 percent of the loans in 1845. This was mainly loans from Thomas Angells stiftelse and Hospitalstiftelsen. The same foundations were active in Trondhjem were just under 11 percent of the loans in 1825 was granted by nonprofit institutions.

The foreign sector is only to a small degree registered as lender of registered mortgage loans. In 1835 the sector represented 1.5 percent of the loans.

The main features of the mortgage market in the rural areas Nedre Romerike and Strinda/Selbu in 1855 and 1865.

The personal sector's share of total mortgage loans in Strinda and Selbu more than doubled from 1845 to 1855 and increased to 67.3 percent in 1865. Compared to 1845 the public sector and Norges Bank's shares of total mortgage loans fell strongly in 1855, but the loan shares of both sectors

5.2 *The mortgage market in Norway, 1820-1850*

increased again in 1865. Savings banks in Strinda and Selbu fell from just under 19 percent in 1855 to 1.5 percent in 1865. Hypotekbanken did not grant any loans in Strinda and Selbu in 1855 and 1865.

A feature of the lending activities in Nedre Romerike in 1855 and 1865 is a higher loan share for the personal sector compared to the three earlier years we have studied. In 1855 the personal sector constituted 81 percent. The public sector's share fell in these years. Widow poverty relief funds (enkekasser) and the Public Guardian (overformynderiet) were the biggest lenders within the public sector these two years. Norges Bank did not grant any loans in Nedre Romerike in 1855. In 1865 the loan share was 14 percent. In Nedre Romerike Hypotekbanken granted in excess of 9 percent of the loans in 1855 and close to 4 percent in 1865.

Datasources and disclaimer

The data sources are scanned mortgage books from three National Archives of Norway/the Digital Archives.⁴ From the mortgage books we have registered the following information about the loans:

- Lender
- Borrower
- Lending sector (sectorised by ten sectors)
- Loan amount in speciealer (recalculated to speciealer if the loan was in foreign currency or in silver species)

We have registered new mortgage loans. The terms for mortgage loans vary between the districts. For Christiania most of the mortgage loans are marked as "pantebreve" [mortgage deeds]. In Trondhjem the loans are marked as "obligasjoner" ["bonds"] or "panteobligasjoner" ["mortgage bonds"]. In a representative recording the text could be like "Jeg underskrivende ... tilstaaer herved at være vitterlig skyldig to ... den summa av ...". [I, the signatory, accept by this to be in debt to ... the amount of ..."]

We have not registered running account loans, certificates of debt or possible loans related to the recording of contracts, notice to creditors, settlements and letter of indemnity. Changes in conditions for loans granted earlier and loans in relation to title deeds have not been included.

Discounting credit and trade credit have not been registered in the mortgage books.

Installments, written in the mortgage books as "afkald"/"aflest", are not covered by this study. The loan volume is therefore higher than net borrowing for the years we look at. The calculated sector loan shares should not be interpreted as share of the loan stocks.

Many mortgage loans were registered with original maturity of 3 or 6 months. The information in the mortgage books about the due dates shows that the actual maturities were several years for most of the loans. As the readability of the digitalised handwritten mortgage books is variable information may have been misinterpreted in some cases. A few interpretation challenges should not change the main picture presented here.

⁴ See <http://www.arkivverket.no/arkivverket/Digitalarkivet>.

Example from the mortgage books

The 400 speciedaler loan granted by Christiania Sparebank to Henrik Wergeland's widow, Mrs. Amalia Sophie Wergeland. The loan was registered with Christiania recorder of deeds on August 14, 1845 and repaid on September 14, 1863.

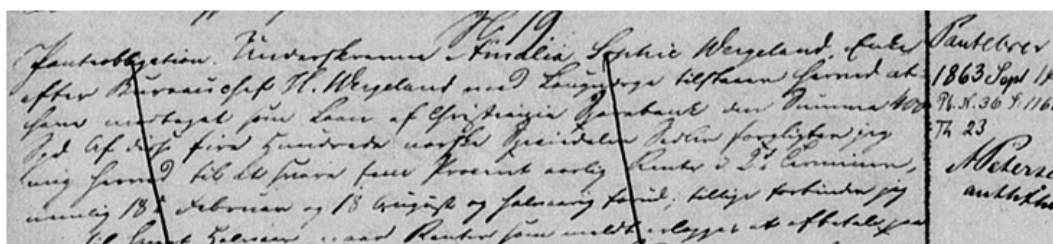


Figure 5.3 Example of a mortgage book entry.

5.3 Christiania and Nedre Romerike

The main features of the mortgage loan market in Christiania (1823, 1824, 1825, 1835 and 1845)

Totally we registered 1 157 mortgage loans for Christiania these five years. Total loan amount in Christiania decreased from 1823 to 1824, but increased again to a higher level in 1825 than in 1823. In 1835 the level was about 28 percent lower than in 1825. In 1845 the level was 229 percent higher than in 1835 and 135 percent higher than in 1825. The developments of the sectors are shown in Table 5.3 and Figure 5.4.

For the years 1823, 1824 and 1845 the loan share of the personal sector was about 50 percent, while the share was about 40 percent in 1825 and 1835. Big personal lenders were merchants Franz Bruun, Schieck and Rasmussen, Johannes Fabritius, the Secretary General of the Department of Justice and State Cashier (zahlkasserer) Andreas Schaft, procurator Elias Smith, widow Mrs. Berthelsen and Anette Anker.

The public sector contributed with 12 percent of the mortgage loans in 1823. The share varied and fell down to 7 percent in 1845. The largest public institution in relation to lending these years was the Christiania Public Guardian. The General Widows Fund (den alminnelige enkekasse) and the Treasury (statskassen) were also among the big lenders in the public sector.

Norges Bank's lending share increased sharply from 12 percent in 1823 to a level around 26-28 percent in 1825 and 1835. The share fell in 1845 to just less than 20 percent.

Three years went after the establishment of Christiania Sparebank before the bank's lending became significant. Lending from savings banks increased from close to zero the first years to over 5 percent in 1825, then to just less than 15 percent in 1835 and to in excess of 13 percent in 1845.

The nonlife insurance companies constituted just less than 8 percent of the loans in 1823, in

5.3 Christiania and Nedre Romerike

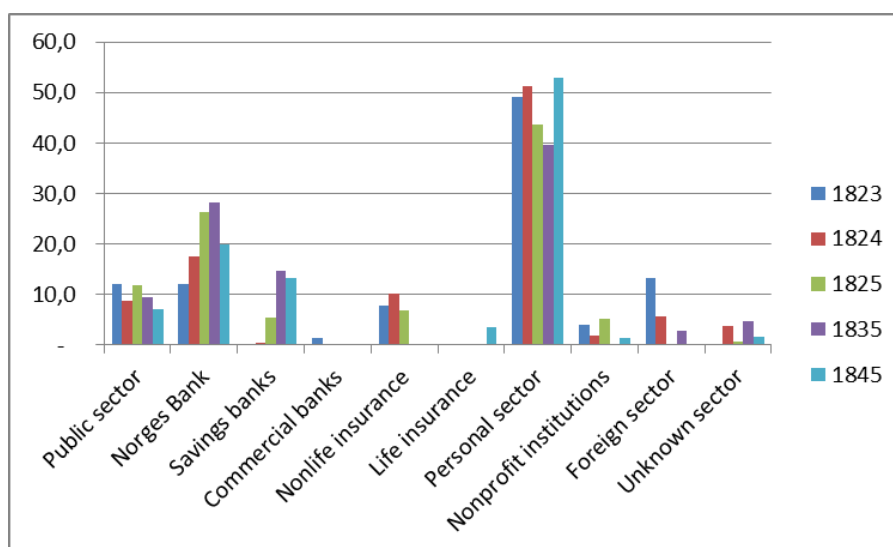


Figure 5.4 Mortgage loan shares in Christiania, by lending sector. 1823, 1824, 1825, 1835 and 1845. Percent.

Table 5.3 *New mortgage loans in Christiania, by lending sector. 1823, 1824, 1825, 1835 and 1845. Speciedaler and percent.*

	Speciedaler					Percent				
	1823	1824	1825	1835	1845	1823	1824	1825	1835	1845
Public sector	18213	12174	24998	14453	35924	12.0	8.8	11.7	9.5	7.2
Norges Bank	18130	24510	56090	43130	99700	12.0	17.7	26.4	28.3	19.9
Savings banks	320	760	11620	22500	66400	0.2	0.5	5.5	14.8	13.3
Commercial banks	2000					1.3				
State banks										
Nonlife insurance companies	11818	14063	14390			7.8	10.1	6.8		
Life insurance companies					17600					3.5
Personal sector	74472	71226	93140	60500	265113	49.2	51.4	43.8	39.7	52.9
Nonprofit institutions	6200	2675	10900	400	7302	4.1	1.9	5.1	0.3	1.5
Foreign sector	19976	7940	4267	600		13.2	5.7		2.8	0.1
Unknown sector	190	5358	1663	7059	8133	0.1	3.9	0.8	4.6	1.6
Total	151319	138706	212800	152309	500771	100.0	100.0	100.0	100.0	100.0
Number of loans	164	171	199	180	443					
Average loan	923	811	1069	846	1130					
Median loan	500	450	500	500	600					

excess of 10 percent in 1824 and just less than 7 percent in 1825. We registered no loans for nonlife insurance companies for 1835 and 1845.⁵

The life insurance companies sector was only registered in 1845, with a loan share of 3.5 percent.

⁵ Christiania Byes Brand Assurance Kasse was dissolved in 1825. See Kristiansen (1925, p. 61). Other loans from nonlife insurance companies have not been registered by us.

A glimpse into mortgage lending in Norway for selected years, 1823-1865

Nonprofit institutions contributed with in excess of 4 percent of the loans in 1823. The highest level was 5.1 percent in 1825. Then the share decreased to 1.5 percent in 1845. Det Bernt Ankerske Fideikommiss, Det Ankerske Waisenhus, Christiania Kathedralskole and Christiania Borgerlige Infanteri Korpser Kasse [infantry corps of the citizens of Christiania] were the sector's largest lenders.

Foreign sector represented more than 13 percent of the lending in 1823 and just less than 6 percent in 1824, but did not grant loans in 1825. In 1835 the loan share was 2.8 percent. Then it fell to close to zero in 1845. Note that trade credits are not covered by our source.

The main features of the mortgage loan market in Nedre Romerike (1825, 1835, 1845, 1855 and 1865)

Totally, 605 mortgage loans were registered for Nedre Romerike these five years. The total loan amount was nearly cut in half from from 1825 to 1835, but more than doubled from 1835 to 1845. Between 1845 and 1855 the total loan amount nearly tripled. The level of lending in 1865 was 38 percent under the 1855 level. The number of loans doubled from 1835 to 1845 and nearly doubled between 1855 and 1865. The median loans were 200 speciedaler in 1825 and 1835 and 230 speciedaler in 1865. In 1845 and 1855 the median loans were 300 and 400 speciedaler, respectively. The personal sector had the largest share of lending in all the five years we have studied. Kongeriget Norges Hypotekbank, which we have classified as a state bank, was a significant lender in 1855 in Nedre Romerike according to our data source. The developments of the sectors are shown in Table 5.4 and Figure 5.5.

In 1825 the loan share of the personal sector was in excess of 72 percent. It then decreased to less than 56 percent in 1835 and to in excess of 42 percent in 1845. In 1855 and 1865 the loan share of the personal sector was 81 and 77 percent, respectively.

The largest loan in the personal sector in 1825 was granted by the former Minister of Finance (in the May 1814 interim government) Carsten Tank to Westlye Egeberg. The loan amount was 11 250 silver speciedaler (16 313 speciedaler) and represented 31 percent of the lending in Nedre Romerike in 1825. In 1855 Jacob Meyer lent 80 000 speciedaler to Thomas Meyer, Thomas Sewell and Thomas Heftye in connection with the purchase of Losby Bruk in Lørenskog. In 1865 the two largest loans within the personal sector were family intern loans. A loan of 25 000 speciedaler was granted to H. Gulbrandsen by his father C. Gulbrandsen. Christian Tandberg granted a loan of 7 000 speciedaler to his brother Engebret Tandberg.

The public sector loan share moved around 16-19 percent the first three years of our selected years. It then fell to 9 percent in 1855 and to in excess of 4 percent in 1865. For the five years as a whole the Public Guardian (overformynderiet) were the biggest lender in the public sector. The Norwegian Church Endowment (Opplysningsvesenets fond)⁶ was also a big lender, especially in 1845 with in excess of 8 percent of new loans. Lånet fra 1820 ("Tyvelånet") represented close to 10 percent of

⁶ The Norwegian Church Endowment (OVF) is regulated in the Norwegian constitution and its assets date back to the Middle Ages and the presence of the Roman Catholic Church in Norway. The fund is an independent legal entity, with the majority of assets in real property and financial assets. Source: <https://ovf.no/om-ovf/information-in-english>".

5.3 Christiania and Nedre Romerike

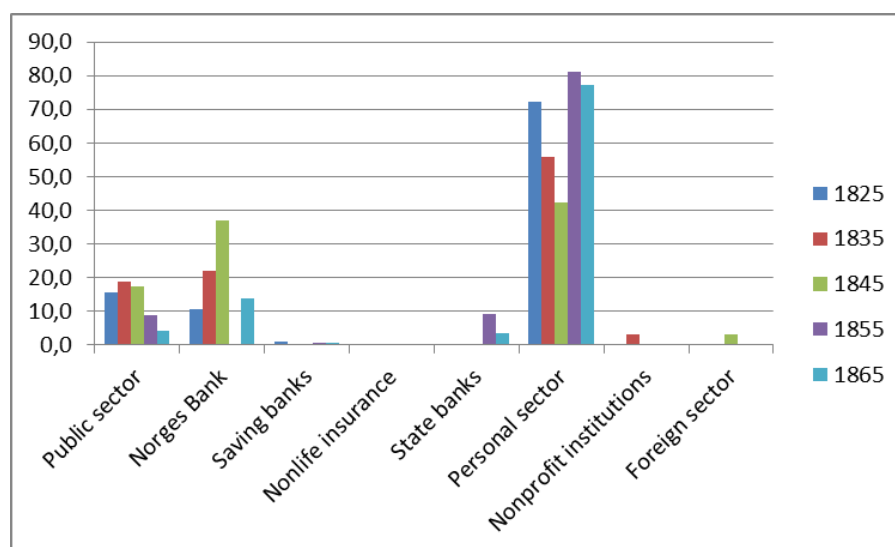


Figure 5.5 Mortgage loan shares in Nedre Romerike, by lending sector. 1825, 1835, 1845, 1855 and 1865. Percent.

Table 5.4 New mortgage loans in Nedre Romerike, by lending sector. 1825, 1835, 1845, 1855 and 1865. Speciedaler and percent.

	Speciedaler					Percent				
	1825	1835	1845	1855	1865	1825	1835	1845	1855	1865
Public sector	8303	5834	11261	17248	5171	15.8	18.9	17.3	9.0	4.4
Norges Bank	5710	6850	24235		16430	10.9	22.2	37.2		14.0
Savings banks	500			1600	660	1.0			0.8	0.6
Commercial banks										
State banks				17470	4180				9.2	3.6
Nonlife insurance companies					450					0.4
Life insurance companies										
Personal sector	38106	17206	27520	154342	90840	72.4	55.7	42.2	81.0	77.2
Nonprofit institutions		1000						3.2		
Foreign sector			2193						3.4	
Unknown sector										
Total	52619	30890	65209	190659	117731	100.0	100.0	100.0	100.0	100.0
Number of loans	75	62	125	118	225					
Average loan value	702	498	522	1616	523					
Median loan value	200	200	300	400	230					

the loan values in 1825. Widow poverty relief funds lending in 1855 constituted 6.9 percent of total loans. The median loan in public sector peaked in 1845 with 500 speciedaler.

Norges Bank's loan share doubled from just less than 11 percent in 1825 to in excess of 22 percent in 1835 and further to in excess of 37 percent in 1845. Norges Bank did not grant loans registered by

A glimpse into mortgage lending in Norway for selected years, 1823-1865

Nedre Romerike recorder of deeds in 1855. In 1865 Norges Bank's loan share was 14 percent. The median loans from Norges Bank increased from 200 speciedaler in 1825 to 375 speciedaler in 1865.

For the savings banks we registered only 7 loans for the five years. The sector had a loan share between zero and 1 percent.

The sector nonprofit institutions granted only one loan in Nedre Romerike these five years. The loan was granted in 1835. It had a value of 1 000 speciedaler and represented in excess of 3 percent of total loans in 1835. The loan was granted by Legatet av 17. mars 1741 [trust].

State banks, represented by Hypotekbanken (Kongeriget Norges Hypotekbank), constituted in excess of 9 percent of the loans in 1855 and close to 4 percent in 1865. The median loans from Hypotekbanken were 500 speciedaler in 1855 and 180 speciedaler in 1865.

The nonlife insurance companies sector was registered with only one loan of 450 speciedaler in 1865.

Loans from the foreign sector have only been registered in 1845. The trading house Pelly & Co in England granted three loans that together represented 3.4 percent of total loans that year in Nedre Romerike.

5.4 Trondhjem and Strinda/Selbu

The main features of the mortgage loan market in Trondhjem (1824, 1825, 1835 and 1845)

Totally we registered 791 mortgage loans for Trondhjem for these four years. Total loan amount decreased from 1824 to 1825 and went further down in 1835. The total loan amount increased again in 1845, to a level 144 percent higher than in 1835. The number of loans nearly doubled from 1835 to 1845. The personal sector constituted the largest share of loans in 1824 and 1845, while Norges Bank was largest in 1825 and 1835. The developments of the sectors are shown in Table 5.5 and Figure 5.6.

In 1824 and 1825 the personal sector's loan share was between 34 and 35 percent, but fell to 30 percent in 1835. Then it grew to 40 percent in 1845. Among the biggest lenders we find the wholesalers Hans Brun, Frederich Bing, Chr. A. Lorck (& sons) and Carsten Wensell.

The loan share of the public sector was at its highest in 1824 with more than 19 percent. In 1825, 1835 and 1845 the share lay between 5 and 9 percent. Statskassen is registered with large loans in 1824 and slightly lower in 1825, but no loans were granted in 1835 and 1845. Overformynderiene gave loans in all four years and was the biggest public lender in 1835 and 1845.

Norges Bank's loan share increased a lot from just less than 30 percent in 1824 to slightly less than 44 percent in 1825 and further up to around 52 percent in 1835. The share fell in 1845 to just less than 24 percent. Savings banks increased from just more than 1 percent in 1825 to just less than 6 percent in 1835, and further to slightly under 21 percent in 1845.

5.4 Trondhjem and Strinda/Selbu

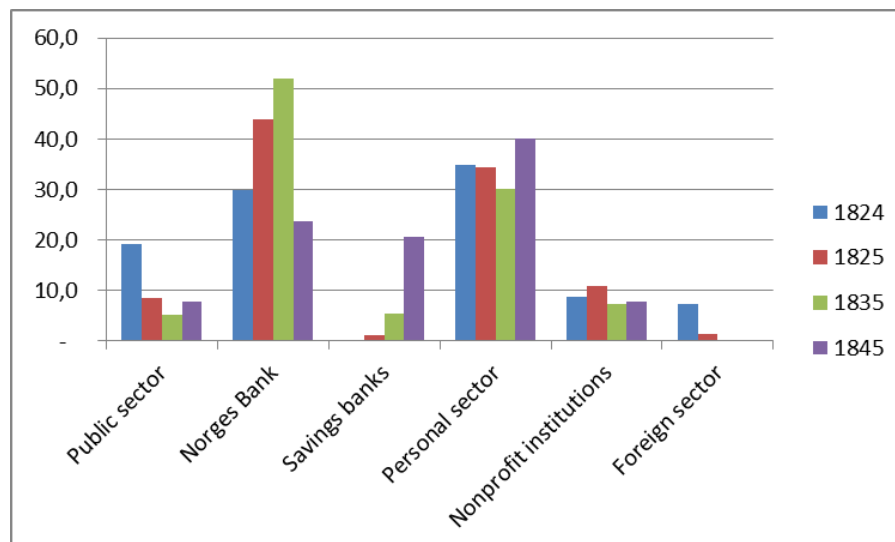


Figure 5.6 Mortgage loan shares in Trondhjem, by lending sector. 1824, 1825, 1835 and 1845. Percent.

Table 5.5 *New mortgage loans in Trondhjem, by lending sector. 1824, 1825, 1835 and 1845. Speciedaler and percent.*

	Speciedaler				Percent			
	1824	1825	1835	1845	1824	1825	1835	1845
Public sector	15750	6027	2713	9907	19.2	8.4	5.2	7.8
Norges Bank	24533	31240	26905	29995	29.8	43.8	51.9	23.7
Savings banks		900	2880	26180		1.3	5.6	20.7
State banks								
Commercial banks								
Nonlife insurance companies								
Life insurance companies								
Personal sector	28670	24498	15597	50664	34.9	34.3	30.1	40.0
Nonprofit institutions	7130	7733	3758	9844	8.7	10.8	7.2	7.8
Foreign sector	6135	929			7.5	1.3		
Unknown sector								
Total	82217	71327	51853	126591	100.0	100.0	100.0	100.0
Number of loans	169	196	147	279				
Average loan value	486	364	353	454				
Median loan value	250	200	200	275				

A glimpse into mortgage lending in Norway for selected years, 1823-1865

The nonprofit institutions' loan share moved between 7 and 11 percent in the years we have studied for Trondhjem. Unlike Christiania, the foundations were important sources of credit in Trondhjem. The biggest lenders within the nonprofit institution sector these years were private foundations [stiftelser], Thomas Angells stiftelse, Hospitalstiftelsen, Waisenhusstiftelsen, St. Jørgens stiftelse and Kathedralskolen.

The foreign sector represented in excess of 7.5 percent of the loans in 1824 and slightly more than 1 percent in 1825. For 1835 and 1845 we have not registered loans from the foreign sector.

The main features of the mortgage loan market in Strinda/Selbu (1825, 1835, 1845, 1855 and 1865)

Totally, we registered 744 mortgage loans for Strinda and Selbu for the five years. The total loan amount in nominal speciealer decreased from 1825 to 1835. In 1845 the loan amount increased to a level 78 percent higher than in 1835. The loan amounts in 1855 and 1865 were 13 to 14 percent lower than in 1845. Norges Bank had the largest share of lending in 1825 and 1845, while the personal sector was largest in the other three years we studied. The developments of the sectors are shown in Table 5.6 and Figure 5.7.

The loan share of the personal sector moved from in excess of 28 percent in 1825 to just less than 66 percent in 1835. It then fell to close to 26 percent in 1845, increased to in excess of 57 percent in 1855, and then grew to in excess of 67 percent in 1865. The most active lender these years was grosserer Hans Brun with 22 loans at a total nominal value of 5 870 speciealer. Another active lender was proprietær Carl Stephansen with 12 loans with a total value of 5 620 speciealer. The largest loan in the personal sector (10 000 speciealer) was granted by Grev Trampes bo [Count Trampe's estate] in 1835.

The public sector increased its share of the loans the first three years we have studied, from in excess of 1 percent in 1825 to in excess of 9 percent in 1845. Then the loan share fell to slightly under 5 percent. It then increased to close to 8 percent in 1865. Overformynderiene were the institutions within the public sector that gave most loans. Trondhjems lærde Skoles egentlige skolekasse [a school fund] was also a big lender in the sector. Skolekassen gave 3 900 speciealer in loans in 1845. This constituted more than 5 percent of total loans in Strinda and Selbu that year.

The lending from Norges Bank represented just less than 64 percent in 1825. In 1835 the share fell to around 20 percent, but in 1845 it increased to in excess of 29 percent. In 1855 the loan share was just under 11 percent. It then increased to 17.5 percent in 1865.

Savings banks' loan share increased gradually from just less than 4 percent in 1825 to slightly less than 15 percent in 1845. It then grew to just under 19 percent in 1855. In 1865 the loan share was only 1.5 percent. Trondhjem sparebank was the dominant bank in the sector, but Strinden sparebank also gave some loans.

Nonprofit institutions did not grant mortgage loans in 1835. In 1825 the sector's loan share was around 3 percent, while it increased to 21 percent in 1845. The two dominant lenders in the sector in the years we studied were Trondhjems hospitalstiftelse, with close to 12 percent of total loans in

5.4 Trondhjem and Strinda/Selbu

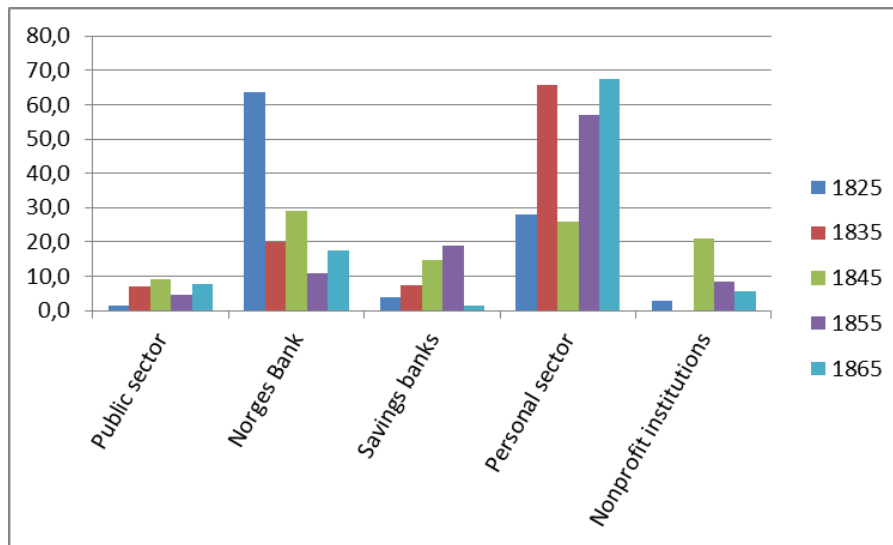


Figure 5.7 Mortgage loan shares in Strinda and Selbu, by lending sector. 1825, 1835, 1845, 1855 and 1865. Percent.

Table 5.6 New mortgage loans in Strinda and Selbu, by lending sector. 1825, 1835, 1845, 1855 and 1865. Speciedaler and percent.

	Speciedaler					Percent				
	1825	1835	1845	1855	1865	1825	1835	1845	1855	1865
Public sector	886	3028	6871	3053	5044	1.4	7.2	9.2	4.7	7.9
Norges Bank	39725	8350	21745	7125	11195	63.7	19.9	29.1	10.9	17.5
Savings banks	2350	3050	11080	12275	955	3.8	7.3	14.8	18.8	1.5
State banks										
Commercial banks										
Nonlife insurance companies										
Life insurance companies										
Personal sector	17563	27572	19343	37271	43048	28.2	65.6	25.9	57.1	67.3
Nonprofit institutions	1800		15700	5500	3720	2.9		21.0	8.4	5.8
Foreign sector										
Unknown sector										
Total	62323	42000	74739	65224	63962	100.0	100.0	100.0	100.0	100.0
Number of loans	113	101	172	164	194					
Average loan value	552	416	435	398	330					
Median loan value	200	100	200	190	200					

1845, and Thomas Angells stiftelse with close to 9 percent in 1845. In 1865 9 loans were granted by De Nordenfjeldske hestehjelpskasser [a fund for insuring and financing horses for military purposes] that constituted 3 percent of the loans registered with the Strinda and Selbu recorder of deeds that year.

The mortgage loans in Trondhjem and Strinda/Selbu seen in context (1825, 1835 and 1845)

Many lenders of loans registered with the Strinda/Selbu recorder of deeds were residents of Trondhjem, and since Trondhjem and Strinda/Selbu were geographically close the lenders may have looked at both districts when they planned their lending activities. Figure 5.8 shows the two districts together. For the public sector, Norges Bank and the savings banks the development of the loan shares has been smoother than if we look at the districts separately.

The data show that the public sector loan share grew from 5.2 percent in 1825 to 8.3 percent in 1845. Norges Bank's share fell from 53.1 percent in 1825 to 37.6 percent in 1835, and then to 25.7 percent in 1845. From a low level of 2.4 percent in 1825 savings banks' loan share grew to 6.3 percent in 1835 and further to 18.5 in 1845. The personal sector increased its share from 31.5 percent in 1825 to 46 percent in 1835. Then the share fell to 34.8 percent in 1845. Nonprofit institutions had an opposite movement from 7.1 percent in 1825 down to 4 percent in 1835 before growing to 12.7 percent in 1845.

It seems like the loans from the saving banks replaced some of the fall in the loans from Norges Bank for the years 1835 and 1845. The reduction of loans from the personal sector from 1835 to 1845 was to a certain degree offset by increased loans from nonprofit institutions.

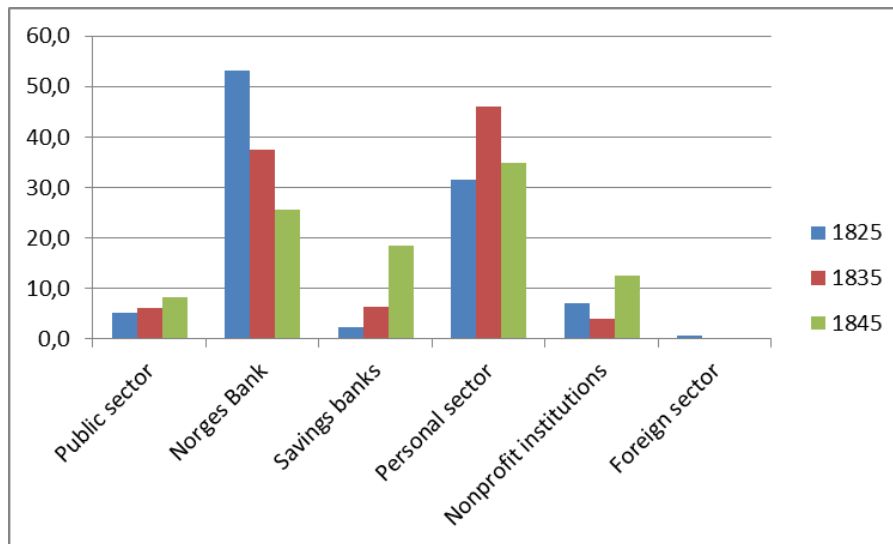


Figure 5.8 Mortgage loan shares in Trondhjem and Strinda and Selbu, by sector, 1825, 1835 and 1845. Percent.

5.5 Bergen

5.5 Bergen

Totally, 282 mortgage loans were granted in Bergen in 1825 (Table 5.7).⁷ The median loan was 300 speciedaler (Figure 13.32). Norges Bank was the largest sector for mortgage lending in Bergen in 1825 with 162 loans and 62.7 percent of the lending. The two biggest loans from Norges Bank were both of 4 800 speciedaler and were granted Wollert Konow and August Konow, respectively. The personal sector gave 92 loans and represented 28.7 percent of total loans. The largest loan in the personal sector (3 000 speciedaler) was granted by Christian Maartmann to Ole Brink.

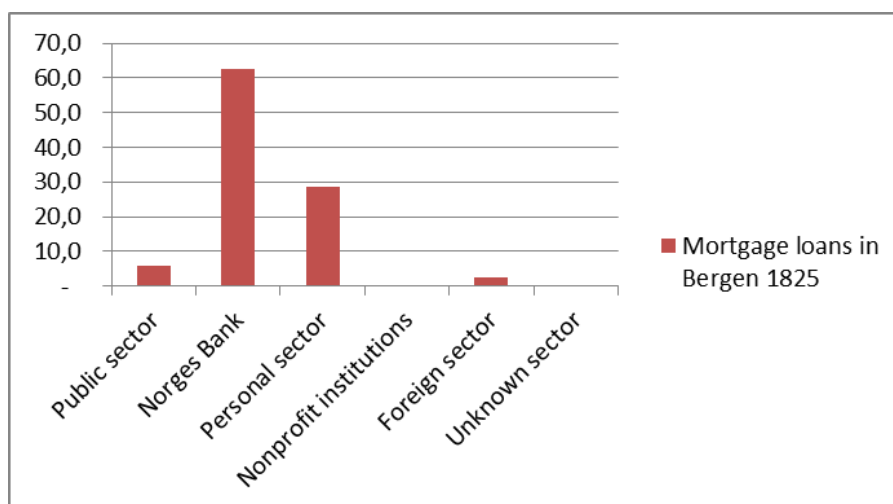


Figure 5.9 Mortgage loan shares in Bergen, by lending sector. 1825. Percent.

Table 5.7 Mortgage loans in Bergen in 1825. Speciedaler (spd) and percent.

Sector	No	Loan amount (spd)	Share of total (percent)	Average amount (spd)	Median amount (spd)	Lowest amount (spd)	Highest amount (spd)
Public sector	25	9085	6.0	363	154	40	2665
- overformynderier	24	8935	5.9	372	154	40	2665
- Drænge fattigfondet	1	150	0.1	150	150	150	150
Norges Bank	162	95565	62.7	590	380	100	4800
Personal sector	92	43647	28.7	474	300	28	3000
Nonprofit institutions	1	200	0.1	200	200	200	200
Foreign sector	1	3625	2.4	3625	3625	3625	3625
Unknown sector	1	200	0.1	200	200	200	200
Total	282	152322	100.0	540	300	28	4800

⁷ Source: The National Archives of Norway/the Digital Archive: Mortgage book no. II.B.a.27 (1825-1826) for Bergen. The data were registered by Mats Bay Fevolden.

A glimpse into mortgage lending in Norway for selected years, 1823-1865

Within the public sector 24 loans were given by the Public Guardian and one loan by a poverty relief fund for boys (Drænge fattigfondet). The public sector represented 6.0 percent of the lending. The biggest loan was given by the Public Guardian to Johan Fischer. The loan amount was 2 665 speciedaler. The only loan from nonprofit institutions was given by "Nyttige selskap in Bergen" to Torstein Mallanger. The loan amount was 200 speciedaler. One loan was granted by a foreign lender, Georg Wilhelm Arnemann (Altona, Tyskland) who gave a loan of 2 500 silver species (3 625 speciedaler) to T. Rosindahl in Bergen.

5.6 Summary

This study of registered mortgage loans for selected years during the period 1823-65 indicates that the provision of non-institutional credit was still considerable up to the midst of the 19th century. The study is restricted to registered mortgage loans only and it excludes trade credits which were typically based on Norwegian and international bills of exchange. Nor does the study cover the medium term credit instrument labelled as *bill bonds*, i.e. loans of two to three years maturity based on security by their underwriters, which we know were in widespread use in that period.

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Central government revenues, expenditures and debt,
1815-2021

Øyvind Eitheim and Mats Bay Fevolden

6.1 A long view of central government revenues and expenditures

This chapter presents data on the Norwegian central government's revenues, expenditures and debt between 1815 and 2021.¹ We show how the central government's total aggregated revenues and expenditures have developed and account for their main components. Different periods have applied different accounting principles, many of which are adjusted for to make figures comparable across time. This is a key distinguishing feature between the figures we present in this study compared with those presented in other publications. We have also made improvements in the data for government debt. We present estimates of the level of government debt at year-end for the period 1815-1850. This extends the annual government debt data series with 35 years, beginning with the level of debt which Norway was responsible for after the dissolution of the Dano-Norwegian union in 1814.

The main data sources in this study have been government accounts and government financial statistics published by the Ministry of Finance and Statistics Norway, respectively.² These sources cover the period from 1850 onwards. For the earliest period, however, we have relied on published overviews in Tvethe (1848) and Kristiansen (1931). The information therein is cross-checked with other available sources such as Steen (1954) and Egge (1988). We have also compared our results for government revenues and expenditures with data presented in Hodne (1984), Grytten (2019), and in international overviews such as Mitchell (1975).

Regarding government debt we have used information on individual loans available in Rygh (1875) and in Woxen (1889, 1900). We have also used the details on new government loans in the 19th and early 20th century presented in Klovland (2004, Table 1, Chapter 4).

The composite historical data we present on the central government's finances are relevant for economists and quantitatively inclined historians. The data may be used to illustrate how the government financed its expenditures in a given time period and shed light on its priorities. The data may also show how government budget decisions either smoothed or amplified the business cycle. A couple of examples are listed in the following:

- A complete overview of the central government revenues and expenditures also provides a bird's eye perspective on some of the main changes in the Norwegian society over the past two centuries. It serves as an important source to analyse how different macroeconomic disturbances have affected government revenues and expenditures across this period, in their own right, both directly, reflecting development trends in the society along with the current business cycle circumstances, as well as indirectly, as a consequence of changes in fiscal policy reacting to these disturbances.
- In many countries there is a continuous need to monitor budget deficits and their funding to ensure that developments are in line with requirements for debt sustainability.³ The sovereign debt crisis following the Global Financial Crisis in 2007-2008 is testament to this. In the case when government debt has risen to unsustainable levels it is important to be able to evaluate how the

¹ Thanks to Jan F. Qvigstad for helpful discussions on the structure of this chapter and to Vetle Hvidsten for insightful comments.

² Note that we will refer to Statistics Norway also in times when the correct name was Central Bureau of Statistics.

³ See Hoel and Qvigstad (1986) for a simple illustration from the perspective of a small open economy in the mid-1980s.

6.1 A long view of central government revenues and expenditures

situation may be improved. There has been substantial activity in policy research in this area in recent years. Two recent books and references therein illustrate the numerous approaches taken to analyse fiscal policy and debt sustainability (Alesina et al., 2019; Eichengreen et al., 2021).

- In Norway the situation has been different. High oil prices and other factors behind positive terms of trade developments during the past decades have given rise to large surpluses in the current account and for the central government. A recent White paper No. 14 (2020-2021), on the economic perspectives ("Perspektivmeldingen") for the next fifty years, shows the need, however, in light of what the White paper describes as *a new reality*, to make similar considerations regarding future government budgeting in Norway as many other countries have struggled with for years already. The White paper points to the need for sustainable government finances as basis for sustainable welfare.

As an organizing principle we use the balance between the central government *sources* and *uses of funds*.⁴ This distinction is also useful because it sheds light on the different accounting principles which have been applied through the past two centuries. We go into more detail on this in section 6.3 below.

There are also other considerations which need to be resolved, such as whether or not the accounts of government finances have a periodization according to a *cash based principle* or an *accrual based principle*. Under a cash based principle revenues and expenditures are recorded in the year these items were paid for, whereas under the accrual based principle the revenues and expenditures are recorded in the year the items originate. In the latter case the accounting records for revenues and expenditures may be, at least in principle, decoupled from the periodization of the actual payments.

$$\underbrace{T_t + TR_{cb,t} + NL_t}_{Sources} = \underbrace{C_t + J_t + TR_{p,t} + i_t B_{t-1} + \Delta A_t + AM_t}_{Uses} \quad (6.1)$$

As an illustration consider the following *sources of funds*: T_t denote income from taxes and revenues from public corporations, $TR_{cb,t}$ transfers from the central bank and NL_t new loans. The *uses of funds* are expenditures for C_t consumption, J_t real investments, $TR_{p,t}$ transfers to the general public, $i_t B_{t-1}$ nominal interest payments on government debt B_t , ΔA_t changes in short-term assets and AM_t amortizations of government debt. We can then define the total government surplus $SURP_{tot,t}$ as the difference between its revenues and expenditures in a given year t :

$$SURP_{tot,t} = (T_t + TR_{cb,t}) - (C_t + J_t + TR_{p,t} + i_t B_{t-1}) \quad (6.2)$$

If we rewrite 6.2 and substitute, we can express the surplus by means of financial variables.

$$\begin{aligned} SURP_{tot,t} &= \Delta A_t - (NL_t - AM_t) \\ &= \Delta A_t - \Delta B_t \end{aligned} \quad (6.3)$$

⁴ A similar distinction is made in Fregert and Gustavsson (2014, p. 186).

Central government revenues, expenditures and debt, 1815-2021

A positive total surplus, $SURP_{tot,t}$, affects financial variables (“below the line”), either by increasing the government’s assets, ΔA_t , or by reducing its debt, $\Delta B_t = NL_t - AM_t$. In order for the central government to reduce its debt, without selling off assets, it must run a surplus which is sufficiently large to cover both interest payments and amortizations. If we correct the total surplus, $SURP_{tot,t}$ by adding (net) interest payments we obtain the *primary surplus* $SURP_{prim,t}$, which may alternatively be expressed as government revenues minus non-interest expenditures. The *primary surplus* is frequently used in analyses of debt sustainability:⁵

$$SURP_{prim,t} = SURP_{tot,t} + i_t B_{t-1} \quad (6.4)$$

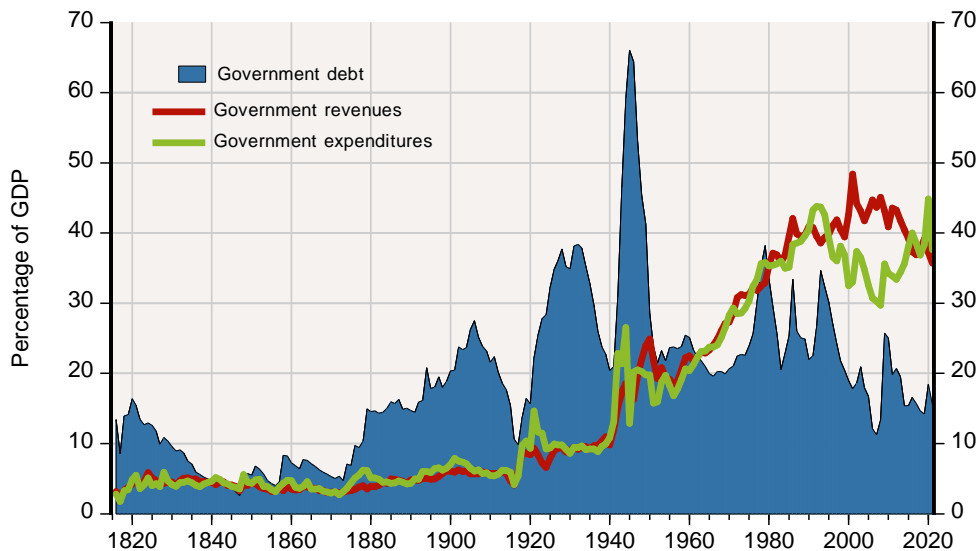


Figure 6.1 Central government revenues, expenditures and debt (in percentage of GDP), 1816-2021. Statistics Norway: <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million), 1985-2021, <https://www.ssb.no/en/statbank/table/05830>, General government financial assets and liabilities, 1965-2021.

Figure 6.1 provides a broad overview of total revenues, expenditures and debt of the central government since 1816, all measured in percentage of GDP. Central government revenues and expenditures fluctuated around five percent of GDP during most of the period before World War I. Fiscal policy in the 1820s and 1830s was tight and government debt was soon brought down and fluctuated around a level between five and ten percent of GDP until the mid 1870s. Large public infrastructure

⁵ IMF (2021), European Commission (2019) and Bouabdallah et al. (2017) provide overviews on Debt Sustainability Analysis (DSA) from the perspectives of IMF, EU and ECB, respectively, whereas Calmfors (2020) zoom in on fiscal sustainability in the Nordic countries. See also Dyvi (2021) for technical details on fiscal sustainability analysis reported in White Paper No. 14 (2020-2021) (“Perspektivmeldingen”). A simple model exercise is offered in the abovementioned study of debt sustainability by Hoel and Qvigstad (1986).

6.1 A long view of central government revenues and expenditures

investments in the final quarter of the 19th century, in particular in railroads, brought government debt up to a level of 27-28 percent around 1905.

During the turbulent interwar years revenues and expenditures fluctuated around ten percent of GDP. Government debt increased rapidly during World War I and continued to rise through the crisis years of the 1920s until the debt level eventually stabilized close to 40 percent of GDP in the early 1930s. Norway abandoned the gold standard in 1931 and as economic conditions improved, government debt was eventually brought down to around 10 percent of GDP at the dawn of World War II. The strong growth in government debt during World War II has a different explanation than the earlier episodes of debt accumulation. The massive injections of liquidity into the economy during the occupation were partly offset by huge emissions of short-term government bills, which absorbed liquidity up to an amount equivalent to more than 60 percent of GDP. We should remind the readers that GDP in Norway declined in real terms during the war years. Nominal GDP showed a decline during 1943-1944, which pushed the ratio of debt to GDP up.

A long period of sustained growth in government revenues and expenditures started after World War II and were instrumental to the postwar transformations and subsequent development of Norway to become a modern welfare state. We will look closer at some of these developments when we comment on the data we have collected which illustrate the long-term trends and changes in the composition of central government revenues and expenditures in Section 6.5 below.

The size of the central government budget eventually stopped growing around 1990 when revenues and expenditures totalled around 40 percent of GDP. Since then revenues have been extraordinary high. Positive terms of trade shocks and strong growth in the export of oil and gas pushed GDP up and government revenues hovered around the mid-40s in percentage of GDP during the first decade of the 2000s. A somewhat less expansionary fiscal policy contributed to the observed decline in government expenditures measured in percent of GDP in the 2000s before this changed after the global financial crisis in 2008. The expansionary fiscal policies of the more recent past, including the strong fiscal response to the Covid-19 pandemic in 2020, has reversed the strictly positive gap between revenues and expenditures over close to two decades since the mid 1990s to the large negative gap observed in 2020.

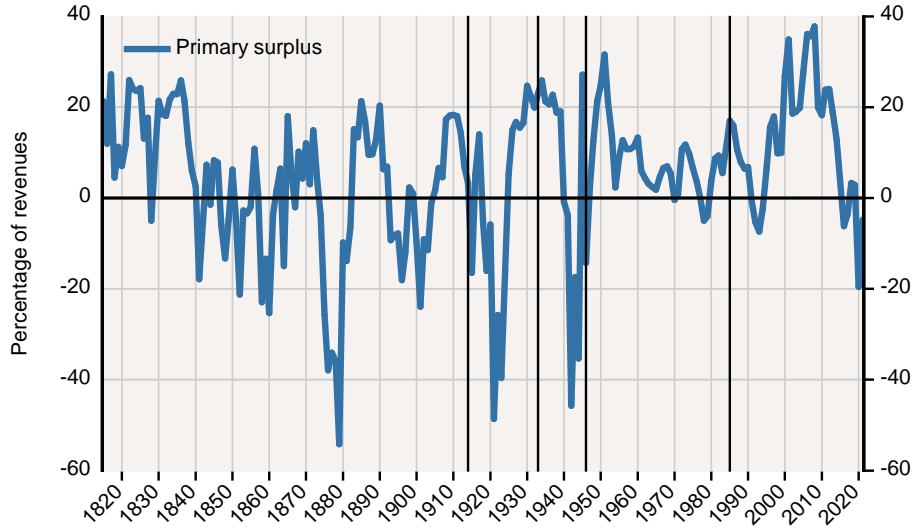
We will now turn to the budget surplus and briefly describe the main developments in the primary surplus of the central government since 1815.

We recall from Equation 6.4 that the primary budget surplus cover interest payments on government debt plus the total surplus $SURP_{tot,t}$, which, if positive, can be used to amortize government debt. Figure 6.2 shows primary surpluses and deficits across the past two centuries, respectively, in percentages of total revenues (Figure 6.2(a)) and in percentages of GDP (Figure 6.2(b)).

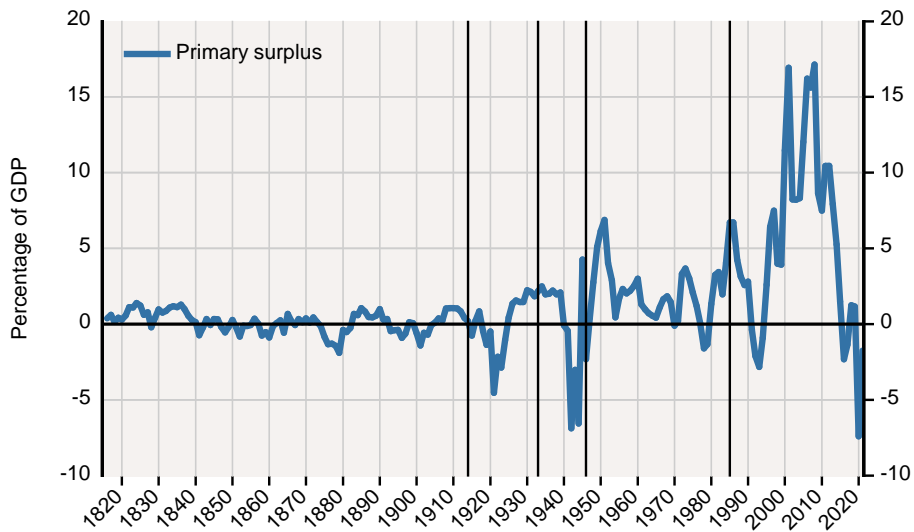
Firstly, the frequent years with primary surpluses up to around 20 percent of revenues during the 1820s and 1830s, confirm that tight fiscal policy brought down government debt with a significant amount. We come back to this in Section 6.6 where we present annual estimates of government debt from 1815 onwards.

Secondly, we observe that the year to year changes in the primary surplus/deficit vary substantially,

Central government revenues, expenditures and debt, 1815-2021



(a) Percentage of revenues



(b) Percentage of GDP

Figure 6.2 Central government primary budget surplus, 1816-2021. In percentage of revenues (top) and in percentage of gdp (bottom).

between plus and minus 20 percent of revenues, that is, with a couple of notable exceptions. These exceptions are observed in years when we observe a significant downturn in the economy, like the

6.1 A long view of central government revenues and expenditures

late 1870s, the early 1920s and during the occupation years from 1940 onwards. Interestingly, the only year in the postwar period in which we have observed a primary deficit larger than 20 percent of revenues is in 2020 as a result of the Covid-19 pandemic.

Thirdly, when we measure primary deficits relative to GDP the same years stand out, but due to the broader coverage of the central government in the 20th century, the latest observation of a deficit in 2020 is a much larger shock measured in percentage of GDP, close to ten percent of GDP, whereas the largest deficit observed in the 19th century during the late 1870s only amounts to around four percent of GDP.

Finally, we take note of the period from the mid-1990s onwards, during which Norway experienced a historically long period with large and persistent surpluses. For more than a decade the total surplus surpassed five percent of GDP. It is the large surpluses in this period which explains the rapid buildup of the Norwegian sovereign wealth fund (Government Pension Fund Global, GPFG) during these years. We consider this in more detail in Section 6.7.

6.2 Historical background

With the Kiel treaty from January 1814 the kingdom of Norway was transferred from Denmark to Sweden. In the loose union with Sweden, which eventually was established in the fall of 1814, Norway retained its own government and, with some necessary adjustments and revisions, its Constitution. The November-Constitution granted Stortinget (the Norwegian parliament) the power to tax, the sole responsibility for public debt and to decide how to spend public money. This power came along with a control mechanism to oversee that government finances were to be made public (§75a in the 1814 Constitution).

The following paragraphs puts the dramatic events in 1814 in perspective. We think of the central government as one of the key institutions of a nation state. Whereas Denmark after the Norwegian exit from the Dano-Norwegian union had all its key institutions in place, Norway had to establish these, starting with the central government and the parliament.

The concept of nation states, as we use it in this context, impose some key obligations on behalf of the nations' authorities. The balance of power is assumed to be rigorously regulated and rests in the case of Norway on the Constitution from 1814, on the laws which are passed by the parliament and how this framework has developed over time with the changing conditions.

For a small open economy like Norway this framework also rests upon the country's past history. The loose union with Sweden lasted from 1814 until 1905. The union with Sweden eventually ended when the Swedish monarch no longer functioned in his capacity of king and the powers entrusted with him went back to the Norwegian parliament (Michalsen, 2021). This paved the way for Norway as a sovereign nation as we know it today.

The first years of Norway's history provide examples. Since the Constitutional Assembly on Eidsvoll in 1814 lacked authority to impose taxes on the population, it was instead decided to fund the government by allowing the Temporary Riksbank to print money. When the first government took office in the late fall of 1814 the situation was less uncertain. A revised Constitution had been negotiated with Sweden after a short war which erupted in July and ended in August. The newly elected (May 1814) king Christian Frederik had been forced to resign and left the country in early October. In late November the new head of the Ministry of Finance, Wedel Jarlsberg, decided to put an end to continued money-printing. The war with Sweden was over. The Ministry of Finance started its work on designing a revised tax code which would provide sufficient revenues to cover the costs induced by the central government. In December 1815 the first budget proposal was presented by the government for the coming three-year period 1816-1818.⁶ The new tax law was effective from 1 July 1816.

A key issue for the new government was to participate in negotiations regarding the level of common debt which remained after the dissolution of the Dano-Norwegian union. This took a long time. On 1 September 1819 an agreement was finally reached after more than three years of negotiations. The negotiations were based on the two countries' interpretations of the Kiel treaty of 1814 and the

⁶ A transcribed version of the first budget proposition is available on the Ministry of Finance's web-site (Ministry of Finance, 2015).

6.3 Government revenues and expenditures over 200 years

Wien declaration of 1815, which established the formal international legal framework at the time. But it has been argued that this was also a question about *realpolitik*, which involved Sweden and the great powers of Europe, including England who acted as a mediator during the negotiations. On the detailed level it was also a disagreement between Norway and Denmark on what was the correct size of the common Dano-Norwegian debt.

The distance on the debt issue had been large during negotiations. Norway offered to pay 2 million *speciedaler* whereas the Danish claim was 6 million, or 5 million plus old banknotes which still were in circulation in Norway. In the November Constitution it was made clear (§93) that it was the Norwegian parliament which had the ultimate power to decide on matters regarding the Norwegian debt. An agreement was reached in September 1819 between the king of Norway and Sweden and the king of Denmark (Steen, 1954; Michalsen, 2021). This agreement was discussed in the next parliamentary session in Norway in 1821 but without reaching a decision.

The debt issue was finally settled in 1822. The agreement in 1819 stated that Norway's debt amounted to 3 million *speciedaler*, with an annual interest rate of 4 percent and a ten year amortization period with 0.3 million *speciedaler* per year. Norway was in a difficult economic situation during these years and was only able to service the obligations according to the 1819-agreement through liquidating assets remaining in Denmark and by funds raised from the first state loan the Norwegian government negotiated with Beneche Brothers in Berlin in 1820. After three years the remaining debt at the end of 1822 was 2.1 million *speciedaler*. At this time Denmark accepted to reduce the Norwegian debt to 1.7 million *speciedaler* provided this was redeemed in full over the next six months. This was successfully achieved when Norway was able to raise a new state loan from Hambro & Son in London in 1822, on more favourable terms which increased the amortization time to 29 years.⁷ This brought to an end the eight year long saga about the debt to Denmark.⁸

6.3 Government revenues and expenditures over 200 years

Accounts for government finances have been published for every year since 1815. Using these accounts as a source for creating long and consistent time series is difficult for several reasons. Both the meaning of the term "government" and the accounting principles which have been applied, have changed several times. If not dealt with, these issues cause observations to be incomparable across time. To overcome the first issue we tried to keep a consistent definition of government by adding components to the accounts that were initially not there, such as social transfers and expenditures key in the development of the welfare state. So to say, we have started with what we think of as central government today and reconstructed the history accordingly. To overcome the second issue we have made corrections to the observed historical data so they better match the accounting princi-

⁷ For more details about the banker Joseph Hambro see e.g. Meyer (1905).

⁸ Steen (1954, p. 254) use this example as an illustration of the fact that Norway's credit worthiness had improved significantly only in two years since the first state loan in 1820.

ples used in government accounts of today, as they appear in the annual reports to parliament (White paper No. 3, "Statsregnskapet").

Overview of the public sector in Norway

Figure 6.3 provides an overview of the public sector, broadly divided between public administration and public corporations.

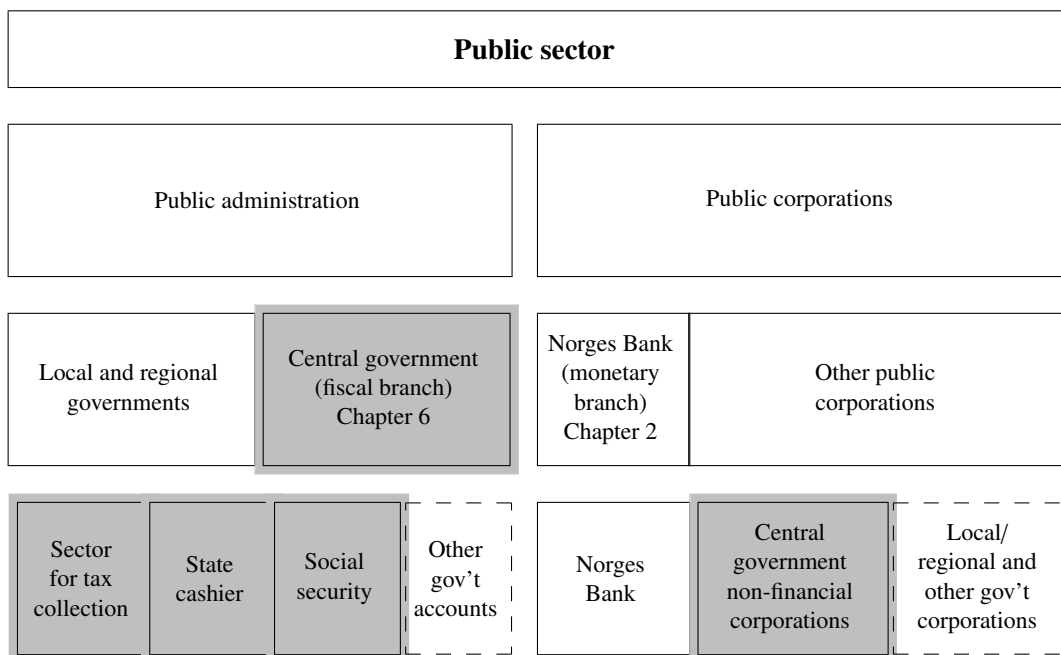


Figure 6.3 A schematic illustration of the public sector, broadly divided between public administration and public corporations (line 2) and, furthermore, on the level of decisionmaking (line 3), between local/regional governments and central government (fiscal branch), Norges Bank (monetary branch) and other public corporations. Line 4 details the sectors (marked in gray color) from which we extract data for this study.

Furthermore, regarding the level of decision making we distinguish between regional and local governments on one side and the central government on the other. This chapter will focus on the fiscal branch of the central government. Our definition of central government will take into account many of the key developments which have taken place in this sector over the past two centuries. Some of these changes have affected the size and scope of central government administration whereas other changes have affected the business conducted by public corporations under the central government. It has been a particularly tedious task to work out composite data series for the contributions to revenues and expenditures from central government corporations over more than two centuries.

6.3 Government revenues and expenditures over 200 years

Among public corporations we also distinguish between financial and non-financial corporations. We have highlighted Norges Bank's role as monetary branch of the central government in this overview. Line 4 in Figure 6.3 details all sectors (marked in gray colour) from which we have collected the data which enter the calculations of consolidated composite measures of aggregated revenues and expenditures.

We have mainly collected data for four sectors, the *State cashier* sector, the *Social security* sector, a sector for *Tax collection* and for *Non-financial public corporations* owned by the central government. There are undoubtedly several omissions to this list. We have for example excluded *Other government accounts*, which includes different types of government funds which have emerged as time went by.

Since we focus on the central government we have excluded local and regional governments and corporations owned by these. Regarding public financial institutions we have already discussed Norges Bank's balance sheet and income accounts in great detail in Chapter 2. We have also provided an overview of main developments in state bank lending in Chapter 4. State banks constitute a part of central government corporations in line 4.

Accounting principles

The basis for the data on government revenues and expenditures tabulated in Tvethe (1848, Chapter 12, pp. 230-241) are published extracts of government accounts.⁹ These extracts were the results of an auditing process rooted in §75k in the Constitution.

For the early years from 1815 onwards the audited data in the extracts were only published with a time lag of several years. The data were given a periodization which placed the different revenue and expenditure items in the year in which year they originated. This periodization resembles *accrual based accounting* of revenues and expenditures, like we see in the National Accounts of today, in contrast to *cash based accounts* of revenues and expenditures, which is the accounting principle which is used for the annual government accounts in White Paper No. 3 ("Statsregnskapet").

In the early years it took several years until extracts of audited accounts were published. From the early 1820s onwards, however, the extracts for year t were typically available in year $t + 1$ as the statutes required. The basic principles of periodization in the published accounts were maintained over the next century. A major change to the accounting principles in the 19th century took place around 1880 when the presentation of the accounts of revenues and expenditures for government corporations changed from a *net basis* to *gross*.

Statistics Norway took over the responsibility for producing statistics about government revenues and expenditures in the mid 1920s. For the year up and until 1924 official statistics on government revenues and expenditures had been produced by the Ministry of Finance. We discuss more details on this in a later paragraph.

The main accounting principles which were introduced by Statistics Norway in the mid-1920s

⁹ In addition to extracts from audited accounts Tvethe (1848) (*The Statistics of Norway*) also relied on information previously reported in "Amtmennes femårsberetninger" and Schweigaard (1840).

Central government revenues, expenditures and debt, 1815-2021

are still key elements in White paper No. 3 today, such as the principles of *cash based accounting*, *gross accounting* (except for government corporations) and *completeness*. The latter contributes to improved monitoring of government finances in contrast to the old system where different kinds of extraordinary revenues and expenditures went under the radar.

In this study we have used as our starting point the accounting principles and definitions used in current versions of White Paper No. 3 ("Statsregnskapet"). This implies that we adopt standards and definitions close to those introduced by Statistics Norway from 1914 onwards. The most important adjustments we have made to the data we collect from the primary sources are therefore made in the period before 1914. But we have also made important adjustments in data for the 20th century in order to construct composite and consistent historical time series. We will now go into details on the primary sources of historical data on government finances.

Main sources

One of the goals of this study is to give an overview of available primary sources of data from 1815 onwards, starting right after Norway's exit from the Dano-Norwegian union. Thereafter we discuss how we may proceed if we want to construct composite historical time series for government expenditures and revenues, which are relatively consistent over time and provide a reasonable approximation to the central government's budget surplus/deficit, which tracks changes in government debt in a meaningful way.

Data on government revenues and expenditures from 1815 onwards have previously been presented in various types of publications over the past two centuries. Two important sources are the books by Tvethe (1848) and Kristiansen (1931). For the early years from 1815 to 1850 we have relied heavily in this study on the overviews of historical data tabulated in Tvethe (1848).

For the period from 1850 through the fiscal year 1912/1913 we have collected data from official statistics on government accounts published by the *Ministry of Finance* from 1878 onwards. Although *Statistics Norway* was established already in 1876, the responsibility for official statistics on government finances remained in the *Ministry of Finance* until the mid 1920s.

The statistical reports from this period distinguish between *ordinary* and *extraordinary* revenues and expenditures. The tables of data marked as "ordinary" are closely related to similar terms in the government's budget. The precise meaning of "extraordinary" may vary between periods but some of the main items that fall under this category stem from activities such as public investments in railroads, telecommunication and defense expenditures. Items in this category were also in many cases approved outside the ordinary budget procedures for the annual State cashier budget.

In addition to regular accounts for revenues and expenditures in the State cashier budget there were also other types of accounts. *Advances and deposits accounts* as well as *Special accounts* were introduced in the accounting system for government finances already in the 19th century. These were used as instruments of periodization of revenue and expenditure items which would enter the State cashier account some time in the future.

The accounts of revenues and expenditures from 1815 through the fiscal year 1912/1913 do not

6.3 Government revenues and expenditures over 200 years

Table 6.1 *Main data sources for government income and expenditures, 1815-2021.*

Time period	Source
1815-1845	Tvethe (1848) "Norges Statistik"
1846-1849	Government accounts published in Parliament Discussions (1851 and 1854)
1850-1913	Government Finances ^a (published by the Ministry of Finance)
1914-1931	The Norwegian Central Government's Finances ^b (published by Statistics Norway)
1932-1945	Statistical Yearbook (published by Statistics Norway)
1946-1984	Public Sector Finances (published by Statistics Norway)
1985-2021	White paper No. 3 (Government accounts ("Statsregnskapet"), published in Table 10486, Central government revenues and expenditures, by Statistics Norway)

^a "Statskassens finanser"

^b Den Norske Statskasses Finanser

Table 6.2 *Overview of break-adjustments across different subperiods.*

	1815-1913	1914-1932	1933-1945	1946-1984	1985-2021
Government corporations (gross/net)	Gross (mainly) ^a	Net – as incomes if positive and as expenditures if negative ^c	Net – as incomes if positive and as expenditures if negative	Net – both as incomes and expenditures ^b	Net – as expenditures
Separation between current and capital account (Yes/No)	No	Yes	Yes	Yes	Yes
Social security funds	Not included	Not included	Not included	Not included	Included

^a According to Grytten (2014b) there was a strict change from 1880 onwards in the direction of gross accounting of revenues and expenditures for government corporations. Before 1880 the reporting was to a larger extent made on a net basis.

^b For the period 1946-1960 the accounts showed negative profits for government corporations on the income side, recorded as a negative revenues. Accounts between 1961 and 1984, however, recorded corporations with positive profits as revenues and corporations with negative profits as expenditures.

^c An exception is noted in 1922–23 where negative profits (losses) were recorded as negative incomes.

distinguish between the *current account* and the *capital account*. This distinction was first introduced when Statistics Norway took over the responsibility for producing official statistics on government revenues and expenditures in the mid 1920s. The first publication from Statistics Norway with revised statistics on government revenues and expenditures appeared in 1926, and provided a revised overview of central government finances from the fiscal year 1913/1914 to 1926/1927.

We have listed the main data sources we have used in this study in Table 6.1. These data sources differ both in terms of how they have defined the central government and regarding their applied accounting principles.

The main sources of break-adjustments between the four periods are summarized in Table 6.2. We distinguish between four periods where data in the primary sources represent either different accounting practices and/or a different definition of government, e.g. whether social security is included or not: 1815-1913, 1914-1945, 1946-1984, 1985-2021.

Overview of main break-adjustments

In the following we give a brief overview of the main adjustments we have made to the historical data we collected from numerous sources when we constructed composite historical data series for aggregated revenues and expenditures, respectively.

To make figures comparable in our composite series for aggregated revenues and expenditures we have made several adjustments. The most important adjustments concern the distinction between the current account and the capital account, the treatment of government corporations and the social security sector. The differences between the unadjusted data series we have collected from the primary sources and the adjusted data series are shown in the following figures. The grey vertical bars indicate the main years in which we have made adjustments according to changes in the primary data sources. The main adjustments are summarized in the following.

- Recorded revenues related to the capital account, mainly new government loans, have been extracted prior to 1914.¹⁰
- Recorded expenditures related to the capital account, mainly debt amortizations, have been extracted prior to 1914, thus, allowing for more precise estimates of interest expenditures related to government debt.
- Recorded revenues and expenditures related to government corporations are represented on net basis for the years prior to 1914 in order to match the definitions used by Statistics Norway from this time onwards. These gross to net adjustments were of a significant magnitude throughout the 19th century, but in particular during the years from 1880 to 1913 when the government implemented gross accounting for government corporations more systematically.
- Recorded net revenues from government corporations are reported as an item on the revenue side prior to 1985. The accounting procedures have varied substantially and in periods when large deficits were recorded on the expenditure side we have made a downward adjustment in aggregated revenues.
- Recorded revenues and expenditures for the social security sector have been included from 1900, which is the first year for which data were recorded in our sources, and until 1985. From 1985 onwards the social security sector have been merged together with the accounts for the State cashier and there were no longer a need for adjustment.

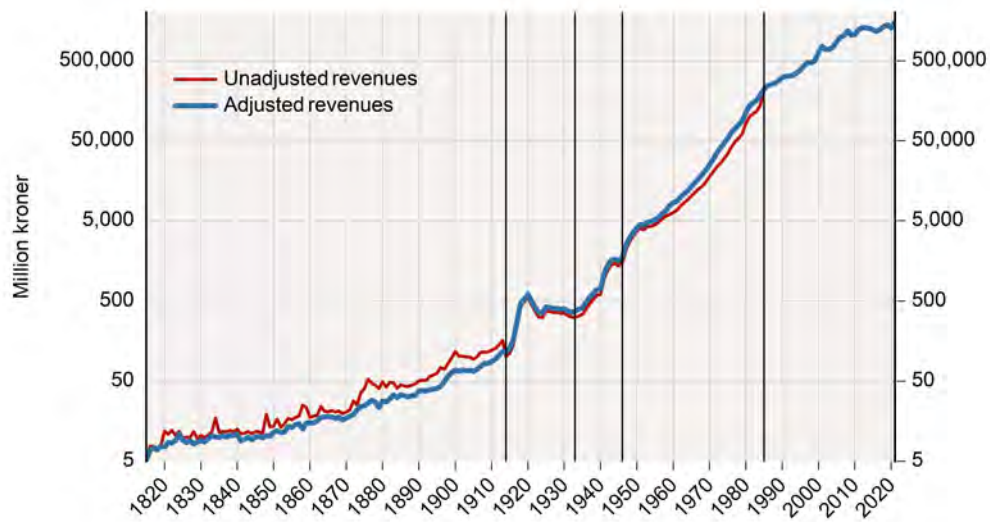
There is one important difference between the data we report in this study and those reported in White Paper No. 3, which is worth a comment. This concerns the treatment of the Tax collection sector (Figure 6.3). From 1997 onwards incomes and expenditures from the Tax collection sector were incorporated in the State cashier accounts. Before 1997 we have included data for the Tax collection sector both as expenditures and incomes in order to avoid a break in the data. The historical origin of the Tax collection sector is that it was originally established as a fund for inter-municipal

¹⁰ We have also extracted capital income, which includes both interest payments and amortizations on government claims. We have not been able to distinguish between these.

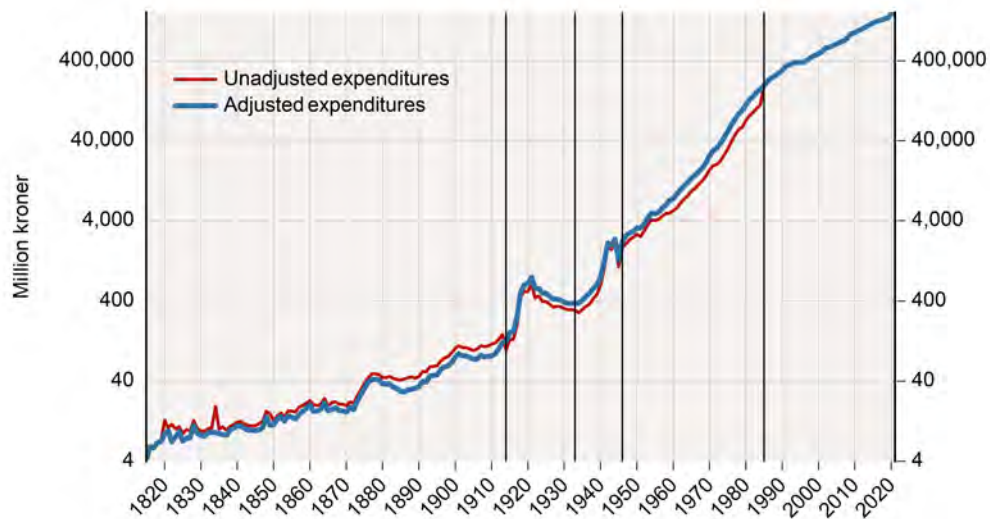
6.3 Government revenues and expenditures over 200 years

tax redistribution ('Tax redistribution fund'). The fund was established in 1936. The fund's sources stemmed from taxes on income and wealth.

Central government revenues, expenditures and debt, 1815-2021



(a) Revenues



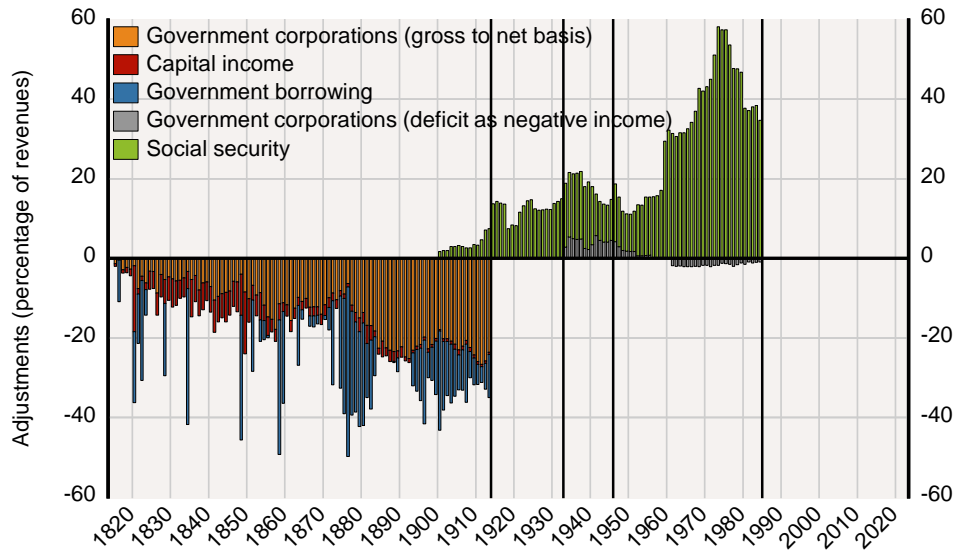
(b) Expenditures

Figure 6.4 Central government revenues and expenditures, raw data from primary sources and composite break-adjusted data, 1815-2021.

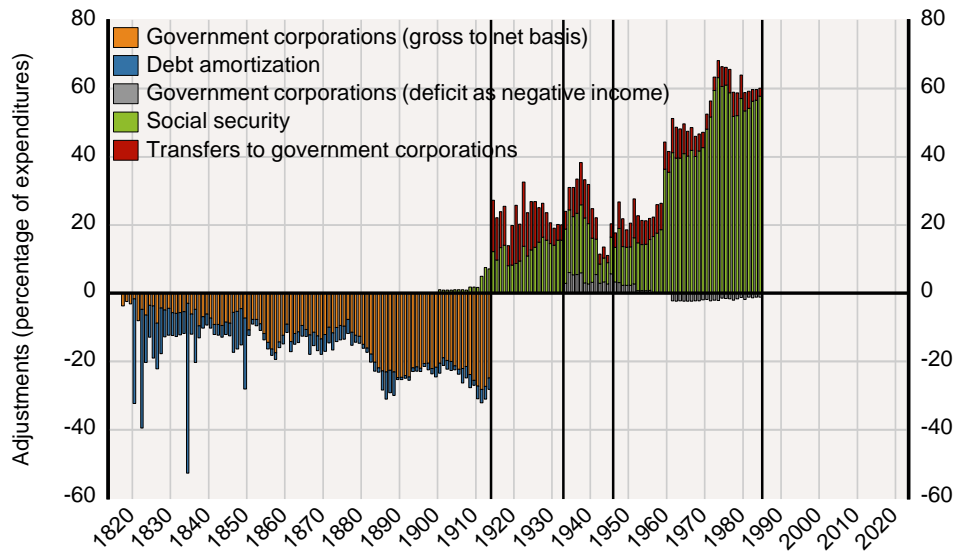
Sources: See overview in Table 6.1 on page 283,

Statistics Norway: <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million), 1985-2021. The data are tabulated in the appendix, see Table 6.A.1 and Table 6.A.2, respectively.

6.3 Government revenues and expenditures over 200 years



(a) Revenues



(b) Expenditures

Figure 6.5 Adjustments to central government revenues and expenditures, 1815-2021.

Sources: See overview in Table 6.1 on page 283,

Statistics Norway: <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million), 1985-2021. The data are tabulated in the appendix, see Table 6.A.1 and Table 6.A.2, respectively.

Central government revenues, expenditures and debt, 1815-2021

As a result of these adjustments revenues and expenditures for the years before 1914 have been reduced, mainly as a consequence of removing items which belong to the capital account and expressing government corporations on the basis of one common principle (net accounting). On the revenue side we note that we have removed numerous instances of government loans, shown as negative spikes (in blue bars) in Figure 6.5(a) prior to 1914. On the expenditure side we note the removal of debt amortization (in blue bars), some of which amounted to close to or more than fifty percent of uncorrected expenditures (60 percent in 1834). For the years from 1914 to 1984 revenues and expenditures have been increased by these adjustments, for a large part as a consequence of the consolidation with the social security sector. The size of these corrections increased over time to more than forty percent of uncorrected revenues and expenditures in the 1970s. Additional details about adjustments for the individual periods are provided in the text.

After adjustments, the figures have the following properties in common:

- The time period for each year is 12 months (although not necessarily the same months).
- The cash flow accounting method is applied as far as possible, revenues and expenditures are included in the year they were received or spent.¹¹
- New government loans have been removed from revenues and amortization on existing loans have been removed from expenditures.
- Except for government corporations revenues and expenditures are based on gross accounting.
- Subsidies and capital investments are accounted for as expenditures, so the surplus is not the same as the definition of savings in standard national accounting principles. Surplus here corresponds to the "surplus before loan transactions" in the government White paper No. 3 ("Statsregnskapet")¹².

In connection with some recent papers on long run trends in government finances (Grytten, 2014a,b, 2019), the author has constructed a set of revised historical dataseries for the total revenues and total expenditures of the central government. In this work Grytten builds on previous work by Hodne (1984) and Bjørsvik (2004). We will comment on these data series below. Other main sources of data are the periodical issues of Historical Statistics from Statistics Norway, such as Historical Statistics 1948, Historical Statistics 1968, Historical Statistics 1978 and Historical Statistics 1994.¹³ Historical Statistics 1948 cover the years 1850-1947, Historical Statistics 1968 covers the years 1850- 1956 and Historical Statistics 1978 also the years 1956-1977. Compared with those publications we cover a longer time period and avoid some of the shifts which stem from changes in accounting principles in the primary sources. For example Historical Statistics 1948, 1968 and 1978 all report a decline in government incomes and expenditures around 40 percent between 1913 and 1914, which is caused mainly by the shift from gross to net accounting of government corporations.

¹¹ Note that for some of the early years the primary sources used in Tvethe (1848) report data on accrued revenues and expenditures, respectively (Kristiansen, 1931, p. 260).

¹² "Net lending" in the national accounts.

¹³ See Statistics Norway (1949, Table 223), Statistics Norway (1969, Table 233), Statistics Norway (1978, Table 240-241) and Statistics Norway (1995, Chapter 23). Mitchell (1975) lists government revenues and expenditures in Norway for the years 1850-1949 relying on figures from Historical Statistics. In contrast with Historical Statistics, Mitchell does not show a break in the series for the years 1913-1914, nor does Mitchell give an explanation of the differences between the sources he has used.

6.3 Government revenues and expenditures over 200 years

In contrast, the composite historical data we present in this study show break-adjusted revenues and expenditures which decline only marginally (two and zero percent, respectively) between 1913 and 1914.

A comparison between the data series we present in this study and the data produced by Grytten and Hodne are shown in Figure 6.6. We have plotted our estimated data series for corrected and uncorrected revenues and expenditures, respectively, against a corridor represented by a blue band which is spanned by the data provided by Grytten and Hodne.

Notably, one of the differences between these data series stem from the fact that the shift in the data sources between July-July budget-year data and January-January budget-year data have been treated differently. Grytten and Hodne have smoothed the data across two consecutive July-July years, whereas in the present study we have chosen a different method. The two methods have different properties. Both methods need to give special treatment to the years 1877/1878 when the July-July budget-year was introduced in the statistical sources, and, correspondingly, to the years 1960/1961, from which time the calendar-year and budget-year have coincided. We denote as $x_{c,t}^a$ the revenues or expenditures in calendar year t by author a and by $x_{b,t-1/t}^a$ the corresponding data in budget-year $t-1/t$ (July-July). Then the two methods may expressed as follows (GH=Grytten & Hodne), EF=Eitrheim & Fevolden):

$$\begin{aligned} x_{c,t}^{GH} &= \frac{1}{2}(x_{b,t-1/t} + x_{b,t/t+1}) \\ x_{c,t}^{EF} &= x_{b,t-1/t} \end{aligned} \quad (6.5)$$

Grytten and Hodne's data will lead on the data in the present study when there are notable changes in revenues or expenditures since their smoothing method put weight on future data for budget-year $t/t+1$.

In Figure 6.6 we can see that Grytten and Hodne's estimates of revenues and expenditures, which are represented by the blue bands, start to increase (decrease) one year earlier in the 1880s and 1890s than the estimates of revenues and expenditures we have presented in this study. Under the assumptions we have made there will be a somewhat lagged response in the data when there are changes in revenues or expenditures, but there will on the other hand be less influence from shocks appearing in year $t + 1$ to influence on data for year t .

The other discrepancies between the two sets of data during the 19th century are to a large extent due to different assumptions regarding the adjustments discussed earlier in this section (cf. Figure 6.5), such as the gross vs. net accounting for government corporations. Recall that in this study we adopted net accounting in order to remove a break in the data in 1914. The discrepancies in the 20th century are mainly due to the social security sector which has been included in both revenues and expenditures in this study from 1900 onwards. It is of course possible to make other choices based on the historical data for these adjustments, which we have tabulated in Table 6.A.4 and Table 6.A.5 in Appendix 6.A.

Central government revenues, expenditures and debt, 1815-2021

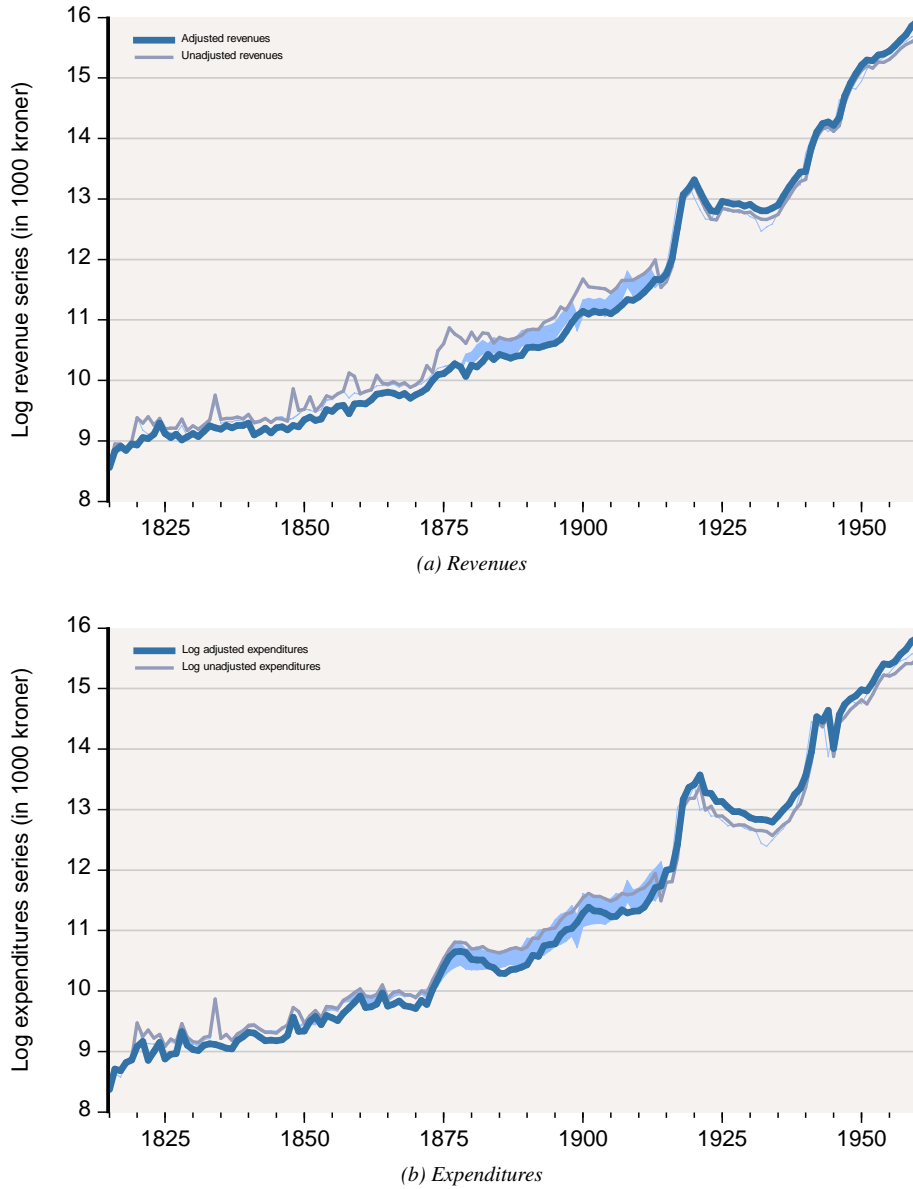


Figure 6.6 Central government revenues and expenditures, a comparison with Grytten (2019) and Hodne (1984), 1815-1960. Data are presented in logarithms. The blue bands in the upper and lower panel represents a corridor which is spanned by the data provided by Hodne and Grytten.

6.4 Government revenues and expenditures in four subperiods

In this section we dig deeper into details on the primary sources from which we have collected data for aggregated revenues and expenditures for the central government in the different subperiods listed in Table 6.2 on page 283 above.

1815-1913

Government accounts summarize revenues and expenditures within a defined period, such as a year. This was also the intention of the 1814 Constitution (§75k), which stated that five government auditors should be appointed who every year by July 1 should receive accounts of government revenues and expenditures for the previous year, and that they should publish in print extracts of these accounts.

This time limit was far from being followed the first few years after 1814 as all incomes and expenditures covering 1815 first had been handed over to official accountants by November 1819. Similarly, 1816 figures were handed over by April 1820 and 1817 figures by August 1820 (Kristiansen, 1931, pp. 190-191). The speed with which accountants received figures however, eventually converged to the limit set by law as the 1819 figures were handed to official accountants only 6 months late (Kristiansen, 1931).

Published accounts on government finances help monitor that public money is spent according to the budget approved by the parliament. The public revision office complained, however, several times during the 19th century that such control was made difficult as the time period of the budget and the accounts did not overlap. Between 1815 and 1878 the budget year followed the months from July to June, while the accounting year followed the calendar year. This mismatch followed from the 1814-Constitution and was not remedied until the late 1870s. This was almost ten years after the parliament started to meet in annual sessions in 1871, replacing the three-yearly intervals between parliamentary sessions in the period 1815-1868. The Constitution was eventually changed, and from 1878 onwards the accounting and budget periods have always overlapped.¹⁴ Accounts for 1878 were published in 1880 and was the first instance where the accounting period covered the months July to June. We have dealt with this change in the following way: data for 1878 have been calculated from primary sources as (January-June 1878) + (July 1878-June 1879)/2. For the following years we have let July 1878-June 1879 represent 1879, July 1879-June 1880 represents 1880 and so forth for all years until 1960 when both the budget and the accounting year were changed again and began following the calendar year. The transition year 1960 was handled in a similar way as we have explained here for 1878.¹⁵

Between 1821 and 1842 government accounts distinguished between records in silver and records

¹⁴ See details on the discussion and decision in the parliament to changes in §75k of the Constitution <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandling/Saksside/?pid=1871-1891&mtid=22&vt=a&did=DIVL61556>

¹⁵ There were also two instances with minor changes in the reported accounting period, in 1900 and 1909, respectively, which we comment briefly in the text.

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in banknotes. The background was that the exchange rate had depreciated significantly after the parliament in 1818 postponed the time when Norges Bank would fulfill the promise made when the bank was established in 1816 to redeem banknotes at the promised par silver value. After an agreement in 1819 which settled the size of Norway's debt to Denmark at 3 million speciedaler the government was compelled to make amortizations on this debt in silver. In 1821 the parliament introduced a law which secured that customs duties were to be paid either in silver coins or in an amount of banknotes which fully compensated for the depreciation of the exchange rate from its promised par silver value (Kristiansen, 1931, pp. 306-308).¹⁶ Confidence in banknotes had suffered from the postponement of resumption and their value relative to silver had been significantly reduced. In 1821 the average exchange rate was 175 speciedaler in bank notes for 100 speciedaler in silver. For this year the records show customs duties of 90 190 speciedaler in silver plus 1 153 990 speciedaler in banknotes. As the mean paper value for 1821 was 175, customs duties have been calculated to $90\,190 * 175/100 + 1\,153\,990 = 1\,311\,823$ speciedaler (par value would have been 1 244 180 speciedaler.). It was first in 1842, after resumption had been completed and banknotes were worth their promised par value against silver, that the practice of distinguishing between the two accounts, in silver and banknotes respectively, stopped.

We note that the crude representation of the *sources of funds* and *uses of funds* presented above (Equation 6.1, page 273) is made up of a mixture of the current account and the capital account of the central government. It was not until 1926 that Statistics Norway published an overview of central government finances which introduced a clear separation between the two, and then with calculations which only went back to the fiscal year 1913/1914. Therefore, for the entire period 1815-1913 the published accounts for central government finances contain a mixture of items belonging to the current account and the capital account, respectively. We have dealt with this in the adjustment procedures we have presented above.

From 1914 onwards government corporations were subject to net accounting showing either a positive or a negative level of income. Before 1914 the accounting principles for government corporations varied more. The accounts for government corporations, such as the silver mines at Kongsberg, postal services, railroad services, were mainly expressed in terms of gross revenues and expenditures although there were exceptions as some enterprises were subject to net accounting. From 1880 onwards the accounts for government enterprises were mainly recorded on a gross basis.¹⁷

We decided for this study to follow the principle of net accounting, which Statistics Norway introduced in 1914. We have therefore calculated net revenues from government corporations for the years prior to 1914 to match the definitions used thereafter. This has no impact on estimates of the central government's surplus, but we have reduced both the level of income and expenditures significantly. These adjustments are shown as negative yellow bars before 1914 in Figure 6.5. The size

¹⁶ See parliament discussion: https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1821&paid=3&wid=a&psid=DIVL8&pgid=a_0486

¹⁷ For a more detailed description about these changes see Ministry of Finance (1887, NOS III 38) and "Instilling 1: Statsbudsjettet 1924", https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1925&paid=1&wid=a&psid=DIVL213&pgid=a_0113&vt=a&did=DIVL217

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of these adjustments, from gross to net representation of revenues from government corporations, were increasing (in absolute value) through the 19th century. The downward adjustment in revenues and expenditures, respectively, increased to more than twenty percent of the uncorrected measures from around 1880 onwards. This development seems reasonable to us since it coincides with known changes towards gross budgeting of government corporations at that time.

The sources from which we have collected data for the 1800s distinguished between *ordinary* and *extraordinary* revenues and expenditures, respectively. Extraordinary revenues and expenditures were not included in the State cashier budget process and they were therefore accounted for separately.¹⁸ Examples of such extraordinary expenditures are government infrastructure investments, such as building of railways and telegraph lines. Loans to finance these projects were accounted for as extraordinary incomes (sources of funds). Railway expenditures also showed a procyclical variation with the business cycle (Hodne, 1984). Investments were typically accelerated during a period with high revenues, such as during the early 1850s following the Crimean war and the early 1870s, but the investments were almost put on hold in the 1860's and 1880's, before they were increased again in the 1890's.

We have included extraordinary expenditures' in our definition of government expenditures, whereas we have filtered out the government loans used to finance these projects from the revenue series in order to adhere to the distinction between the current account and the capital account which Statistics Norway introduced in 1926. In addition to this we should note that railways were also funded through contributions from local municipalities, which have been included in our measure of government revenues.

The overall effect of including expenditures for infrastructure investments is a large reduction in the government surplus compared with the original sources, where they appeared as separate distinguished items.¹⁹ A similar problem arises in the 20th century where expenditures for subsidies and capital injections in government corporations were added on the expenditure side.

Between 1815 and 1913 government accounts were reported in three different currency units, riksbankdaler in 1815, speciedaler from 1816 until 1876 and kroner from 1877 onwards. We present figures expressed in kroner. We have recalculated the figures accordingly: the 1815 riksbankdaler figures were multiplied with (4/10) and the 1816-1876 speciedaler figures were multiplied by 4. In 1900 there was another change in the budget regime which affected the periodization of the central government accounts. Figures were this year published only for the nine months from July 1899 through March 1900 (3/4 of a full year).²⁰ Between 1900 and 1908 the reported figures covered the months from April one year through March the next year. In 1908 the parliament changed the regime again and the former decision was reversed. Thus, the published accounts for 1909 show figures for a 15 month period from April 1908 through June 1909 (5/4 of a full year). We have annualized the observations in each of the two years 1900 and 1909, respectively, when the reported figures in the

¹⁸ See Ministry of Finance (1878, NOS I D1B).

¹⁹ See also Eitrheim and Lie (2014, p. 87) for a discussion of the financing of infrastructure investments during this period.

²⁰ The change in the budget regime also involved a change in §75a of the Constitution. https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandling/Lesevisning/?p=1898&paid=8&wid=a&psid=DIVL431&pgid=a_0273

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published accounts did not cover a twelve month period. The 1900-figures were multiplied by 4/3 and the 1909-figures by 4/5.

1914-1939

During and after World War I the government incurred large costs related to wartime provisioning and the defense of Norwegian neutrality. The government increased taxes to compensate for extraordinary wartime costs but this was not enough. Large deficits were the result. The government accounts published by the Ministry of Finance, however, did not reflect this. Instead, the accounts for the years 1915-1925 showed a surplus of NOK 145 million. The reason for this mismatch was that many of the incurred costs were not accounted for in the government records as these were compiled at the time, whereas one frequently did include revenues that had not yet been received. Government finances in Norway were subject to intense debates in the 1920s.²¹ When Statistics Norway published their revised set of government accounts in 1926, taking into account all relevant revenues and expenditures incurred in the period 1915-1925 they reported for the same period a deficit of NOK 817 million (Hjort, 1927, p. 10).

These revised government accounts published in Statistics Norway (1926) were based on new accounting principles for the fiscal years 1913/1914 – 1926/1927. The publication was still published under the name "Treasury Finances ("Den Norske Statskasses Finanser") and represented in one sense a continuation of the long series of NOS-reports (Norwegian Official Statistics) on government accounts which had been produced by the Ministry of Finance since 1878 (Statistics Norway, 1878). But there was one key difference. Statistics Norway introduced significant changes in definitions and accounting principles, and, most importantly, they presented a more complete overview of central government finances.

With their new and revised government accounts from 1914 onwards Statistics Norway introduced the distinction between the current account and the capital account. Records affecting financial assets and liabilities were shown in the capital account. Examples are infrastructure investments in railways, dams and telecommunication. To ensure consistency, however, we have included these investments as part of government expenditures, similar to in the current versions of White Paper No. 3. These adjustments contribute to increases in government expenditures during 1914-1945 as shown in Figure 6.5(b).

In contrast with the previous publications produced by the Ministry of Finance, the statistics on government finances published by Statistics Norway used a different combination of gross and net basis in the accounts. Government corporations for example, which had, in particular since the 1880s, been recorded on a gross basis, were from 1914 onwards accounted for on a net basis.

We also note that it appears to have been significant variations in how Statistics Norway presented deficits in government corporations. For some years these were recorded on the income side as nega-

²¹ See e.g. Hjort and Hoff (1923), Hjort (1927) and Keilhau (1927, 1930). We note that Hjort and Hoff (1923, p. 4) criticized the government budget for lack of completeness and that the presentation of the budget was unclear and provided no overview for non-expert readers.

6.4 Government revenues and expenditures in four subperiods

tive net revenues (1921-1922), whereas in other years deficits showed up as positive net expenditures on the expenditure side (1933-1939).²²

The background was that from 1933 onwards an imputed expenditure amounting to five percent return on invested capital was added to the government corporation accounts and this explained their negative net revenues in the period 1933-1939.²³ But at the same time the State cashier records only reported net interest payments on government debt after deducting these imputed interest payments. We have therefore reconstructed the total interest payments for the consolidated central government for the period 1933-1955. From 1956 onwards the statistical yearbooks reported total interest payments on government debt again.

Prior to 1985 we have recorded net revenues from government corporations on the income side in this study and when necessary we have made downward adjustments in both government revenues and expenditures as shown in Figure 6.5 for the period 1962-1984.

Figure 6.7 illustrates the real-time properties of different measures of the government surplus in the period 1914-1925. The official statistics produced by the Ministry of Finance in real-time (thick beige line) showed persistently large surpluses until 1921, followed by some deficit years. This picture is however highly misleading.

We have compared the real-time estimates with two sets of revised measures of the government surplus calculated in the mid-1920s, both published in 1926. The first was based on the report by the Currency Commission (1926) (green line) and shows large deficits already during the war years.²⁴ The second was based on the revised official statistics published in Statistics Norway (1926) (red line), showing even larger deficits. For comparison we have also included the government surplus $SURP_{tot,t}$, estimated in this study (thick blue line), which are based on Statistics Norway (1926) but show even larger deficits in 1919-1923, primarily due to the consolidation with the social security sector.

The primary shortcomings of the previous official statistics on government finances produced by the Ministry of Finance was that they left out many types of war-related expenditures which were handled outside the government budget. This is an important reminder about problems a lack of completeness in official statistics will create. We will discuss some of the omissions in more detail in the following.

There were expenditures directly related to the war, like for defense purposes to support the Norwegian neutrality during the war, which were only detectable if one studied the government balance

²² Statistical Yearbook 1934, Footnote 5 below Table 202 (page 196) provides some details on these changes in the accounts for government corporations.

²³ This change was proposed already in the debate on government finances which took place in the early 1920s, see for example Hjort and Hoff (1923, pp. 35-38) who proposed to use the average interest rate paid on government debt as an appropriate level of such imputed interest expenditures for government corporations. It is interesting that this level of return provides a benchmark for whether or not government corporations received support and were subsidized by the government. In Section 4.4.3 in Chapter 4 we saw that the average interest rate paid on government debt was substantially higher than the average loan rates on state bank loans from the mid-1950s onwards. The implied subsidies from this arrangement do not appear in the accounts of the government sector in this study since it excludes government owned financial corporations (cf. Figure 6.3 on page 280).

²⁴ Appendix 3 in the report by the Currency Commission (1926) offers a detailed discussion of government finances in this period and illustrates the ongoing work regarding revision of the accounts. We have collected data from Table A and Table C in this appendix.

Central government revenues, expenditures and debt, 1815-2021

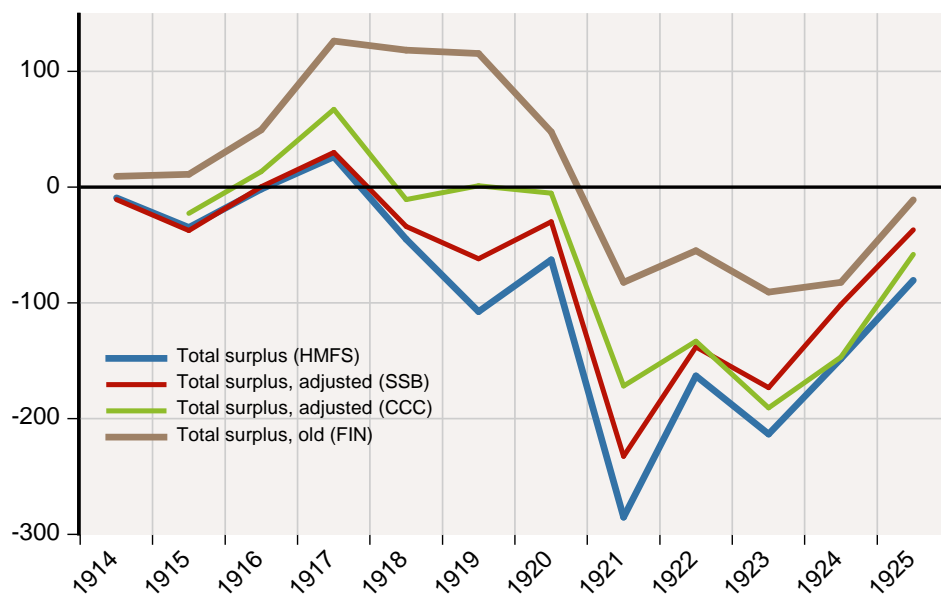


Figure 6.7 A real-time exercise in gauging the government surplus 1914-1925. Whereas the official statistics provided by the Ministry of Finance in real-time showed surpluses until 1921 (thick beige line), this picture was gradually replaced in the data provided by the Currency Commission (1926) (green line) and in the revised official statistics provided in Statistics Norway (1926) (red line). The estimated government surplus in this study (thick blue line, HMFS) shows an even larger deficit in 1919-1923, primarily due to the consolidation with the social security sector.

sheet closely. Soon there were also an increasing amount of expenditures for provisioning, including government guarantees, later came expenditures when several new ministries and directorates were established in order to administer the crisis.²⁵

All these expenditures were handled outside both the ordinary and extraordinary budgets. Instead the expenditures for these purposes were recorded using *advances and deposits* accounts, which we will refer to as *advances and special accounts*. Imports had to be paid in cash. Since the expenditures

²⁵ A Provisioning Commission with a mandate to secure imports of food and other goods was established immediately after the war broke out in 1914. In 1916 this commission was elevated to become a Ministry of Provisioning. Similarly, in 1917 a Ministry was established for the provisioning of goods for manufacturing industries. The state also engaged directly in the supply chain for important goods and services. Several state run monopolies for trade and import were established for commodities like sugar, grain and coal. State run production of flour, fat, sea transportation, mining and hydroelectric power production was also established in the following years (Hodne and Grytten, 2002, p. 78). Another direct effect of the war was cartellization of important production sectors engaged in foreign trade. This was a consequence of the sector agreements regulating foreign trade which were the results of negotiations with Norway's trading partners currently in a state of war such as Germany and UK. There were private agreements with UK on imports of many commodities and the government negotiated agreements with UK related to exports of fish and copper ore, coal imports, ocean freight to mention a few, and with USA on imports of grain. The government's efforts to secure the supply of consumer goods to the public involved funding operations on British and German accounts. For more details see e.g. Eitheim, Klovland and Øksendal (2016, Chapter 7), Hodne and Grytten (2002, Chapter 5), Keilhau (1927) and Rongved (2014).

6.4 Government revenues and expenditures in four subperiods

lacked formal budget coverage, for example in tax decisions, they were to a large extent financed by bank loans, either from Norges Bank or from private banks. In the latter case often with a guarantee that the loans could be rediscounted in Norges Bank. From 1918 onwards the government also accelerated their borrowing in domestic and international bond markets.

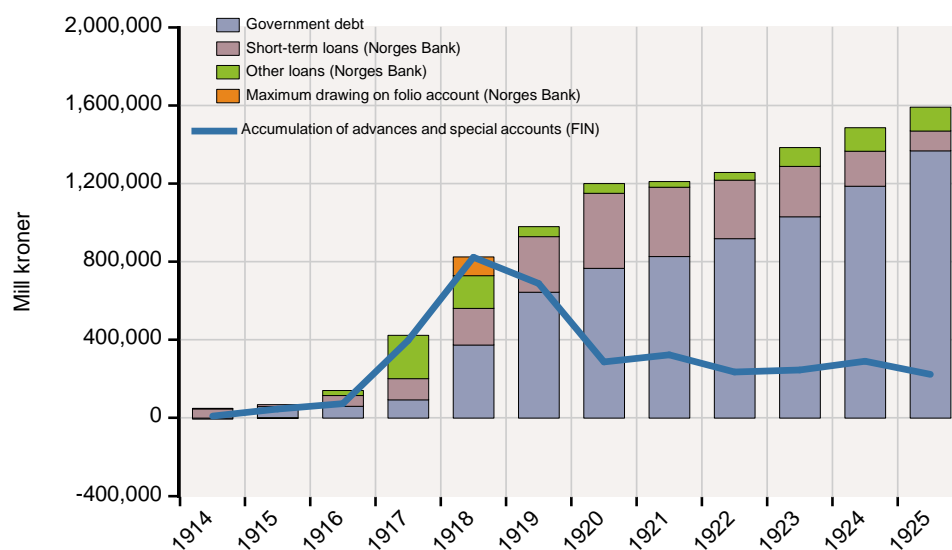


Figure 6.8 Accumulation of advances and special accounts (blue line) outside the budget 1914-1925. The coloured bars illustrate how these accumulated expenditures measure against observed changes in government debt (blue) and different types of loans in Norges Bank. These loans were loans under the fishing agreement in 1917 (green area) and discount lending (red area). In 1918 the government could also use their folio account to fund these expenditures (orange area).

We have illustrated this in Figure 6.8 which shows accumulated changes in *advances and special accounts* as these were reported in real-time the official statistics. We note that these items increased rapidly in 1917 and 1918 (blue line).

We have illustrated in some detail how these expenditures were partially funded by Norges Bank, in particular during the years 1917-1919. The loans (marked in green) include the fishing loan of 1917 as well as other loans for provisioning. In 1918 the government also debited its folio account in Norges Bank to fund these expenditures (marked in orange).²⁶ The large increases in short-term discount lending in Norges Bank (marked in red) reflected government borrowing in private banks subject to a rediscounting guarantee which allowed the banks to transfer the loan to Norges Bank. There were also loans emerging from overdrafts of the government folio account in Norges Bank,

²⁶ The estimate marked in orange in Figure 6.8 is based on the authors' assessment of monthly movements in the government's folio account in Norges Bank.

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which are not shown here. From 1918 onwards there were also large increases in government bond debt (marked in blue), which were vital in the funding of the large government deficits further on.

This book focuses on sources and methods behind historical data. We conclude that the revision process regarding accounts of government finances resulted in a transition to a system based on *cash based accounting*, a system which is still in use today for government accounts. It was also decided to make a distinct separation between the current account and the capital account, which gives a better overview of the central government's *sources of funds* and *uses of funds*. But, as we see from Figure 6.7, it is the lack of completeness which emerges as the main culprit of the old accounting system. It is only after factoring in all relevant revenues and expenditures we obtain the extent of revisions shown in Figure 6.7, i.e., from perceived surpluses in real-time during the war years followed by moderate deficits, to the view we hold today that the period 1914-1925 was a period with persistently large government deficits which were accumulated already during the last two war years and led to rapid growth in government debt.²⁷

1940-1945

The German occupation during World War II represented a huge shift in the financing of government expenditures in Norway. A large part of the German expenditures were financed by means of the printing press, which, more specifically, manifested itself through the accumulation of the occupation account in Norges Bank. When the war ended in 1945 the total gross balance of the occupation account was 11.4 billion kroner, which corresponds to around 120 percent of GDP in 1939 (Figure 6.9). During the war years the balance of the occupation account was reduced by around 3 billion kroner leaving a net balance of 8.3 billion kroner in 1945. We have discussed this in some detail in Section 2.5 in Chapter 2.

When the war ended in 1945 it was also evident that this item had only illusory value as an asset on Norges Bank's balance sheet. It was less clear, however, whether the occupation account should be treated as government debt or Norges Bank debt. Given its magnitude the occupation dominated Norges Bank's balance sheet in nominal terms.²⁸ In real terms the item was worthless. But who was ultimately the debtor responsible for this worthless claim? Was it the government or was it Norges Bank?

The occupation account was seen, at least partly, as a government responsibility. This was stated already in 1941 in an agreement between Norges Bank and the Ministry of Finance under the Quisling government. But would the peacetime government see this differently? This issue was subject to intense public debate in the following years, and was not resolved until 1958. Then the government

²⁷ A related question, subject to intense discussion already in the early 1920s, centred on when and to what extent key decision makers in the government and in the parliament were actually aware of the seriousness of the central government's financial situation. Who knew what and when did they know it? This topic was subject to intense debates among contemporaneous writers in the 1920s and the academic debate has continued. We refer interested readers to Keilhau (1927, 1930) and Rongved (2014) for more on this.

²⁸ The occupation account amounted to 94.1 percent of Norges Bank's total balance sheet at the end of 1945 and 84.9 percent of nominal GDP that year.

6.4 Government revenues and expenditures in four subperiods

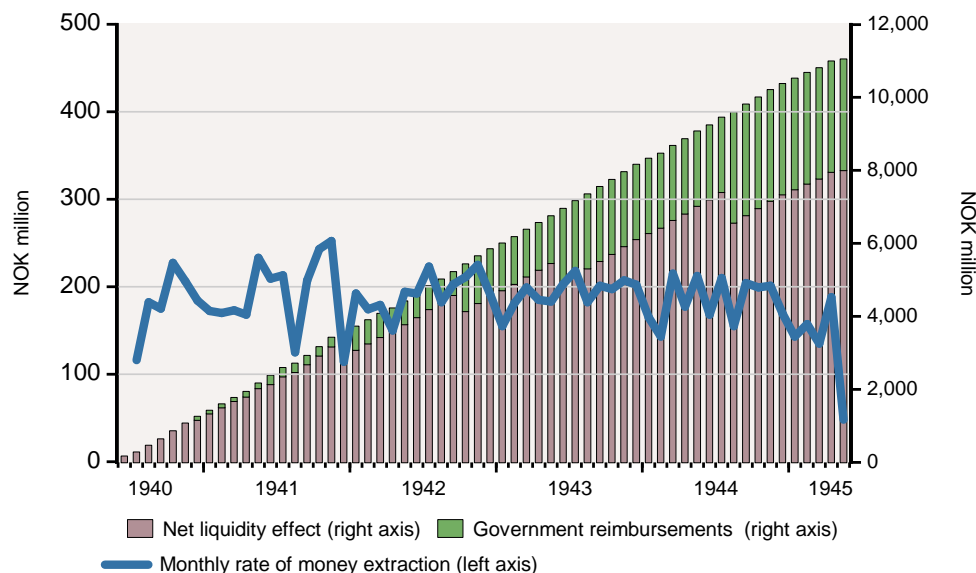


Figure 6.9 Money printing during World War II and the accumulation of the occupation account in Norges Bank from May 1940 through May 1945.

changed its capital accounts and included the remaining 5.4 billion kroner in the occupation account as part of government debt.

Figure 6.10 shows the revisions in the government's capital account which were made in 1958. The occupation account was transferred to the government and listed as "Other government debt". A corresponding item "The government's consolidated account in Norges Bank" remained in Norges Bank's balance until it was written off against a reduction in Norges Bank's equity in 1982 (Section 2.6 in Chapter 2).²⁹

Formally the occupation account was included on the asset side of the government's capital account as "Equity deficit". In Figure 6.10 we have, however, shown a measure of net equity on the liability side, as we have made a corresponding downward adjustment on both sides of the government's balance sheet which translates into negative net equity position until 1960.

1946-1984

History rhymes, is an old aphorism which comes to mind in this overview of accounting standards and principles. As was the case with the early government accounts in the first years following

²⁹ The government capital accounts were revised for all years back to 1945. The occupation account was included in the item "Other government debt" and labelled as *The government's consolidated account in Norges Bank*. The name changed accordingly in Norges Bank's balance sheet, and government net equity was reduced correspondingly. On the liability side the item was listed as, respectively, correction item 7 and "The government's consolidated account in Norges Bank", a sub-item under the label "Other debt" (Statistics Norway, 1966, NOS A 143, Table 8, p. 46).

Central government revenues, expenditures and debt, 1815-2021

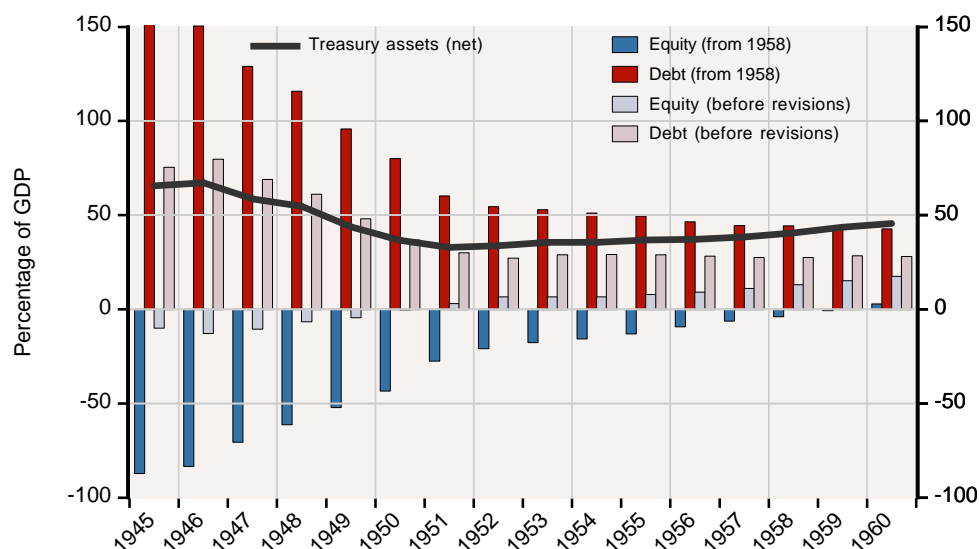


Figure 6.10 Revisions in the government's capital account made in 1958 (Statistics Norway, 1966, Table 8, p. 46). The occupation account was transferred to the government and listed as "Other government debt". A corresponding item "The government's consolidated account in Norges Bank" remained in Norges Bank's balance until it was written off against a reduction in Norges Bank's equity in 1982. Formally the occupation account was included on the asset side of the government's capital account as "Equity deficit". In Figure 6.10 we have, however, shown a measure of net equity on the liability side, as we have made a corresponding downward adjustment on both sides of the government's balance sheet which translates into negative the net equity position until 1960.

the Napoleonic wars, and as we have discussed in some detail regarding the important watershed created by World War I, the government accounts covering the years following World War II were also criticized for being incomplete (Hiorth, 1952). The budget reforms of the late 1920s and early 1930s put an end to *extraordinary* accounts, but maintained the possibility to deviate from strict cash based accounting through the use of *advance and deposit accounts*. This possibility was used heavily the next fifteen years or so. How did this system work?

Expenditures that were to be included in the current account for some year in the future could temporarily be included in advance accounts, whereas deposit accounts were used for the recording of revenues that were to be included in the current account for a future year or expenditures that has not yet led to a payment. *Advance accounts* were later offset either by recording revenues in advance accounts in a future year, or against a loss in the current account. *Deposit accounts* were offset either by a future expenditure in the deposit account or by revenues in the current account. The use of these

6.4 Government revenues and expenditures in four subperiods

accounts was fairly limited in the 1920's and 1930's but grew substantially after World War II and intensified in the years 1948-1953 (Figure 6.11).³⁰

Revenues and expenditures recorded in the deposit and advance accounts were mainly related to the war and its aftermath, such as the European reconstruction program and amortizations on the German occupation account at Norges Bank. Some of these revenues and expenditures are of such a character that they could be held outside of government financial statistics whereas others are not. Due to limited knowledge about details regarding the individual items in these accounts, it has not been possible to distinguish between them. The figures we present for the *State cashier* for the years 1946-1960 therefore include all items recorded in *advances and deposits* accounts (Statistics Norway, 1966, NOS A143). Figure 6.11 compares the government surplus for the State Cashier (red line) which includes the advances and deposits accounts with the surplus in the Budget account (green line). The government surplus we have calculated for the government sector in this chapter (blue line) follows the State Cashier surplus relatively closely although is somewhat smaller due to the way we have treated the social security sector.

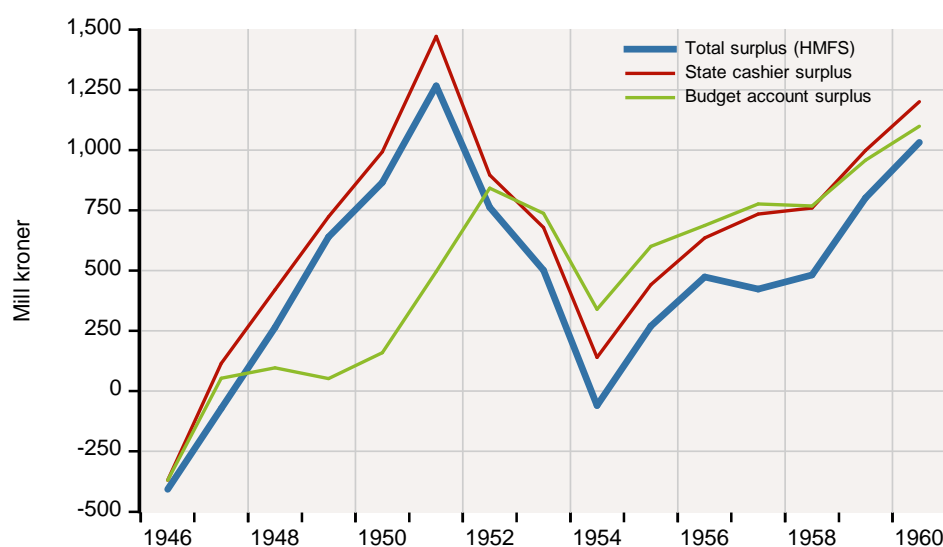


Figure 6.11 Government surplus 1946-1960. The total surplus for the central government as defined in this chapter (HMFS) is compared with the *State cashier* and the *Budget account* surplus ("Bevilgningsregnskapet").

Statistics Norway published government finances in NOS-publications under the title *Public Sector Finances*. There were also changes over time, mainly in how they accounted for government corporations and government investments. Beginning from 1972 investments in infrastructure was

³⁰ Examples of items in these accounts are transfers from special accounts and transfers from abroad like the Marshall aid in the late 1940s and early 1950's. One complaint which was raised against their use was that it was almost impossible for outsiders to understand what was going on (Hiorth, 1952).

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part of the surplus/deficit rather than being part of the expenditures. This change was made to define the surplus similarly to how savings is defined in the National Accounts (NA), where savings is the sum of real and financial investments (net lending). In government accounts presented to parliament (White Paper No. 3), infrastructure investments are part of the central government expenditures. For the years 1972-1984 we have therefore added investments presented as part of the surplus/deficit to government expenditures, and our figures therefore show higher expenditures and a lower surplus, comparable with White Paper No. 3.

Government corporations were also accounted for in slightly different ways as we have mentioned earlier. For the years 1946-1960 the accounts showed deficits of government corporations as negative revenues on the income side (as the sum across the individual corporations was consistently negative). Between 1961 and 1984, however, a positive figure was shown on the income side (representing corporations with a surplus) and another positive figure was shown on the expenditure side (representing corporations with a deficit). To maintain consistency over time we have netted these, and present the difference as a negative revenue on the income side.

1985 onwards

Figures from 1985 correspond with those found in government accounts reported annually to parliament (White Paper No. 3 "Statsregnskapet").³¹ In contrast with sources used for previous years, these figures also include incomes and expenditures of the social security fund. The social security fund's income sources consist of membership premium and employee fees. Its expenditures consist mainly of pensions and social benefit. The social security funds were until 1983 accounted for separately when it was integrated with Ministry of Finance accounts (Statistics Norway 1989)³². To avoid a large break in our series caused by the merging of the social security and treasury accounts we have added incomes and expenditures of the social security fund back to the year 1900, which is the first year for which we have figures.³³ A difference between accounts covering social security funds and the treasury until 1960 is that figures for social security funds followed the calendar year, whereas the treasury accounts followed the budget year (July year $t - 1$ until June year t). Also, the accounts of the social security funds were recorded using accrual based accounting principles. The administration of social security accounts was handled privately or by municipalities until 1967, when it was centralized.

Figures from 1985 differ from figures prior to 1985 as the net result of government enterprises are accounted for as expenditures, while they before 1985 are accounted for as incomes. We have decided not to make changes to figures from 1985 to make updating easier, and to ensure comparability with figures used in other public reports, such as the budget and government accounts.

³¹ These can for example be extracted from the web page of Statistics Norway.

³² 1985 using our sources

³³ See table 11 in Statistical Yearbook for 1953 for the years up to 1939. For the years 1940-45 we used information in Statistical Yearbook 1941, 1942, 1943-1945 and 1949. Figures include insurance for industrial workers, fishermen and accidents for seamen, health insurance for seamen, private and municipal sickness insurance, different forms of unemployment insurance and war pensions, see Statistics Norway (1952, p. 198) .

6.4 Government revenues and expenditures in four subperiods

In 1972 the first item of government revenues coming from the petroleum sector is recorded. This was an indirect tax on production of petroleum of about NOK 42 million. In 1976 the government also increased the direct taxation of the petroleum sector. More on this below.

6.5 Decomposition of government revenues and expenditures

The composition of central government revenues and expenditures has changed over time. In the early part of the 19th century expenditures were mainly related to defense and central administration. The main sources of revenues were customs duties and taxes on certain consumer products (particularly related to alcohol production). Today the bulk of expenditures are for purposes such as culture and education, health and social security, in other words expenditures related to the modern welfare state. The main sources of revenues are from a variety of direct and indirect taxes on income and property, oil and gas revenues and social security premia.

Table 6.3 *Main data sources for the components of government revenues and expenditures, 1815-2021.*

Time period	Source
1815-1845	Tvethø (1848) "Norges Statistik"
1846-1849	Government accounts published in Parliament Discussions (1851 and 1854)
1850-1913	Government Finances ^a (published by the Ministry of Finance)
1914-1931	The Norwegian Central Government's Finances ^b (published by Statistics Norway)
1932-1994	Statistical Yearbook (published by Statistics Norway)
1980-2021	Central government revenues, published in Table 07107 by Statistics Norway
1995-2021	Central government expenditures, published in Table 10725 by Statistics Norway

^a "Statskassens finanser"

^b Den Norske Statskasses Finanser

Table 6.3 shows the main data sources from which we have collected historical data for this study, whereas Table 6.4 provides an overview of the different subcategories of government revenues and expenditures, respectively.

Figure 6.12 shows changes in the composition of revenues and expenditures over the past two centuries measured in percentages of GDP. We have stacked the different subcategories on top of each other such that they accumulate to match the aggregated levels of revenues and expenditures we have seen in Section 6.1 above. Details about the construction of composite historical data series for these components are provided in the following subsections of this chapter. Figure 6.13 provide further details on evolution and changes in the composition of government revenues and expenditures (in percentages). In the following subsections we provide further details on the primary data underlying the decomposition of government revenues and expenditures into subcategories in the different subperiods. The data for revenues and expenditures are tabulated in the appendix, see Table 6.A.4 and Table 6.A.5, respectively.

We have collected data for revenue items such as taxes, income from capital and government corporations, local contributions to railway investments and social security premiums. On the detailed level we have collected data for direct taxes, customs duties, taxes related to alcohol production, oil and gas production and several other indirect taxes. Total revenues from oil and gas consist of all direct and indirect taxes plus net profits and dividends stemming from the oil and gas sector. We return to this in Section 6.7.

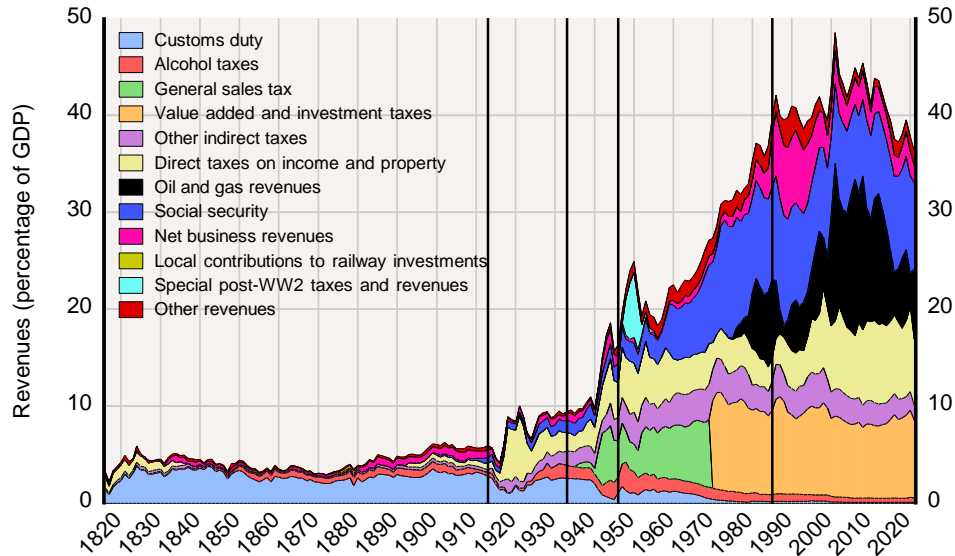
Table 6.4 *Main components of government revenues and expenditures, 1815-2021.*

	Revenues	Expenditures
1	Customs duty	Interest expenditures
2	Alcohol taxes	Culture and education
3	General sales tax	Police and Judiciary
4	Value added and investment taxes	Military defense
5	Other indirect taxes	War and crisis expenditures
6	Direct taxes on income and property	Social security
7	Oil and gas revenues	Health
8	Social security	Health and Social security
9	Net business revenues	Subsidies and capital investments
10	Local contributions to railway investments	Civil administration
11	Special post-World War II taxes and revenues	Other expenditures
12	Other revenues	

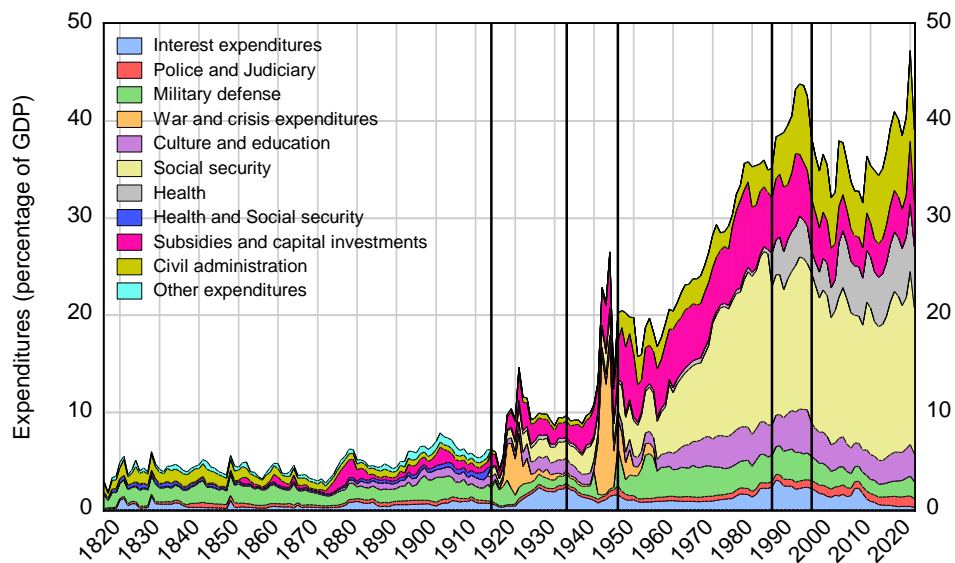
Regarding expenditures items we have aimed at collecting data which cover all areas of government expenditures during the past two centuries. The different purposes of these expenditures range from activities like the central administration, defense, police and judiciary, public investments, culture and education, social support (including health) and interest expenditures.

The subcategories of revenues and expenditures reported in the available data sources have changed over time and it has been challenging to put them together in a unified format. Table 6.4 provides an overview of our choice of subcategories of revenues and expenditures in this study.

Central government revenues, expenditures and debt, 1815-2021



(a) Revenues



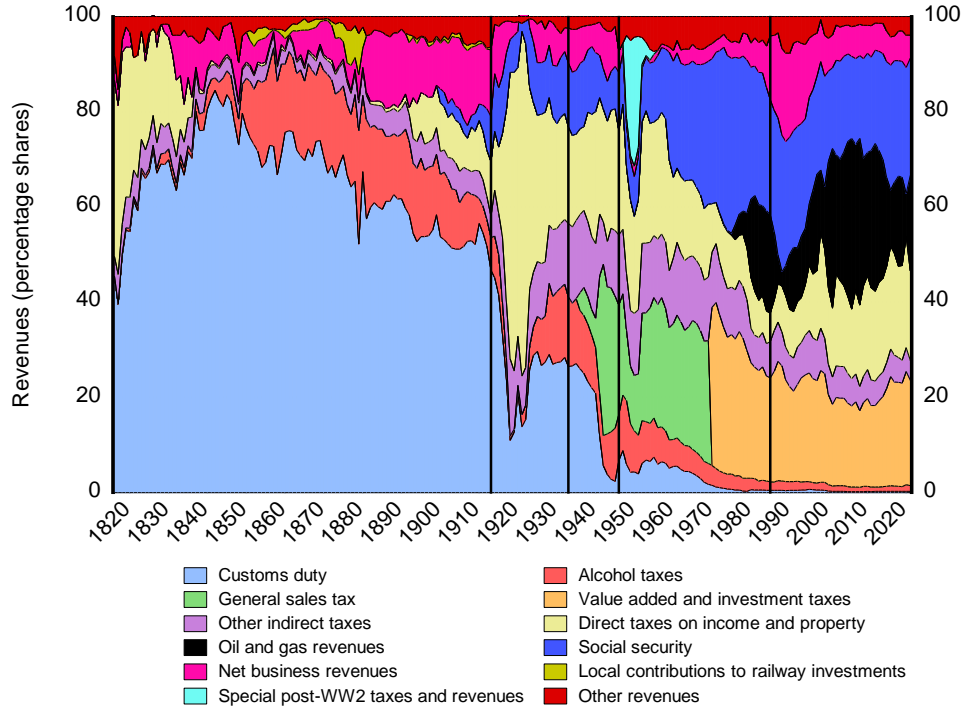
(b) Expenditures

Figure 6.12 Government revenues and expenditures, 1816-2021, in percent of GDP.

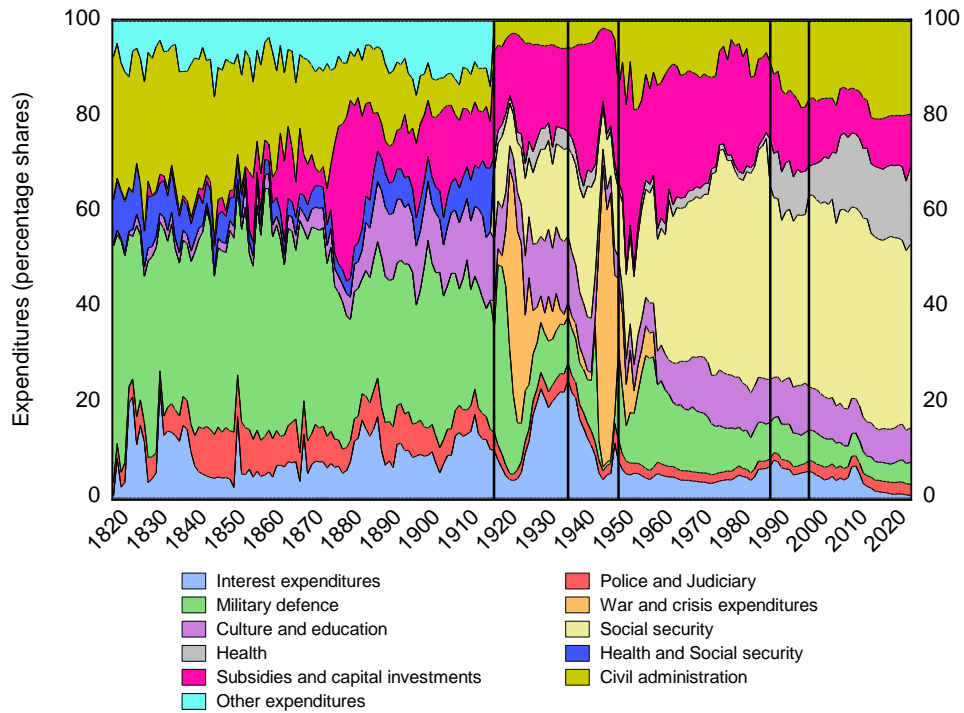
Sources: See overview in Table 6.3 on page 304,

Statistics Norway: <https://www.ssb.no/en/statbank/table/07107>, Central government revenue items (NOK million) 1980-2021, <https://www.ssb.no/en/statbank/table/10725>, Central government expenditures, by sector and function (NOK million) 1995-2021.

6.5 Decomposition of government revenues and expenditures



(a) Revenues



(b) Expenditures

Figure 6.13 Government revenues and expenditures, 1816-2021, percentage shares.
Sources: See overview in Table 6.3 on page 304 and Figure 6.12.

Central government revenues, expenditures and debt, 1815-2021

We provide additional details in the following paragraphs for three subperiods.

1815-1913

For the years 1815-1849 expenditures were, for example, divided between the central civil administration, police and judiciary, government corporations and institutions for the public benefit. A number of expenditure items did not fit easily into a subcategory and were retained as a residual. After some adjustments we present the following list of main subcategories of government expenditures for this period:

- Civil administration: expenditures related to the royal house, Stortinget, the government and the offices for customs duty.
- Police and judiciary: mainly expenditures related to the courts and prisons.
- Social support: pensions, medical services and support for the poor at Kongsberg silver mines.
- Military defense: expenditures include land and sea military.
- Culture and education : include primary and secondary schools and the university.
- Investments: offices of canals and lighthouses, the geographical survey of Norway.

Apart from expenditures for the royal house, parliament and government, individual expenditure items were from 1850 onwards listed under the ministries responsible for their administration. Expenditures were then presented for the following ministries:³⁴

- Ministry of Church Affairs
- Ministry of Justice Affairs
- Ministry of the Interior
- Ministry of Finance
- Ministry of the Army
- Ministry of the Navy and Postal Affairs

From 1850 we first considered to use data sources which reported annual expenditure items of these ministries to approximate the abovementioned categories of expenditures. However, this turned out to be problematic since these data sources were incomplete. The sum of the specified items did not add up to total expenditures. Accordingly, we decided not making use of these figures. Instead we have approximated the categories in the following way:

- *Culture and education*: expenditures under the Ministry of Church and Education.
- *Social support*: the sum of medical services (this item belonged under different ministries), pensions and from 1900 expenditures of social security funds.
- *Police and judiciary*: expenditures under the Ministry of Justice Affairs (less expenditure to the medical office).

³⁴ See <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning-/?p=1925&paid=1&wid=a&psid=DIVL213&pgid=a.0152&vt=a&did=DIVL257>

6.5 Decomposition of government revenues and expenditures

- *Investments*: expenditures of the office for roads, railways, canals and docks and extraordinary investments in new railways and telegraph lines.
- *Military defense*: expenditures of the Ministry of the Army plus expenditures of the Ministry of the Navy and Postal Affairs.³⁵ From 1891 onwards these data also include "extraordinary defense expenditures".

In the primary data sources interest expenditures were typically reported together with amortization of government debt. As we have stated above, we have aimed at being able to distinguish between current account and capital account items as far as possible also prior to 1913. We have therefore estimated an aggregated amortization series on the basis of available information about each government loan issued between 1815 and 1913. We have applied available information about the nominal coupon interest rate, the amortization type, size and duration of each loan and have estimated the amortization and interest payment schedule on an annual basis.³⁶ From 1850 onwards we have also collected annual data in primary data sources which states for each government loan how much remained.

For the period 1815-1849 we have extracted revenue categories from Tvethe (1848). Between 1850 and 1885 the following revenue categories were available from the primary data sources:

- Taxes
- Government properties (silver mines at Kongsberg, government forests etc.)
- Government assets (dividend and interest)
- Public infrastructures (postal, telegraph and railway services)
- Various incomes

We have combined revenue groups like "Government properties", "Government assets" and "Public infrastructure" into a new group that we have labeled *net business revenues*. We present separate time series for some of the larger taxes, such as *customs duty* and those related to consumption and production of alcohol. For the period 1815-1913 the series *alcohol taxes* consists of a tax on distillation, which was introduced in 1816,³⁷ and a tax on the production of malt, introduced in 1858.³⁸ The series *other indirect taxes* includes taxes on playing cards, taxes on land used for the production of tobacco, sportel fees and a tax on production of timber at sawmills.³⁹ Data for the *social security* sector, beginning from 1900, comprise the membership premiums and expenditures of different social security funds including the national social security fund ("Folketrygden") which was established in 1967.

A change was made in 1886 in the way government revenues were presented, as they were also

³⁵ Expenditures related to postal services, telegraph and docks resided under the Ministry of the Navy.

³⁶ See Section 6.6 for details. The facts about the different government loans issued in this period are collected from Rygh (1875), Woxen (1889), Steen (1954) and Klovland (2004).

³⁷ See parliament discussions: <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1815-16&paid=3&wid=a&psid=DIVL142&pgid=a.0611>

³⁸ See parliament discussion <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Saksside/?pid=1814-1870&mtid=8&vt=a&did=DIVL18140>

³⁹ See Skatteetaten (2022) for an overview of existing and previous indirect taxes in Norway. <https://www.skatteetaten.no/globalassets/rettskilder/avgiftshistorie/avgiftshistorie-2022.pdf>

Central government revenues, expenditures and debt, 1815-2021

sorted under the ministry responsible for their administration (most ended up being presented as revenues under the Ministry of Finance). Grouping expenditures under the responsible ministry makes more sense than grouping incomes this way, as it seems more intuitive to determine which expenditures belong under which ministry. For all years from 1886 to 1913 we have therefore regrouped individual revenue items to match the categories which were used in the accounts for the years 1850-1885.⁴⁰

Since direct taxes on income and wealth were discontinued in 1836 there was an abrupt decline in revenues from this category from 1836 onwards.⁴¹ The period with no direct taxes on income and wealth lasted almost 60 years, as direct taxes were first reintroduced in 1892. In the meantime the only form of direct taxation was taxes on heritage.

1914-1945

Publications on government finances covering the years starting from 1914 grouped incomes and expenditures according to their financial type, rather than under the ministry responsible for their administration.

We have grouped expenditures for this period into the categories listed in Table 6.4 above:

- *Civil administration* is the sum of expenditures for the national political institutions, foreign affairs and tax collection.
- *Culture and education* comprise expenditures for the school system, universities, science and arts plus the church.
- *Police and judiciary*
- *Military defence*
- *Health and Social security*
- *Subsidies and capital investments* in sectors like agriculture, fisheries, manufacturing industry, public infrastructure, trade and shipping.
- *Interest expenditures* on government debt.

We have constructed separate time series for a few other large categories of expenditures and revenues in this period. Beginning from 1916 there was a large increase in government expenditures for defense and other war and crisis measures. War and crisis related expenditures were a significant part of government expenditures both during and after World War I. In the government accounts these were sorted under "Other expenditures".⁴² Crisis related expenditures relating to World War II and its aftermath are also shown separately. The large expenditures during the war relates to the National Unity labor services and were to a large extent funded by the occupation account at Norges

⁴⁰ The regrouping of revenue was a result of an initiative from the public revisions office.

⁴¹ There was a separate direct tax for those living in cities (the so called kjøpstadsskatt) and those living in rural areas (the so called landstadsskatt). Direct taxes in cities were according to income and wealth while in the rural areas people were taxed according to land ownership (regardless of how productive the usage of the land was).

⁴² The government issued extraordinary taxes on both income and wealth to provide funding for the increased crisis and defense expenditures. This causes the large increase in direct taxes in this period (Hiorth, 1952). These measures did not hinder a massive buildup of government debt in this period.

6.5 *Decomposition of government revenues and expenditures*

Bank, while the postwar expenditures include reconstruction work in the northern regions of Norway (Troms and Finnmark).

In addition to special taxes on certain consumer products (such as sugar, chocolate and alcohol), a general sales tax was introduced in 1935. This was intended as a temporary tax to relief the government of incurred crisis costs.⁴³ To reduce the large amount of liquidity that was created during the war, the government introduced several taxes after the war. These are shown in a series called "Special post-World War II taxes and revenues" (Table 6.4), which comprise a one-time tax on wealth increases during the war, incomes from the European Recovery Program, a one-time tax on income and wealth introduced in 1947 (the so called war-damage tax) and an additional one-time tax introduced in 1948 (a tax to increase the country's military readiness).⁴⁴

The series various alcohol related taxes includes tax on beer production, tax on distillation, beginning from 1924 surplus from the wine monopoly (Vinmonopolet), beginning from 1942 a crisis tax on beer sales (incorporated in the ordinary beer tax in 1952) and an additional war tax on liquor (incorporated in the ordinary tax on liquor sales in 1960), a tax on sales of drinks at restaurants (from 1925). The series also includes sales of licenses to sell alcohol and surplus from selling alcohol products in rural areas.

1946 onwards

From 1946 onwards we have collected data on the individual revenues and expenditures items as these were tabulated in Statistical Yearbook, whereas information about total government revenues and expenditures are compiled from a broader range of publications in order to cover the necessary consolidation of the central government sector in this study. Unfortunately the sources from which we have collected the data underlying the aggregated totals do not at the same time provide a detailed break-down into their different subcomponents. There is therefore a risk that there will be a discrepancy between aggregates across the individual items presented here, and the aggregates we have reported for total government revenues and expenditures.⁴⁵

We have made adjustment in data in light of changes in the reporting of individual subcomponents of revenues and expenditures items. One example is a shift in the reporting of interest expenditures in the period 1933-1955 compared with from 1956 onwards. We have reconstructed a consistent measure of interest payments on government debt through the consolidation of interest payments recorded in the accounts of the State cashier and in the accounts of government corporations.

The series government transfers beginning in 1946 contains transfers to the treasury from other public sector accounts. The general sales tax which was introduced in 1935 was replaced in 1970 by a value added tax and a tax on investment expenditures.

⁴³ <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1935&paid=2&wid=a&psid=DIVL377&pgid=a.0070>

⁴⁴ For more details see SSB (1949). https://www.ssb.no/a/histstat/nos/nos_x.171.pdf

⁴⁵ The reason why we do not use the totals presented in Statistical Yearbook is that we need to consider a broader range of sources in order to cover all parts of the central government in this study (cf. Figure 6.3 and Table 6.2 on page 283 on changes in definitions in previous publications).

6.6 Government debt

Information on government debt between 1815 and 1850 is available from several sources. These describe the size of the loans, the year they were initiated, their nominal interest rate and the number of years before redemption. In many cases the government could make extraordinary downpayments, with the possibility of an early complete redemption of a loan. In the description of government finances offered in Tvethe (1848) there is information about the years when the Norwegian Parliament made such extraordinary downpayments, their respective size and to which specific loan they applied. In the calculations of government debt presented here we have assumed that the loans are amortized yearly and we have calculated the amortization profile for each individual loan accordingly and taken into account the information in Tvethe (1848) about extraordinary downpayment and instances of early redemption of the different loans when estimating total government debt each year.

Figures showing the annual level of the central government's debt exist from 1850. Information about new government loans during the years 1815-1900 were included in the chapter on bond yields in HMS I (Klovland, 2004). Available information in these sources includes the size of the loan, when it was issued, the interest rate, duration, whether it was given at par value or lower, whether the loan was refinanced and whether there were years when the government made extraordinary down-payments.

We have used information from these sources to calculate a down-payment schedule for each loan. By adding the remaining debt on each loan we get the government's overall debt level by year-end. Our starting point is 1815 when the central government debt was 7.2 million speciedaler (28.8 million kroner). Included in this figure is the debt inherited from the union with Denmark of 3 million speciedaler, a debt to the Temporary Riksbank of 2.5 million speciedaler and 1.7 million speciedaler in government bonds.⁴⁶

⁴⁶ The level of debt Norway inherited from the union with Denmark was subject to negotiations and were first agreed on in the 1819 settlement between the monarchs of the two countries. We have included this level of debt, 3 million speciedaler, in our figures from 1815 onwards.

6.6 Government debt

Table 6.5 provides a brief overview of new government loans during the period 1815-1850 together with some relevant information which we have used in the calculations behind the annual debt levels we present in this study.

Table 6.5: *New government loans 1819–1848, in speciedaler.*

Year	Amount (speciedaler)	Duration	Creditor	Coupon rate	Effective rate	Type	Comment
1819	195 450	18 months	Domestic	6.5 %			Redeemed in 1821
1820	900 000	20 years	Foreign	5 %	12.3 %	Annuity	Refinanced in 1825
1822	2.4 mill ⁴⁷	29 years	Foreign	6 %	7.8 %	Annuity	Refinanced in 1834
1822	50 000	2 years	Domestic	6 %			Redeemed in 1824
1822	150 000	50 years	Domestic	5 %		Serial	
1825	846 000	15.5 years	Foreign	4 %	5.2 %	Annuity	Refinanced in 1834
1828	300 000	30 years	Foreign	4 %	4.8 %	Annuity	
1834	1.2 mill	15 years	Foreign	4 %	4.7 %	Annuity	Redeemed in 1847
1848	1.5 mill	30 years	Foreign	4 %	4.8 %	Annuity	

In addition to servicing these loans the government also made amortizations on the redemption loan Norges Bank had granted to the Temporary Riksbank in 1817-1818 in connection with the changeover from the old riksbankdaler banknotes to the new speciedaler banknotes issued by Norges Bank. As an approximation we have assumed that the government made amortizations and interest payments on an annual basis. This simplification will have some impacts on the debt level and on the effective interest rate. Prior to 1850, figures on government debt exist for six years. Compared with these figures, our calculations of the debt level, taking into account new loans and amortizations on old loans over the period 1815-1850, seem to match these estimates fairly well.

The annual estimates of total government debt we present in this study are fairly close to the benchmark figures stated in Parliamentary Proposition No. 1 1915. The estimates confirm that tight fiscal policy led to significant reductions in government debt. The largest difference is observed in 1835. For 1847 the figures for government debt given in the Parliamentary Proposition differ slightly from those stated in Tvethe (1848) and Woxen (1889) whereas our estimates match the latter sources. From 1850 onwards we have collected information on government debt from available official statistical sources published by the Ministry of Finance and Statistics Norway, see e.g. Ministry of Finance (1878), Statistics Norway (1926) and Statistics Norway (1978). Developments in total government debt over the past two centuries from 1816 to 2021, in percentage of GDP, are shown in Figure 6.15.

⁴⁷ This is the Hambro loan which was used to amortize Norway's debt to Denmark after the dissolution of the Dano-Norwegian union. We might conjecture that in order for Joseph Hambro to provide such a large loan to the Norwegian government on his own books he must have drawn heavily on his credibility and international reputation. Meyer (1905, p. 524) writes: "Til at skaffe de fornødne Pengemidler til veje fra Udlandet hørte der baade et betydeligt Talent og en grundmuret Anseelse" [It took a significant amount of talent and rock solid reputation to attract the necessary means from abroad to fund this loan.] (author's translation from Danish).

Central government revenues, expenditures and debt, 1815-2021

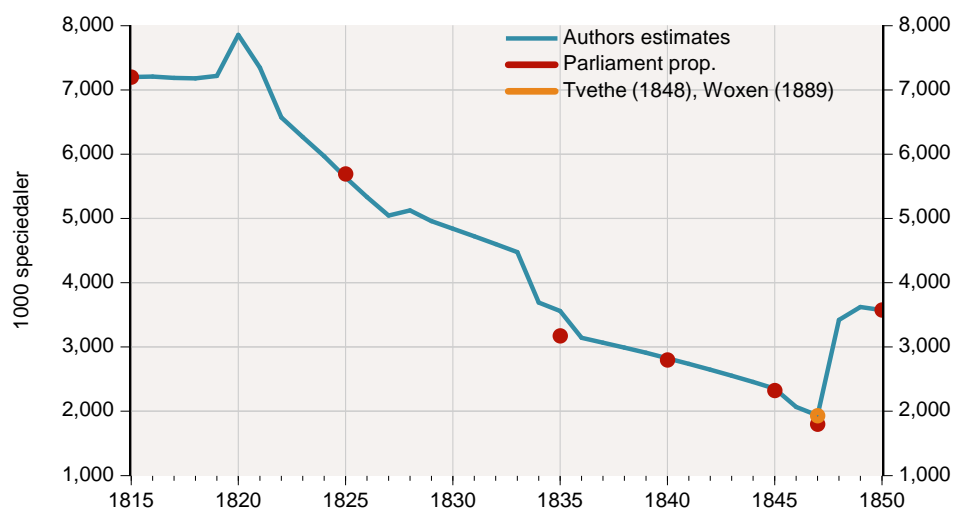


Figure 6.14 Central government debt, 1815-1850 (in 1000 speciedaler).

In 1849 the size of the unrevocable debt, which stemmed from the period before the dissolution of the union with Denmark, had increased from 1.7 mill speciedaler to 1.95 mill speciedaler after the "tiende-tax" to the King was dismantled. As compensation to private holders of claims on this "tiende-tax" the government issued additional 0.25 million speciedaler (1 million kroner) in unrevocable bonds to the Angell foundation in Trondhjem, see Rygh (1875, p. 55) and Woxen (1889, p. 4).

For all years from 1815 we have made a distinction between government debt denoted in Norway's official currency (speciedaler and kroner) and foreign government debt denoted in international currencies.

For the years until 1932 debt denominated in foreign currencies has been converted to kroner at par exchange rates. From 1932 until 1961, however, foreign debt has been converted to kroner at the prevailing exchange rate at the time the debt was issued. This is also the convention used in the government accounts. From 1962 onwards foreign debt is converted to kroner at market exchange rates (see Statistical Yearbook 1965). For the entire period we can split government debt between debt issued in domestic and foreign currencies. The developments in the domestic and foreign component of total government debt over the past two centuries is shown in Figure 6.16.

6.6 Government debt

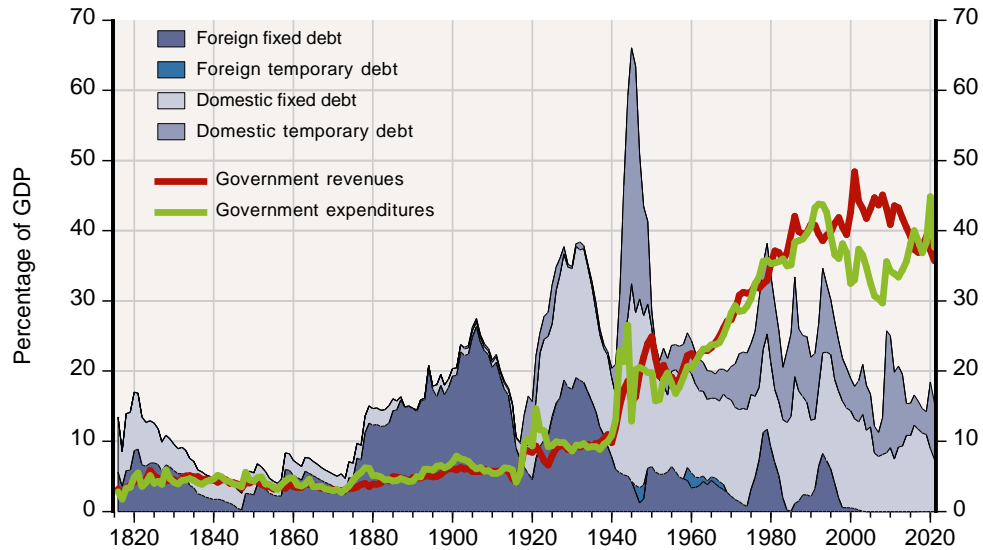


Figure 6.15 A decomposition of central government debt, distinguishing between foreign and domestic debt and between long-term and short-term debt (in percentage of GDP), 1816-2021.

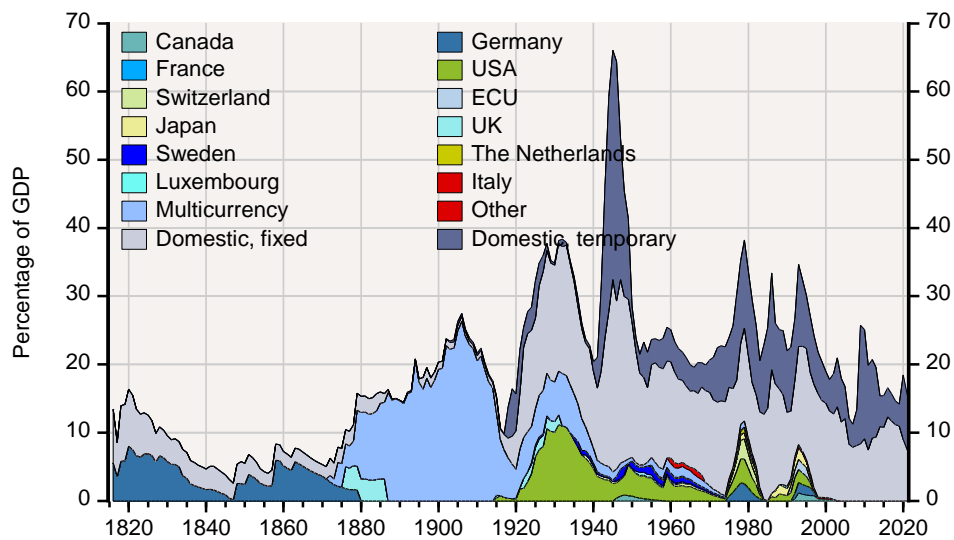


Figure 6.16 A decomposition of Central government debt, distinguishing between foreign debt in different currencies (including multicurrency loans during the gold standard period) and between long-term and short-term debt (in percentage of GDP), 1816-2021.

Historical data for government debt are tabulated in Appendix 6.A. Table 6.A.7 provides an overview of the central government's domestic and foreign debt, 1815-2021. Table 6.A.8 shows how the foreign debt is distributed across different currencies. We have treated multicurrency loans shown in Figure 6.16 as a separate category. Finally, Table 6.A.9 provides an overview of the currency distribution of the central government's new foreign debt from 1946 onwards.

6.7 Government Pension Fund Global

The first deposit was made in the Norwegian sovereign wealth fund (Government Pension Fund Global, GPF) in 1996. In this section we will outline the links between aggregated central government revenues and expenditures as we have defined these variables in Section 6.3.⁴⁸

Figure 6.17 compares three measures of the central government surplus. The blue and red lines denote, respectively, the total surplus $SURP_{tot,t}$ and the primary surplus $SURP_{prim,t}$ as we defined these variables in Section 6.3.⁴⁹ The green line denotes the oil-adjusted surplus, which is obtained by subtracting oil and gas revenues $OIL\&GAS_t$ from $SURP_{tot,t}$.

$$SURP_{oiladj,t} = SURP_{tot,t} - OIL\&GAS_t \quad (6.6)$$

Oil and gas revenues $OIL\&GAS_t$ is one of the subcategories of government revenues we introduced in Section 6.5.⁵⁰ This variable, which consists of all direct and indirect taxes plus net profits and dividends stemming from the oil and gas sector, makes a fairly good approximation of the official statistics for the net cash flow from oil and gas as we can see in Figure 6.18. The net cash flow from oil and gas is the basis for the inflow of funds into the GPF.

Figure 6.17 illustrates the huge impact this cash flow from oil and gas revenues have had on the government surplus. Two observations are worth noting. Firstly, that the oil corrected surplus has been negative in all years since the early 1990s, and secondly, that it has grown increasingly more negative over the past two decades. Figure 6.19 compares the measures of the total surplus $SURP_{tot,t}$ and the oil-adjusted surplus $SURP_{oiladj,t}$ from this study with a decomposition of the government surplus as this is recorded by Statistics Norway. The decomposition identifies contributions from net deposits in the fund plus net lending, debt amortization and residual allocation. We note that the crude surplus measure $SURP_{tot,t}$ (blue line) we have calculated in this study does a fairly good job mimicking the exact numbers in the official statistics (black line).

Figure 6.20 shows the development in the total market value in the Norwegian sovereign wealth fund (Government Pension Fund Global, GPF) since the first deposit was made in the oil fund in 1996. The total value of the fund is decomposed into the net inflow of deposits and the return from management of this fund, 1996-2021. A crude estimate of the inflow is made from the accumulation

⁴⁸ See Table 6.2 on page 283.

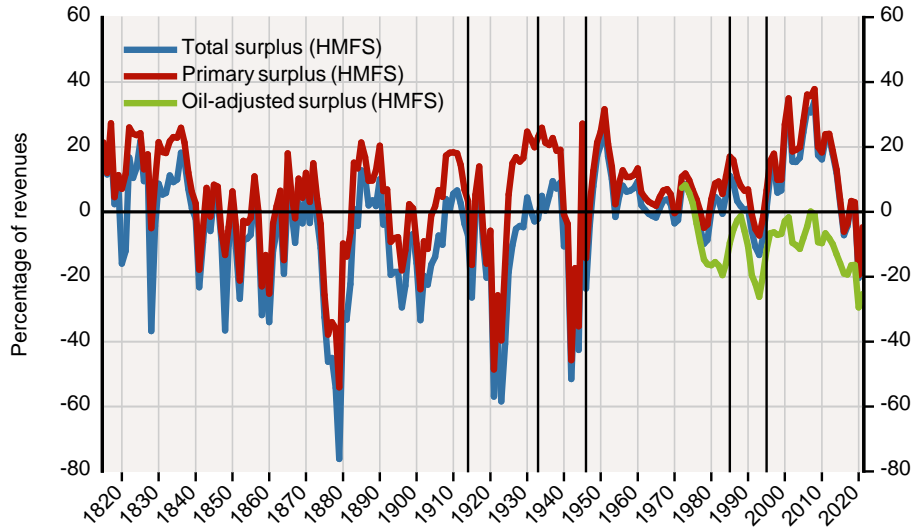
⁴⁹ See Equation 6.2 on page 273.

⁵⁰ See Table 6.4 on page 304.

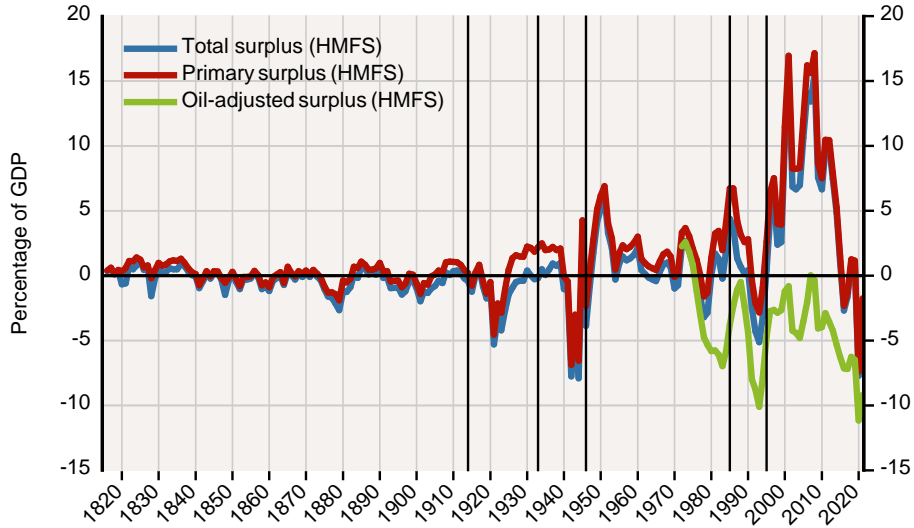
6.7 Government Pension Fund Global

of $SURP_{tot,t}$ from 1996 onwards. The estimated inflow to the fund is shown as a dashed red line in Figure 6.20.

Central government revenues, expenditures and debt, 1815-2021



(a) Percentage of revenues



(b) Percentage of GDP

Figure 6.17 Three central government budget surplus measures, total surplus $SURP_{tot,t}$, primary surplus $SURP_{prim,t}$ and oil-adjusted surplus $SURP_{oiladj,t}$, 1816-2021. In percentage of revenues (a) and in percentage of gdp (b).

6.7 Government Pension Fund Global

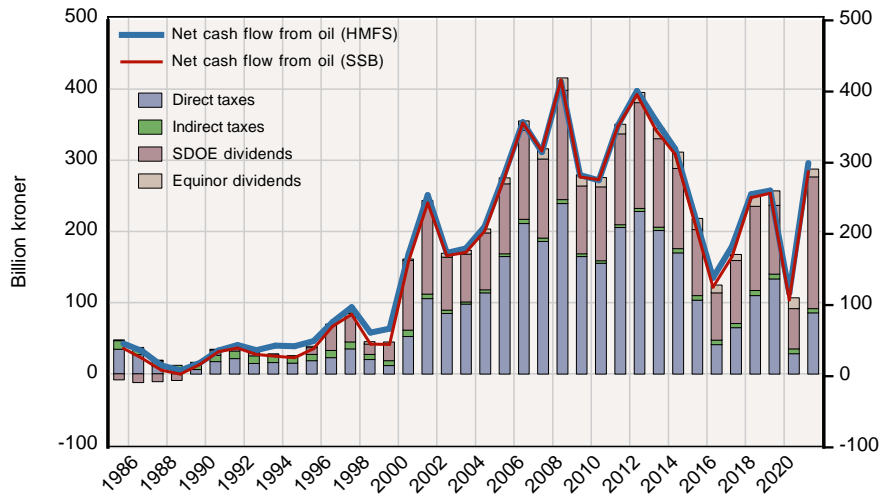


Figure 6.18 Net cash flow from oil- and gas-related taxes and dividends related to the state's direct financial interest (SDFI), 1985-2021. Detailed cash flow data from Statistics Norway (coloured bars) are compared with the crude cash flow estimates *OIL&GAS*, in this study.
 Statistics Norway: <https://www.ssb.no/en/statbank/table/11012>, Net cash flow from petroleum activities (NOK million), 1985-2021.

Central government revenues, expenditures and debt, 1815-2021

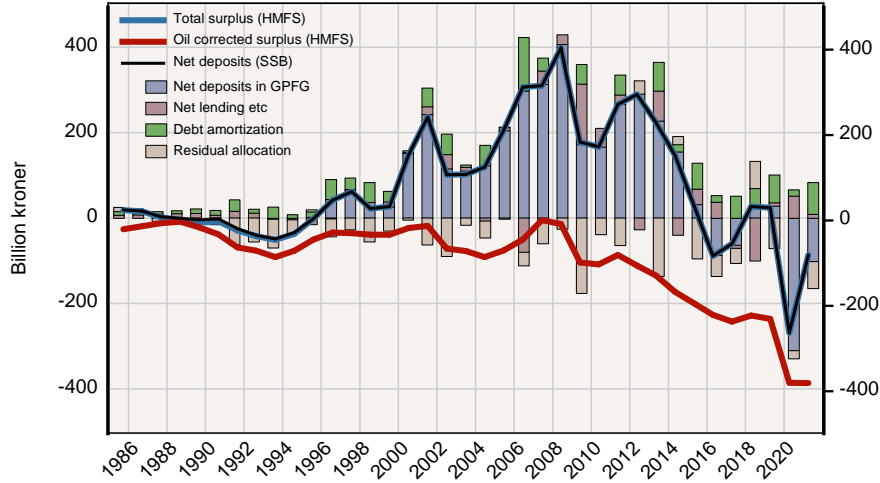


Figure 6.19 Net allocation of surplus before deposits in the Government Pension Fund Global (GPF), 1985-2021. Detailed surplus data from Statistics Norway (coloured bars) are compared with the crude estimate $SURP_{tot,t}$ from this study (thick blue line) before and after adjusting for oil and gas related revenues. Statistics Norway: <https://www.ssb.no/en/statbank/table/11012>, Net cash flow from petroleum activities (NOK million) 1985 - 2021, <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million) 1995 - 2021

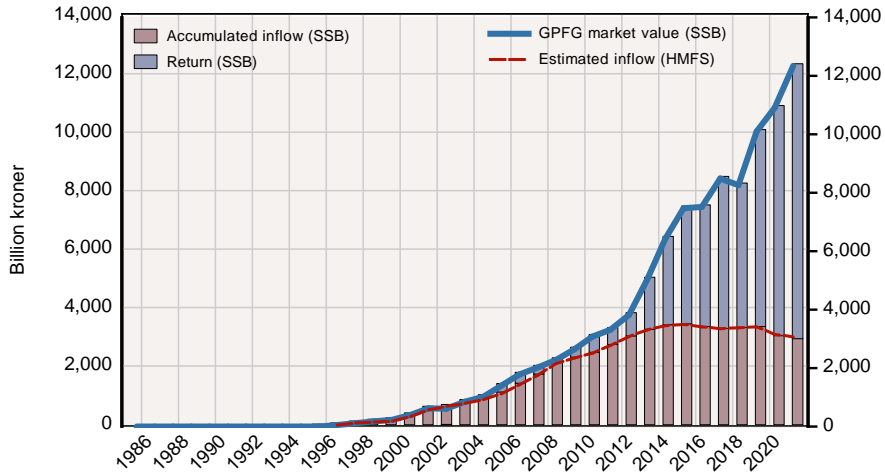


Figure 6.20 Government Pension Fund Global (GPF) market value, deposit inflow and return, 1996-2021. A crude estimate of the inflow to the fund based on $SURP_{tot,t}$ (dashed red line) is compared with data from Statistics Norway. Statistics Norway: <https://www.ssb.no/en/statbank/table/11012>, Net cash flow from petroleum activities (NOK million) 1985 - 2021.

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6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.1: Central government revenues, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted revenues	Adj. for govt. corporations (gross to net basis)	Adj. for capital income	Adj. for govt. borrowing	Adj. for govt. corporations (deficit as negative income)	Adj. for Social security sector revenues	Adjusted revenues
1815	5.309	-0.072	-0.032				5.205
1816	7.676		-0.030	-0.800			6.846
1817	7.694	-0.220	-0.063				7.412
1818	7.166	-0.163	-0.093				6.910
1819	8.035	-0.219	-0.128				7.688
1820	11.876	-0.219	-1.969	-2.112			7.577
1821	10.859	-0.827	-0.149	-1.335			8.547
1822	12.098	-0.546	-0.132	-3.027			8.393
1823	10.513	-0.651	-0.180	-0.662			9.020
1824	11.757	-0.379	-0.524				10.854
1825	9.873	-0.326	-0.420				9.127
1826	9.969	-0.869	-0.545				8.555
1827	9.987	-0.407	-0.560				9.020
1828	11.628	-0.624	-0.697	-2.096			8.211
1829	9.639	-0.447	-0.565				8.627
1830	10.416	-0.539	-0.734				9.143
1831	9.842	-0.555	-0.598				8.689
1832	10.579	-0.583	-0.473				9.524
1833	11.491	-0.559	-0.545				10.387
1834	17.220	-0.562	-0.753	-5.871			10.034
1835	11.521	-0.613	-1.077				9.832
1836	11.747	-0.502	-0.769				10.476
1837	11.717	-0.929	-0.757				10.031
1838	11.998	-0.744	-0.796				10.459
1839	11.671	-0.695	-0.536				10.440
1840	12.537	-0.891	-0.791				10.855
1841	10.956	-1.145	-0.883				8.927
1842	11.160	-1.066	-0.711				9.383
1843	11.725	-1.044	-0.698				9.983

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.1: Central government revenues, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted revenues	Adj. for govt. corporations (gross to net basis)	Adj. for capital income	Adj. for govt. borrowing	Adj. for govt. corporations (deficit as negative income)	Adj. for Social security sector revenues	Adjusted revenues
1844	10.995	-0.939	-0.807				9.248
1845	11.738	-0.959	-0.705				10.075
1846	11.602	-0.663	-0.728				10.211
1847	11.230	-0.663	-0.841				9.726
1848	19.182	-0.758	-1.984	-6.000			10.439
1849	13.449	-1.142	-2.078				10.229
1850	13.681	-1.391	-0.798				11.492
1851	16.756	-1.128	-0.626	-2.990			12.012
1852	13.267	-1.219	-0.683				11.365
1853	14.664	-1.261	-1.008	-0.784			11.610
1854	17.065	-2.011	-0.666	-0.808			13.580
1855	16.456	-2.417	-0.764	-0.082			13.192
1856	17.590	-2.700	-0.545				14.345
1857	18.423	-3.294	-0.533				14.596
1858	24.955	-2.840	-1.020	-8.416			12.678
1859	23.499	-2.623	-0.509	-5.408			14.958
1860	17.640	-2.057	-0.492				15.091
1861	18.317	-2.862	-0.496				14.959
1862	18.838	-2.364	-0.477				15.996
1863	23.978	-2.350	-0.491	-3.590			17.547
1864	21.085	-2.285	-0.447	-0.479			17.873
1865	20.679	-2.089	-0.487				18.103
1866	21.491	-2.635	-0.472	-0.537			17.847
1867	20.546	-2.505	-0.463	-0.553			17.025
1868	21.220	-2.583	-0.444	-0.450			17.742
1869	19.640	-2.759	-0.500				16.381
1870	20.438	-2.392	-0.554	-0.179			17.314
1871	22.124	-2.181	-0.543	-1.237			18.163
1872	28.165	-2.447	-0.560	-5.924			19.233
1873	25.136	-2.620	-0.534				21.983
1874	35.894	-2.928	-0.486	-8.260			24.220
1875	40.331	-3.622	-0.429	-11.679			24.601
1876	52.534	-3.342	-0.444	-22.327			26.421
1877	47.589	-5.610	-0.723	-12.389			28.867
1878	44.695	-6.072	-1.066	-10.096			27.461
1879	40.724	-6.100	-1.392	-9.689			23.543
1880	48.721	-6.627	-1.276	-12.540			28.278
1881	42.370	-7.126	-1.928	-5.736			27.580
1882	48.332	-8.189	-1.761	-8.338			30.044
1883	47.790	-8.746	-0.653	-4.677			33.713
1884	40.841	-9.210	-0.603				31.028
1885	44.994	-9.369	-1.739	-0.012			33.874
1886	43.541	-9.794	-0.852				32.895
1887	42.977	-9.929	-1.184				31.864
1888	44.493	-10.425	-1.088	-0.129			32.851
1889	46.353	-10.766	-0.838	-1.578			33.171
1890	50.332	-11.194	-1.289				37.850
1891	51.447	-12.763	-0.474				38.209
1892	51.095	-12.862	-0.478				37.755
1893	57.234	-13.206	-0.408	-4.690			38.930
1894	59.858	-13.203	-0.496	-6.233			39.926
1895	63.061	-13.671	-0.571	-8.258			40.562
1896	74.201	-14.680	-0.566	-15.561			43.393
1897	70.514	-16.050	-0.572	-4.491			49.401
1898	82.562	-17.900	-0.557	-6.837			57.267
1899	97.413	-19.622	-0.668	-12.980			64.144

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.1: Central government revenues, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted revenues	Adj. for govt. corporations (gross to net basis)	Adj. for capital income	Adj. for govt. borrowing	Adj. for govt. corporations (deficit as negative income)	Adj. for Social security sector revenues	Adjusted revenues
1900	117.292	-20.981	-0.469	-29.102		2.000	68.740
1901	103.340	-20.916	-0.682	-17.696		2.000	66.047
1902	102.460	-20.698	-0.735	-13.859		2.000	69.169
1903	100.980	-20.993	-0.784	-14.849		3.000	67.354
1904	100.142	-21.591	-1.313	-11.726		3.000	68.512
1905	94.127	-21.666	-1.146	-8.195		3.000	66.120
1906	100.981	-22.328	-0.909	-10.117		3.000	70.627
1907	115.209	-23.780	-1.050	-16.765		3.000	76.615
1908	114.937	-25.773	-1.157	-7.433		3.000	83.574
1909	115.671	-28.101	-0.815	-7.783		4.000	82.971
1910	122.244	-31.713	-0.869	-6.066		4.000	87.596
1911	128.280	-34.120	-0.828	-4.945		6.000	94.387
1912	140.730	-36.296	-0.829	-9.078		10.000	104.527
1913	161.175	-38.095	-0.837	-17.297		12.000	116.946
1914	102.242					14.000	116.242
1915	112.114					16.000	128.114
1916	144.175					20.000	164.175
1917	242.717					33.000	275.717
1918	442.596					33.000	475.596
1919	488.236					41.000	529.236
1920	562.190					46.000	608.190
1921	448.462					52.000	500.462
1922	371.716					49.000	420.716
1923	317.288					46.000	363.288
1924	313.431					46.000	359.431
1925	378.108					47.000	425.108
1926	371.323					45.000	416.323
1927	362.486					44.000	406.486
1928	363.291					45.000	408.291
1929	350.777					43.000	393.777
1930	355.742					48.900	404.642
1931	330.287					47.100	377.387
1932	317.152					47.400	364.552
1933	314.481				9.165	50.100	373.746
1934	326.888				17.603	52.800	397.291
1935	342.897				17.141	55.700	415.738
1936	398.982				19.069	66.200	484.251
1937	460.167				22.388	78.100	560.655
1938	529.370				13.264	81.900	624.534
1939	590.377				13.479	100.100	703.956
1940	608.454				21.021	88.645	718.120
1941	940.401				54.173	97.498	1 092.072
1942	1 219.743				56.123	117.868	1 393.734
1943	1 405.494				58.135	133.769	1 597.398
1944	1 449.898				59.812	133.681	1 643.391
1945	1 353.448				61.385	138.731	1 553.564
1946	1 487.000				63.188	215.000	1 765.188
1947	2 158.000				64.596	267.000	2 489.596
1948	2 723.000				56.182	266.000	3 045.182
1949	3 211.000				60.107	298.000	3 569.107
1950	3 694.000				65.751	343.000	4 102.751
1951	4 000.000				70.215	402.000	4 472.215
1952	3 852.000				25.311	492.000	4 369.311
1953	4 249.000				27.774	541.000	4 817.774
1954	4 228.000				31.983	619.000	4 878.983
1955	4 457.000				36.453	650.000	5 143.453

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.1: Central government revenues, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted revenues	Adj. for govmt. corporations (gross to net basis)	Adj. for capital income	Adj. for govmt. borrowing	Adj. for govmt. corporations (deficit as negative income)	Adj. for Social security sector revenues	Adjusted revenues
1956	4 809.000					743.000	5 552.000
1957	5 305.000					834.000	6 139.000
1958	5 693.000					974.000	6 667.000
1959	5 952.000					1 750.000	7 702.000
1960	6 305.000					2 034.000	8 339.000
1961	6 774.000				-123.000	2 124.000	8 775.000
1962	7 635.000				-150.000	2 336.000	9 821.000
1963	8 358.000				-159.000	2 633.000	10 832.000
1964	9 168.000				-186.000	2 890.000	11 872.000
1965	10 244.000				-208.000	3 333.000	13 369.000
1966	11 286.000				-229.000	3 854.000	14 911.000
1967	12 548.000				-240.000	4 637.000	16 945.000
1968	13 506.000				-275.000	5 769.000	19 000.000
1969	15 358.000				-266.000	6 454.000	21 546.000
1970	17 663.000				-298.000	7 611.000	24 976.000
1971	20 571.000				-416.000	9 257.000	29 412.000
1972	23 577.000				-400.000	12 036.000	35 213.000
1973	25 937.000				-447.000	15 083.000	40 573.000
1974	29 920.000				-349.000	17 183.000	46 754.000
1975	34 407.000				-444.000	19 754.000	53 717.000
1976	41 565.000				-585.000	22 271.000	63 251.000
1977	48 249.000				-920.000	23 001.000	70 330.000
1978	54 122.000				-844.000	25 789.000	79 067.000
1979	60 813.000				-672.000	28 439.000	88 580.000
1980	82 471.000				-1 218.000	31 139.000	112 392.000
1981	99 486.000				-872.000	36 901.000	135 515.000
1982	108 828.000				-1 169.000	41 434.000	149 093.000
1983	117 039.000				-1 116.000	44 935.000	160 858.000
1984	139 433.000				-1 205.000	48 332.000	186 560.000
1985	222 218.000						222 218.000
1986	244 683.000						244 683.000
1987	253 197.000						253 197.000
1988	262 446.000						262 446.000
1989	281 554.000						281 554.000
1990	306 951.000						306 951.000
1991	322 113.000						322 113.000
1992	321 379.000						321 379.000
1993	329 797.000						329 797.000
1994	353 469.000						353 469.000
1995	382 931.000						382 931.000
1996	432 922.000						432 922.000
1997	478 210.000						478 210.000
1998	471 330.000						471 330.000
1999	499 571.000						499 571.000
2000	643 651.000						643 651.000
2001	758 442.000						758 442.000
2002	691 071.000						691 071.000
2003	700 195.000						700 195.000
2004	746 408.000						746 408.000
2005	860 836.000						860 836.000
2006	994 900.000						994 900.000
2007	1 030 124.000						1 030 124.000
2008	1 182 630.000						1 182 630.000
2009	1 051 890.000						1 051 890.000
2010	1 064 764.000						1 064 764.000
2011	1 223 524.000						1 223 524.000

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.1: Central government revenues, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted revenues	Adj. for govmt. corporations (gross to net basis)	Adj. for capital income	Adj. for govmt. borrowing	Adj. for govmt. corporations (deficit as negative income)	Adj. for Social security sector revenues	Adjusted revenues
2012	1 290 735.000						1 290 735.000
2013	1 291 819.000						1 291 819.000
2014	1 278 758.000						1 278 758.000
2015	1 227 412.000						1 227 412.000
2016	1 162 483.000						1 162 483.000
2017	1 225 888.000						1 225 888.000
2018	1 350 592.000						1 350 592.000
2019	1 407 407.000						1 407 407.000
2020	1 288 828.000						1 288 828.000
2021	1 502 720.000						1 502 720.000

Sources: See overview in Table 6.1 on page 283,

Statistics Norway: <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million), 1985-2021.

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.2: Central government expenditures, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted expenditures	Adj. for govmt. corporations (gross to net basis)	Adj. for govmt. debt amortization	Adj. for govmt. corporations (deficit as negative income)	Adj. for Social security sector expenditures	Adj. for capital injections in govmt. corporations	Adjusted expenditures
1815	4.314		0.000				4.314
1816	6.057		0.000				6.057
1817	6.100	-0.220	0.000				5.880
1818	6.915	-0.163					6.752
1819	7.271	-0.219	0.000				7.051
1820	12.961	-0.219	-3.954				8.788
1821	10.408	-0.827					9.581
1822	11.551	-0.546	-4.012				6.993
1823	10.130	-0.651	-1.396				8.083
1824	10.774	-0.379	-0.997				9.398
1825	8.819	-0.326	-1.346				7.147
1826	9.950	-0.869	-1.328				7.753
1827	9.514	-0.407	-1.270				7.838
1828	12.867	-0.624	-1.007				11.236
1829	10.253	-0.447	-0.804				9.001
1830	9.524	-0.539	-0.629				8.357
1831	9.414	-0.555	-0.632				8.227
1832	10.212	-0.583	-0.653				8.976
1833	10.443	-0.559	-0.662				9.222
1834	19.241	-0.562	-9.564				9.114
1835	10.060	-0.613	-0.589				8.859
1836	10.745	-0.502	-1.669				8.574
1837	9.715	-0.929	-0.337				8.449
1838	10.833	-0.744	-0.354				9.735
1839	11.393	-0.695	-0.362				10.337
1840	12.341	-0.891	-0.358				11.092
1841	12.502	-1.145	-0.350				11.007
1842	11.695	-1.066	-0.363				10.265
1843	11.100	-1.044	-0.377				9.679
1844	11.129	-0.939	-0.392				9.798
1845	11.016	-0.959	-0.407				9.650
1846	11.851	-0.663	-1.378				9.811
1847	12.593	-0.663	-1.387				10.543
1848	16.775	-0.758	-1.761				14.256
1849	15.667	-1.142	-3.237				11.287
1850	12.916	-1.391	-0.195				11.331
1851	14.679	-1.128	-0.180				13.371
1852	15.918	-1.219	-0.287				14.412
1853	14.168	-1.261	-0.269				12.637
1854	17.020	-2.011	-0.296				14.713
1855	16.874	-2.417	-0.322				14.136
1856	16.536	-2.700	-0.303				13.533
1857	18.870	-3.294	-0.347				15.229
1858	19.872	-2.840	-0.308				16.724
1859	21.365	-2.623	-0.527				18.215
1860	22.837	-2.057	-0.549				20.232
1861	20.200	-2.862	-0.571				16.767
1862	19.951	-2.364	-0.596				16.991
1863	20.741	-2.350	-0.621				17.770
1864	24.331	-2.285	-0.746				21.300
1865	19.609	-2.089	-0.379				17.140
1866	21.542	-2.635	-1.212				17.695
1867	22.017	-2.505	-0.845				18.668
1868	20.730	-2.583	-0.882				17.265
1869	20.650	-2.759	-0.920				16.971
1870	19.832	-2.392	-0.957				16.482

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.2: Central government expenditures, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted expenditures	Adj. for govmt. corporations (gross to net basis)	Adj. for govmt. debt amortization	Adj. for govmt. corporations (deficit as negative income)	Adj. for Social security sector expenditures	Adj. for capital injections in govmt. corporations	Adjusted expenditures
1871	21.988	-2.181	-1.002				18.804
1872	21.140	-2.447	-1.044				17.649
1873	26.249	-2.620	-1.074				22.556
1874	31.159	-2.928	-1.289				26.942
1875	37.662	-3.622	-1.420				32.620
1876	43.791	-3.342	-1.797				38.651
1877	49.342	-5.610	-1.846				41.887
1878	49.420	-6.072	-0.970				42.377
1879	48.572	-6.100	-0.991				41.481
1880	44.212	-6.627	-0.474				37.111
1881	44.421	-7.126	-0.546				36.750
1882	45.978	-8.189	-1.041				36.748
1883	43.264	-8.746	-1.081				33.437
1884	42.117	-9.210	-0.511				32.396
1885	41.234	-9.369	-2.304				29.561
1886	42.500	-9.794	-3.341				29.365
1887	44.085	-9.929	-2.897				31.259
1888	45.224	-10.425	-3.092				31.707
1889	43.604	-10.766	-0.228				32.610
1890	45.537	-11.194	-0.293				34.050
1891	52.864	-12.763	-0.375				39.725
1892	52.384	-12.862	-0.465				39.056
1893	60.320	-13.206	-0.609				46.505
1894	61.277	-13.203	-0.741				47.334
1895	62.333	-13.671	-0.552				48.111
1896	71.431	-14.680	-0.568				56.182
1897	78.197	-16.050	-1.458				60.689
1898	81.028	-17.900	-1.195				61.932
1899	90.652	-19.622	-2.502				68.528
1900	102.634	-20.981	-2.961		1.000		79.691
1901	110.404	-20.916	-2.331		1.000		88.157
1902	105.129	-20.698	-2.568		1.000		82.864
1903	105.214	-20.993	-2.737		1.000		82.485
1904	101.294	-21.591	-1.038		1.000		79.665
1905	97.319	-21.666	-1.314		1.000		75.339
1906	101.315	-22.328	-4.184		1.000		75.803
1907	110.800	-23.780	-3.608		1.000		84.413
1908	108.119	-25.773	-4.055		2.000		80.291
1909	109.967	-28.101	-1.455		2.000		82.411
1910	116.751	-31.713	-4.356		2.000		82.682
1911	120.905	-34.120	-4.598		6.000		88.188
1912	132.932	-36.296	-4.847		10.000		101.789
1913	153.506	-38.095	-5.062		11.000		121.348
1914	98.061				12.000	14.751	124.812
1915	132.721				13.000	16.319	162.040
1916	134.069				18.000	14.035	166.104
1917	198.337				28.000	22.497	248.834
1918	456.858				37.000	26.825	520.683
1919	531.314				44.000	61.690	637.004
1920	533.644				47.000	90.497	671.141
1921	653.450				62.000	70.196	785.646
1922	440.382				61.000	82.700	584.082
1923	466.023				51.000	58.866	575.889
1924	398.480				51.000	56.216	505.696
1925	397.215				54.000	52.701	503.916
1926	367.064				55.000	37.160	459.224

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.2: Central government expenditures, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted expenditures	Adj. for govt. corporations (gross to net basis)	Adj. for govt. debt amortization	Adj. for govt. corporations (deficit as negative income)	Adj. for Social security sector expenditures	Adj. for capital injections in govt. corporations	Adjusted expenditures
1927	338.671				56.000	33.403	428.074
1928	344.695				54.000	27.416	426.111
1929	341.910				50.000	20.544	412.454
1930	324.931				46.000	16.107	387.038
1931	313.296				49.000	14.169	376.465
1932	312.774				49.000	13.672	375.446
1933	308.008			9.165	49.000	15.757	381.930
1934	288.238			17.603	53.000	18.932	377.773
1935	316.169			17.141	54.000	26.865	414.175
1936	344.834			19.069	62.000	34.517	460.420
1937	367.221			22.388	73.000	45.240	507.849
1938	434.780			13.264	83.000	48.651	579.695
1939	485.788			13.479	86.000	55.487	640.754
1940	636.898			21.021	82.283	54.782	794.984
1941	979.066			54.173	101.713	61.088	1 196.040
1942	1 894.551			56.123	107.782	54.151	2 112.607
1943	1 734.127			58.135	122.774	54.661	1 969.697
1944	2 110.682			59.812	130.468	43.366	2 344.328
1945	1 062.465			61.385	114.197	40.265	1 278.312
1946	1 856.000			63.188	189.000	76.000	2 184.188
1947	2 043.000			64.596	326.000	157.000	2 590.596
1948	2 302.000			56.182	261.000	186.000	2 805.182
1949	2 488.000			60.107	276.000	127.000	2 951.107
1950	2 702.000			65.751	303.000	188.000	3 258.751
1951	2 528.000			70.215	341.000	287.000	3 226.215
1952	2 955.000			25.311	413.000	232.000	3 625.311
1953	3 570.000			27.774	484.000	252.000	4 333.774
1954	4 088.000			31.983	559.000	279.000	4 957.983
1955	4 015.000			36.453	597.000	248.000	4 896.453
1956	4 173.000				698.000	233.000	5 104.000
1957	4 571.000				811.000	376.000	5 758.000
1958	4 934.000				921.000	380.000	6 235.000
1959	4 954.000				1 803.000	391.000	7 148.000
1960	5 343.500				1 898.000	321.500	7 563.000
1961	5 770.000			-123.000	2 379.000	576.000	8 602.000
1962	6 670.000			-150.000	2 649.000	600.000	9 769.000
1963	7 463.000			-159.000	2 966.000	633.000	10 903.000
1964	8 168.000			-186.000	3 350.000	703.000	12 035.000
1965	9 373.000			-208.000	3 779.000	670.000	13 614.000
1966	10 074.000			-229.000	4 228.000	664.000	14 737.000
1967	11 379.000			-240.000	4 570.000	665.000	16 374.000
1968	12 646.000			-275.000	5 280.000	629.000	18 280.000
1969	14 479.000			-266.000	6 184.000	651.000	21 048.000
1970	17 170.000			-298.000	8 275.000	738.000	25 885.000
1971	19 563.000			-416.000	10 129.000	908.000	30 184.000
1972	20 191.000			-400.000	12 025.000	768.608	32 584.608
1973	22 365.000			-447.000	14 155.000	1 099.639	37 172.639
1974	26 603.000			-349.000	16 141.000	1 521.940	43 916.940
1975	31 606.000			-444.000	19 300.000	1 620.111	52 082.111
1976	38 756.000			-585.000	22 788.000	2 647.541	63 606.541
1977	46 966.000			-920.000	24 378.000	3 317.004	73 741.004
1978	55 271.000			-844.000	28 787.000	3 670.355	86 884.355
1979	59 161.000			-672.000	33 843.000	3 993.064	96 325.064
1980	71 486.000			-1 218.000	38 222.000	3 835.544	112 325.544
1981	81 763.000			-872.000	44 433.000	4 004.716	129 328.716
1982	90 807.000			-1 169.000	51 195.000	3 077.680	143 910.680

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.2: Central government expenditures, overview over adjustments 1815–2021. Million kroner

Year	Unadjusted expenditures	Adj. for govt. corporations (gross to net basis)	Adj. for govt. debt amortization	Adj. for govt. corporations (deficit as negative income)	Adj. for Social security sector expenditures	Adj. for capital injections in govt. corporations	Adjusted expenditures
1983	102 032.000			-1 116.000	57 802.000	3 153.010	161 871.010
1984	111 409.000			-1 205.000	64 477.000	2 468.311	177 149.311
1985	197 561.000						197 561.000
1986	223 361.000						223 361.000
1987	244 895.000						244 895.000
1988	257 874.000						257 874.000
1989	280 427.000						280 427.000
1990	303 930.000						303 930.000
1991	341 852.000						341 852.000
1992	356 238.000						356 238.000
1993	373 669.000						373 669.000
1994	382 393.000						382 393.000
1995	378 858.000						378 858.000
1996	385 764.000						385 764.000
1997	411 468.000						411 468.000
1998	443 745.000						443 745.000
1999	467 010.000						467 010.000
2000	490 217.000						490 217.000
2001	516 843.000						516 843.000
2002	584 231.000						584 231.000
2003	592 679.000						592 679.000
2004	622 245.000						622 245.000
2005	650 053.000						650 053.000
2006	683 527.000						683 527.000
2007	715 078.000						715 078.000
2008	778 561.000						778 561.000
2009	868 653.000						868 653.000
2010	892 881.000						892 881.000
2011	952 122.000						952 122.000
2012	996 144.000						996 144.000
2013	1 063 121.000						1 063 121.000
2014	1 127 096.000						1 127 096.000
2015	1 194 465.000						1 194 465.000
2016	1 246 092.000						1 246 092.000
2017	1 280 866.000						1 280 866.000
2018	1 318 145.000						1 318 145.000
2019	1 378 116.000						1 378 116.000
2020	1 552 529.000						1 552 529.000
2021	1 584 176.000						1 584 176.000

Sources: See overview in Table 6.1 on page 283,

Statistics Norway: <https://www.ssb.no/en/statbank/table/10486>, Central government revenues and expenditures (NOK million), 1985-2021.

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.3 *Main components of government revenues and expenditures, 1815-2021.*

Sources: See overview in Table 6.3 on page 304.

	Revenues	Expenditures
1	Customs duty	Interest expenditures
2	Alcohol taxes	Culture and education
3	General sales tax	Police and Judiciary
4	Value added and investment taxes	Military defense
5	Other indirect taxes	War and crisis expenditures
6	Direct taxes on income and property	Social security
7	Oil and gas revenues	Health
8	Social security	Health and Social security
9	Net business revenues	Subsidies and capital investments
10	Local contributions to railway investments	Civil administration
11	Special post-World War II taxes and revenues	Other expenditures
12	Other revenues	

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
1815	3.145			0.116	1.214			0.103				0.627	5.205
1816	3.107	0.004		0.282	2.534			0.347				0.571	6.846
1817	2.924	0.010		0.461	2.629			0.247				1.139	7.412
1818	3.435	0.026		0.434	2.494			0.175				0.345	6.910
1819	4.233	0.041		0.496	2.427			0.321				0.170	7.688
1820	4.151	0.056		0.489	2.388			0.231				0.261	7.577
1821	5.247	0.064		0.478	2.300			-0.278				0.737	8.547
1822	4.967	0.078		0.506	2.218			-0.060				0.684	8.393
1823	6.071	0.075		0.546	2.166			-0.122				0.284	9.020
1824	7.158	0.078		0.576	2.027			0.194				0.822	10.854
1825	6.141	0.074		0.580	1.905			0.099				0.329	9.127
1826	6.162	0.079		0.534	1.892			-0.332				0.219	8.555
1827	6.052	0.083		0.490	1.816			0.230				0.348	9.020
1828	5.664	0.175		0.526	1.734			-0.029				0.143	8.211
1829	5.943	0.205		0.470	1.717			0.154				0.138	8.627
1830	6.395	0.204		0.500	1.654			0.238				0.152	9.143
1831	5.751	0.169		0.535	1.545			0.338				0.350	8.689
1832	6.043	0.147		0.526	1.538			0.892				0.377	9.524
1833	7.196	0.167		0.562	1.175			0.875				0.412	10.387
1834	6.694	0.151		0.539	0.804			1.560				0.285	10.034
1835	7.038	0.125		0.577	0.833			0.837				0.421	9.832
1836	7.358	0.122		0.781	0.443			1.344				0.428	10.476
1837	8.038	0.249		0.585	0.090			0.578				0.491	10.031
1838	7.952	0.365		0.446	0.109			0.992				0.595	10.459
1839	7.945	0.396		0.407	0.048			1.125				0.518	10.440
1840	8.739	0.463		0.401	0.058			0.934				0.260	10.855
1841	7.396	0.357		0.264	0.089			0.550				0.272	8.927
1842	7.925	0.245		0.262	0.033			0.538				0.379	9.383
1843	8.228	0.379		0.278	0.053			0.541				0.504	9.983
1844	7.503	0.554		0.305	0.058			0.628				0.201	9.248
1845	8.422	0.506		0.290	0.057			0.622				0.179	10.075
1846	8.398	0.553		0.308	0.043			0.783				0.126	10.211
1847	7.545	0.552		0.326	0.047			0.822				0.434	9.726
1848	7.628	0.567		0.315	0.054			0.869				1.006	10.439
1849	8.147	0.627		0.300	0.052			0.677				0.425	10.229
1850	8.788	1.214		0.337	0.051			0.723				0.379	11.492
1851	8.952	1.429		0.352	0.049			0.619	0.262			0.349	12.012

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
1852	8.297	1.336		0.313	0.046			0.658	0.312			0.404	11.365
1853	8.322	1.735		0.382	0.058			0.519	0.306			0.288	11.610
1854	9.272	2.428		0.467	0.076			0.694	0.316			0.327	13.580
1855	9.145	2.283		0.424	0.076			0.671	0.310			0.283	13.192
1856	10.453	2.462		0.463	0.073			0.388	0.100			0.405	14.345
1857	10.619	3.008		0.424	0.078			0.063	0.028			0.377	14.596
1858	8.459	2.496		0.377	0.088			0.870	0.044			0.345	12.678
1859	10.626	2.832		0.466	0.148			0.316	0.158			0.412	14.958
1860	11.418	2.167		0.393	0.074			0.329	0.245			0.465	15.091
1861	11.371	2.479		0.446	0.120			-0.029	0.239			0.334	14.959
1862	12.124	2.512		0.415	0.078			0.392	0.234			0.241	15.996
1863	12.618	2.830		0.401	0.076			1.081	0.246			0.296	17.547
1864	12.650	3.220		0.445	0.126			0.906	0.334			0.192	17.873
1865	12.627	3.023		0.461	0.131			1.337	0.440			0.084	18.103
1866	12.878	3.193		0.434	0.082			0.750	0.291			0.219	17.847
1867	12.018	3.074		0.496	0.090			0.905	0.292			0.150	17.025
1868	13.079	2.458		0.548	0.116			1.138	0.304			0.099	17.742
1869	12.110	2.702		0.498	0.117			0.765	0.089			0.102	16.381
1870	12.215	3.132		0.489	0.090			1.231	0.063			0.094	17.314
1871	12.187	3.768		0.518	0.104			1.428	0.074			0.083	18.163
1872	13.216	3.460		0.639	0.152			1.400	0.148			0.217	19.233
1873	14.551	3.858		0.900	0.141			1.514	0.668			0.351	21.983
1874	16.706	3.735		1.197	0.125			1.392	0.763			0.303	24.220
1875	17.452	3.554		1.228	0.174			0.895	0.919			0.378	24.601
1876	17.597	3.918		1.230	0.208			0.875	1.839			0.752	26.421
1877	18.543	4.384		1.275	0.157			1.548	2.089			0.870	28.867
1878	17.967	4.976		1.290	0.167			0.678	1.854			0.530	27.461
1879	12.295	5.591		1.366	0.153			1.259	2.047			0.832	23.543
1880	19.063	4.527		1.530	0.136			1.125	1.264			0.633	28.278
1881	15.858	5.752		1.399	0.153			3.303				1.115	27.580
1882	18.001	5.039		1.465	0.196			4.216				1.126	30.044
1883	20.515	5.483		1.470	0.225			5.057				0.962	33.713
1884	18.638	5.043		1.550	0.308			4.549				0.939	31.028
1885	20.137	5.738		1.619	0.271			5.008				1.102	33.874
1886	20.117	4.488		1.669	0.268			5.089				1.263	32.895
1887	19.496	4.337		1.719	0.233			4.723				1.358	31.864
1888	20.549	4.207		1.756	0.292			4.914				1.134	32.851

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
1889	20.460	4.348		1.728	0.306			5.187				1.142	33.171
1890	23.354	5.146		2.030	0.523			5.790				1.007	37.850
1891	22.793	6.373		2.232	0.588			4.869				1.355	38.209
1892	22.017	5.848		2.145	0.535			5.149	0.598			1.463	37.755
1893	21.169	5.748		2.051	3.310			4.974	0.062			1.616	38.930
1894	21.022	6.193		2.205	3.198			5.030	0.362			1.916	39.926
1895	21.797	6.688		2.245	3.343			4.747	0.051			1.691	40.562
1896	23.311	6.095		2.364	4.529			5.126	0.097			1.870	43.393
1897	26.653	7.130		2.572	4.633			5.284	0.447			2.681	49.401
1898	31.587	7.688		3.236	5.111			6.315	0.311			3.019	57.267
1899	37.422	8.175		3.568	5.705			6.315	0.312			2.647	64.144
1900	36.878	9.072		3.303	7.004		2.000	6.617	0.305			3.560	68.740
1901	35.067	9.414		3.050	5.996		2.000	7.352	0.432			2.736	66.047
1902	36.109	9.433		3.118	5.881		2.000	8.675	0.537			3.415	69.169
1903	34.070	8.269		4.229	6.348		2.000	8.669	0.475			2.295	66.354
1904	34.502	8.431		3.738	6.141		2.000	9.715	0.440			2.545	67.512
1905	33.295	6.372		4.241	6.595		2.000	9.673	0.724			2.220	65.120
1906	36.003	7.474		4.075	5.021		2.000	10.661	0.539			3.854	69.627
1907	39.876	7.929		3.526	4.940		2.000	11.906	0.840			4.597	75.615
1908	43.657	8.048		3.945	7.752		2.000	11.857	0.603			4.713	82.574
1909	42.730	8.459		4.289	6.795		3.000	11.591	0.399			4.708	81.971
1910	48.909	4.546		5.005	9.183		3.000	10.991	0.509			4.452	86.596
1911	50.967	5.305		5.130	9.569		5.000	12.088	0.304			5.022	93.387
1912	53.627	5.732		4.979	10.111		9.000	12.920	0.333			6.823	103.527
1913	54.088	7.995		5.168	13.340		11.000	16.203	0.642			7.510	115.946
1914	52.424	10.242		11.174	14.356		14.000	12.097				1.949	116.242
1915	53.232	10.814		11.095	17.851		16.000	16.584				2.538	128.114
1916	54.788	11.193		22.347	35.417		20.000	18.317				2.113	164.175
1917	65.113	12.834		32.324	111.496		33.000	18.251				2.699	275.717
1918	52.206	4.307		76.942	286.157		33.000	18.262				4.722	475.596
1919	67.059	3.587		64.455	332.125		41.000	13.916				7.094	529.236
1920	127.044	9.812		62.916	343.355		46.000	12.285				6.778	608.190
1921	68.990	12.903		40.532	362.431		52.000	-43.789				7.395	500.462
1922	64.372	12.883		33.237	286.142		49.000	-28.999				4.081	420.716
1923	93.992	17.850		43.733	153.059		46.000	6.874				1.780	363.288
1924	103.599	21.620		41.082	128.144		46.000	16.464				2.522	359.431
1925	126.150	31.059		49.042	130.615		47.000	34.525				6.717	425.108

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
1926	111.028	40.349		48.966	130.579		45.000	36.850				3.551	416.323
1927	111.331	39.466		46.148	127.866		44.000	26.996				10.679	406.486
1928	118.376	60.933		50.066	109.277		45.000	21.124				3.515	408.291
1929	106.162	56.236		55.189	92.804		43.000	35.247				5.139	393.777
1930	110.473	60.464		53.430	89.102		48.900	31.966				10.307	404.642
1931	103.491	58.813		50.830	84.355		47.100	19.427				13.371	377.387
1932	103.518	55.983		49.538	81.214		47.400	18.207				8.692	364.552
1933	98.892	54.711		57.617	75.876		50.100	27.536				9.014	373.746
1934	105.709	52.379		63.701	76.185		52.800	35.813				10.704	397.291
1935	112.665	56.626		68.160	75.497		55.700	35.877				11.213	415.738
1936	125.849	59.093	18.357	79.538	87.372		66.200	36.683				11.159	484.251
1937	140.380	68.233	32.687	90.795	98.672		78.100	40.406				11.382	560.655
1938	145.382	75.568	36.024	98.651	143.200		81.900	32.270				11.539	624.534
1939	154.278	77.832	37.810	107.742	181.911		100.100	32.261				12.022	703.956
1940	150.043	69.133	44.151	112.209	199.141		88.645	44.140				10.658	718.120
1941	129.259	97.955	269.124	142.318	266.781		97.498	76.490				12.647	1 092.072
1942	77.912	89.507	500.476	124.253	330.682		117.868	119.973				33.063	1 393.734
1943	60.786	136.403	493.559	152.285	403.500		133.769	167.672				49.424	1 597.398
1944	45.630	164.306	496.607	205.687	407.380		133.681	138.515				51.585	1 643.391
1945	36.851	173.364	430.954	213.087	397.735		138.731	130.729				32.113	1 553.564
1946	119.644	170.547	405.155	259.654	387.000		215.000	79.188				129.000	1 765.188
1947	218.398	290.439	530.705	336.458	655.000		267.000	51.596				140.000	2 489.596
1948	178.994	409.977	448.023	361.006	678.000		266.000	50.182			531.000	122.000	3 045.182
1949	151.417	362.542	429.670	420.371	823.000		298.000	37.107			866.000	181.000	3 569.107
1950	178.964	353.676	478.595	533.765	836.000		343.000	90.751			1 109.000	179.000	4 102.751
1951	173.943	365.823	575.900	603.334	1 028.000		402.000	92.215			1 044.000	187.000	4 472.215
1952	267.139	393.585	985.695	641.581	1 114.000		492.000	34.311			249.000	192.000	4 369.311
1953	327.895	387.192	1 106.145	704.768	1 336.000		541.000	18.774			135.000	261.000	4 817.774
1954	317.339	390.629	1 185.151	671.881	1 219.000		619.000	28.983			112.000	335.000	4 878.983
1955	382.499	422.018	1 303.711	666.772	1 228.000		650.000	82.453			29.000	379.000	5 143.453
1956	329.736	427.065	1 439.950	759.621	1 401.000		743.000	59.000			1.000	391.628	5 552.000
1957	397.995	448.836	1 666.409	819.326	1 571.000		834.000	46.000				355.434	6 139.000
1958	413.620	448.676	1 718.352	930.643	1 726.000		974.000	55.000				400.709	6 667.000
1959	394.866	458.212	1 815.378	920.493	1 785.000		1 750.000	88.000				490.051	7 702.000
1960	454.403	471.504	2 035.514	1 146.735	1 418.000		2 034.000	180.500				598.345	8 339.000
1961	489.243	517.144	2 263.538	1 343.825	1 365.439		2 124.000	229.000				442.811	8 775.000
1962	475.691	562.112	2 474.667	1 419.989	1 581.751		2 336.000	277.000				693.790	9 821.000

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
1963	480.036	588.011	2 627.762	1 584.332	1 810.519		2 633.000	372.000				736.340	10 832.000
1964	520.260	639.021	2 983.713	1 722.536	1 926.388		2 890.000	370.000				820.082	11 872.000
1965	543.566	667.620	3 621.638	1 818.315	2 130.293		3 333.000	478.000				776.568	13 369.000
1966	537.395	720.465	4 050.732	1 959.472	2 290.781		3 854.000	504.000				994.155	14 911.000
1967	500.528	788.795	4 469.547	2 263.447	2 568.266		4 637.000	537.000				1 180.417	16 945.000
1968	407.931	840.340	4 796.100	2 440.221	2 859.985		5 769.000	606.000				1 280.423	19 000.000
1969	380.176	931.407	5 560.317	2 881.076	3 311.479		6 454.000	717.000				1 310.545	21 546.000
1970	378.238	1 039.010	8 300.992	2 897.280	2 542.556		7 611.000	778.000				1 428.924	24 976.000
1971	348.377	1 127.959	10 251.826	3 632.677	2 571.425		9 257.000	764.000				1 458.736	29 412.000
1972	356.152	1 224.268	11 513.266	3 910.163	3 601.592	42.045	12 036.000	948.000				1 581.514	35 213.000
1973	358.360	1 313.672	12 375.079	4 271.286	4 475.891	69.275	15 083.000	1 134.000				1 492.437	40 573.000
1974	351.327	1 449.124	13 460.944	4 748.936	5 606.002	120.775	17 183.000	1 590.000				2 243.892	46 754.000
1975	375.076	1 749.721	15 694.347	5 366.371	5 840.360	208.478	19 754.000	1 829.000				2 899.647	53 717.000
1976	313.748	1 912.974	18 174.215	6 536.302	6 675.415	1 957.730	22 271.000	2 133.000				3 276.616	63 251.000
1977	370.697	2 154.509	21 271.753	7 550.314	6 648.947	3 121.770	23 001.000	2 314.000				3 897.010	70 330.000
1978	262.846	2 120.866	23 232.159	8 626.237	8 663.597	3 819.293	25 789.000	3 790.000				2 763.002	79 067.000
1979	238.000	2 453.012	23 667.000	9 473.988	9 623.000	6 599.000	28 439.000	4 820.000				3 267.000	88 580.000
1980	689.400	2 655.000	27 239.300	8 103.900	12 064.400	18 569.600	31 139.000	5 698.000				6 233.400	112 392.000
1981	735.900	3 230.000	31 709.300	9 092.200	12 506.100	27 243.200	36 901.000	8 051.000				6 046.300	135 515.000
1982	789.200	2 855.000	34 568.300	10 310.000	11 715.000	29 879.700	41 434.000	9 401.000				8 140.800	149 093.000
1983	800.900	3 309.000	38 358.700	11 563.700	12 472.200	30 379.100	44 935.000	11 092.000				7 947.400	160 858.000
1984	851.200	3 684.000	41 104.900	12 637.700	12 910.600	39 212.700	48 332.000	16 335.000				11 491.900	186 560.000
1985	964.100	4 058.000	48 507.400	16 896.100	13 249.600	45 895.600	53 781.000	29 843.000				9 023.200	222 218.000
1986	1 205.600	4 269.000	56 818.400	20 953.200	15 702.400	34 901.200	62 495.000	38 602.000				9 736.200	244 683.000
1987	1 231.900	5 099.000	63 339.100	20 988.500	20 321.200	15 269.400	72 948.000	45 247.000				8 752.900	253 197.000
1988	1 213.400	5 203.000	63 386.400	18 531.200	25 403.600	7 960.400	75 115.000	47 986.000				17 647.000	262 446.000
1989	1 135.100	5 364.000	60 062.600	19 252.700	30 519.700	17 958.100	73 247.000	52 439.000				21 575.800	281 554.000
1990	1 304.900	5 756.000	61 109.800	20 521.600	29 369.400	35 845.300	75 299.000	54 095.000				23 650.000	306 951.000
1991	1 439.200	5 853.000	61 382.700	22 373.400	31 288.900	43 456.900	79 060.000	59 170.000				18 088.900	322 113.000
1992	1 533.300	6 007.000	65 403.000	25 202.600	30 680.400	36 452.500	81 930.000	57 373.000				16 797.200	321 379.000
1993	1 680.800	5 775.000	71 929.000	24 380.300	30 968.000	42 592.500	78 176.000	55 858.000				18 437.400	329 797.000
1994	1 811.500	6 223.000	79 323.200	29 517.900	37 208.400	42 004.700	81 420.000	55 074.000				20 886.300	353 469.000
1995	2 647.100	6 027.800	87 591.700	34 004.200	52 899.000	49 252.200	85 468.000	47 532.000				17 509.000	382 931.000
1996	2 454.200	6 539.300	94 691.600	36 812.200	58 271.300	76 099.800	91 531.000	49 636.000				16 886.600	432 922.000
1997	2 430.900	7 106.400	102 921.400	40 086.200	70 464.900	97 010.300	98 191.000	43 373.000				16 625.900	478 210.000
1998	2 574.300	7 432.600	110 614.800	42 004.200	95 730.800	61 038.300	107 298.000	41 521.000				3 116.000	471 330.000
1999	2 394.900	8 251.500	114 076.200	37 009.700	93 109.900	66 532.800	115 604.000	42 715.000				19 877.000	499 571.000

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.4: Central government revenues, categories 1815–2021. Million kroner

Year	Customs duty	Alcohol	VAT	Indirect taxes	Direct taxes	Oil & gas revenues	Social security	Govmt. corp.	Regional railroad	Transf	War taxes	Other income	Total income
2000	2 014.900	8 543.800	121 710.200	40 719.500	102 780.400	171 835.300	122 008.000	44 793.000				29 245.900	643 651.000
2001	1 772.500	8 472.200	130 306.000	43 723.900	109 515.800	254 373.700	128 375.000	52 807.000				29 095.900	758 442.000
2002	1 649.200	8 198.700	128 318.300	45 734.000	133 159.300	173 034.100	137 085.000	51 533.000				12 359.400	691 071.000
2003	1 571.000	8 486.100	128 912.500	46 366.700	126 151.400	179 277.600	144 018.000	49 641.000				15 770.700	700 195.000
2004	1 594.600	9 014.100	137 337.200	49 701.500	126 497.900	210 043.600	149 867.000	47 836.000				14 516.100	746 408.000
2005	1 608.300	9 297.800	150 311.100	53 709.800	139 107.700	281 059.600	157 611.000	52 758.000				15 372.700	860 836.000
2006	1 756.200	9 738.100	169 437.200	57 068.000	145 437.300	356 660.200	171 665.000	61 743.000				21 395.000	994 900.000
2007	2 014.000	10 337.600	183 827.900	60 103.400	182 297.700	314 883.100	185 297.000	71 357.000				20 006.300	1 030 124.000
2008	2 088.300	10 799.000	190 683.700	59 713.400	202 857.000	413 191.900	205 949.000	78 000.000				19 347.700	1 182 630.000
2009	2 149.900	11 241.300	185 178.300	58 427.200	199 956.200	282 471.500	218 889.000	73 914.000				19 662.600	1 051 890.000
2010	2 416.200	11 320.400	196 808.600	64 169.100	210 393.300	275 124.400	222 352.000	62 397.000				19 783.000	1 064 764.000
2011	2 537.100	11 862.500	208 747.600	66 115.200	237 103.500	352 323.700	240 978.000	80 171.000				23 685.400	1 223 524.000
2012	2 877.200	12 139.600	220 713.100	67 084.500	243 325.600	400 651.700	251 817.000	74 417.000				17 709.300	1 290 735.000
2013	2 881.800	12 238.800	233 874.300	66 909.800	254 040.400	358 361.500	269 430.000	75 093.000				18 989.400	1 291 819.000
2014	2 980.600	12 642.600	242 570.900	66 167.200	250 840.200	319 386.900	283 951.000	81 878.000				18 340.600	1 278 758.000
2015	3 068.300	12 827.200	252 219.900	66 945.000	248 461.900	227 764.800	299 436.000	78 553.000				38 135.900	1 227 412.000
2016	3 175.700	13 503.500	266 171.900	67 474.500	250 820.100	138 068.800	304 924.000	69 030.000				49 314.500	1 162 483.000
2017	3 270.600	13 691.900	267 432.500	69 240.300	262 323.100	182 437.900	313 520.000	63 473.000				50 498.700	1 225 888.000
2018	3 193.500	14 138.000	295 121.000	70 428.700	259 208.200	255 432.000	327 402.000	84 180.000				41 488.600	1 350 592.000
2019	3 247.200	14 425.000	305 886.000	67 638.000	279 857.700	260 427.300	342 761.000	90 998.000				42 166.800	1 407 407.000
2020	3 307.000	17 659.700	306 739.600	64 382.600	300 694.600	116 920.800	341 345.000	87 617.000				50 161.700	1 288 828.000
2021	3 964.200	17 953.900	333 241.000	62 273.800	283 165.700	299 419.200	370 235.000	73 455.000				59 012.200	1 502 720.000

Sources: See overview in Table 6.3 on page 304.

Statistics Norway: <https://www.ssb.no/en/statbank/table/07107>, Central government revenue items (NOK million) 1980- 2021.

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
1815	0.220	0.014	0.075	1.966		0.200		0.014	1.410	0.342	4.242
1816	0.029	0.028	0.169	3.006		0.555		0.018	1.803	0.450	6.057
1817	0.486	0.057	0.184	2.575		0.618		0.022	1.664	0.274	5.880
1818	0.153	0.028	0.212	3.276		0.667		0.018	1.799	0.599	6.752
1819	0.230	0.038	0.294	3.062		0.757		0.021	1.899	0.751	7.051
1820	1.746	0.048	0.298	2.823		0.792		0.014	2.041	1.026	8.788
1821	2.035	0.135	0.358	2.863		0.734		0.014	2.833	0.608	9.581
1822	0.781	0.169	0.412	2.803		0.730		0.014	1.690	0.395	6.993
1823	1.228	0.136	0.433	2.810		0.714		0.003	2.132	0.628	8.083
1824	1.106	0.174	0.375	2.895		0.693		0.016	2.940	1.200	9.398
1825	0.230	0.198	0.379	2.942		0.772		0.229	1.932	0.466	7.147
1826	0.314	0.162	0.354	3.257		0.818		0.016	2.226	0.605	7.753
1827	0.411	0.185	0.325	3.381		0.705		0.040	2.371	0.420	7.838
1828	2.612	0.206	0.378	3.515		0.707		0.205	3.163	0.449	11.236
1829	1.184	0.219	0.360	3.539		0.691		0.087	2.343	0.577	9.001
1830	1.170	0.192	0.418	2.912		0.597		0.118	2.420	0.528	8.357
1831	1.137	0.207	0.490	3.101		0.720		0.090	2.054	0.429	8.227
1832	1.175	0.202	0.484	3.029		0.831		0.148	2.670	0.438	8.976
1833	1.094	0.200	0.494	2.957		0.707		0.082	2.706	0.982	9.222
1834	1.384	0.193	0.554	2.994		0.588		0.064	2.377	0.960	9.114
1835	1.273	0.167	0.536	2.915		0.534		0.097	2.404	0.933	8.859
1836	0.811	0.188	0.498	2.945		0.483		0.113	2.768	0.768	8.574
1837	0.561	0.211	0.547	3.255		0.536		0.111	2.575	0.653	8.449
1838	0.533	0.225	0.917	3.838		0.689		0.128	2.622	0.783	9.735
1839	0.524	0.140	0.978	4.266		0.474		0.297	3.086	0.571	10.337
1840	0.509	0.154	1.154	5.047		0.499		0.157	2.648	0.923	11.092
1841	0.482	0.130	1.104	4.739		0.677		0.178	2.825	0.873	11.007
1842	0.422	0.140	0.942	3.411		0.498		0.144	3.072	1.636	10.265
1843	0.428	0.188	1.010	3.642		0.475		0.313	2.684	0.937	9.679
1844	0.411	0.182	0.941	3.726		0.633		0.287	2.613	1.006	9.798
1845	0.411	0.178	1.016	3.543		0.544		0.118	3.067	0.772	9.650
1846	0.394	0.204	0.988	4.124		0.463		0.152	2.647	0.839	9.811
1847	0.236	0.249	1.217	4.298		0.648		0.167	2.781	0.947	10.543
1848	2.427	0.219	1.253	5.621		0.596		0.156	3.005	0.978	14.256
1849	0.566	0.276	1.228	4.568		0.523		0.182	2.668	1.276	11.287
1850	0.556	0.616	1.119	5.240		0.266		0.079	2.759	0.696	11.331
1851	0.804	0.335	1.121	4.926		0.333		1.623	3.213	1.015	13.371
1852	0.634	0.305	1.136	5.244		0.408		1.939	2.908	1.839	14.412

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
1853	0.706	0.559	1.093	5.953		0.325		0.810	2.424	0.767	12.637
1854	0.674	0.313	1.102	6.336		0.442		1.125	3.371	1.351	14.713
1855	0.684	0.400	1.136	7.352		0.467		0.572	2.898	0.627	14.136
1856	0.743	0.425	1.177	6.862		0.370		0.472	3.017	0.466	13.533
1857	0.675	0.370	1.219	6.453		0.700		0.820	4.010	0.980	15.229
1858	1.133	0.314	1.228	7.211		0.654		0.964	3.484	1.736	16.724
1859	1.259	0.455	1.103	7.538		0.611		2.971	3.352	0.926	18.215
1860	1.322	0.399	1.335	7.239		0.567		3.419	3.764	2.187	20.232
1861	1.272	0.458	1.271	6.946		0.586		2.537	2.700	0.996	16.767
1862	1.257	0.518	1.446	6.797		0.541		1.911	3.455	1.065	16.991
1863	1.355	0.563	1.582	6.303		0.643		1.325	3.694	2.304	17.770
1864	0.751	0.603	1.275	10.364		0.600		2.915	3.289	1.501	21.300
1865	2.296	0.562	1.196	6.160		0.668		1.443	3.497	1.319	17.140
1866	0.909	0.650	1.211	7.495		0.616		1.500	3.880	1.434	17.695
1867	1.294	0.689	1.214	8.096		0.678		1.473	3.501	1.723	18.668
1868	1.328	0.760	1.331	7.108		0.776		0.648	3.481	1.833	17.265
1869	1.287	0.795	1.201	7.041		0.780		0.488	3.747	1.633	16.971
1870	1.249	0.686	1.230	6.863		0.716		0.710	3.302	1.724	16.482
1871	1.191	0.700	1.244	6.822		0.806		1.424	4.947	1.670	18.804
1872	1.281	0.686	1.192	6.813		0.701		1.669	3.477	1.829	17.649
1873	1.459	0.857	1.313	7.224		0.690		5.247	3.553	2.213	22.556
1874	1.793	0.911	1.490	8.337		0.720		7.758	3.960	1.972	26.942
1875	1.701	1.202	1.651	10.055		1.023		9.941	4.214	2.834	32.620
1876	2.213	1.822	1.862	10.687		0.995		13.317	4.338	3.417	38.651
1877	3.191	1.995	1.821	10.665		1.614		15.643	4.318	2.639	41.887
1878	5.050	2.409	1.988	11.310		1.555		12.556	4.353	3.157	42.377
1879	5.183	2.344	1.904	11.138		1.649		12.593	4.276	2.395	41.481
1880	6.056	2.259	2.053	8.957		1.603		8.772	4.370	3.041	37.111
1881	5.347	3.667	2.529	9.672		2.065		7.115	4.509	1.845	36.750
1882	4.753	3.847	2.577	9.641		2.114		7.573	4.414	1.829	36.748
1883	4.831	3.800	2.661	9.233		2.266		4.158	4.484	2.003	33.437
1884	5.514	4.075	2.631	9.275		2.066		2.633	4.480	1.721	32.396
1885	2.909	4.141	2.687	9.339		2.005		2.130	4.556	1.793	29.561
1886	2.012	4.278	2.613	9.029		2.071		1.974	4.755	2.635	29.365
1887	2.430	4.307	2.584	9.256		2.057		2.405	4.776	3.444	31.259
1888	2.023	4.378	2.706	9.838		2.091		2.530	4.835	3.306	31.707
1889	3.670	4.358	2.646	9.753		2.065		2.654	4.674	2.790	32.610
1890	3.898	4.373	2.832	10.236		2.180		2.848	4.580	3.103	34.050

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
1891	3.942	4.718	3.045	12.499		2.473		5.264	4.672	3.111	39.725
1892	3.902	4.915	3.163	12.113		2.283		3.444	4.925	4.311	39.056
1893	3.948	5.433	3.243	14.852		2.709		5.896	4.843	5.581	46.505
1894	4.149	5.890	3.285	11.709		2.792		7.370	4.768	7.371	47.334
1895	4.386	5.983	3.466	13.156		2.963		7.811	4.814	5.531	48.111
1896	4.932	7.091	3.461	18.892		3.051		7.708	4.850	6.198	56.182
1897	5.424	7.566	3.453	23.889		3.170		7.098	4.799	5.290	60.689
1898	6.000	7.739	3.571	20.911		3.441		7.852	4.980	7.438	61.932
1899	5.032	8.609	3.895	23.469		3.644		10.033	5.350	8.496	68.528
1900	4.164	8.909	4.251	29.271		4.783		12.876	5.897	9.541	79.691
1901	6.305	9.467	4.509	26.532		4.965		20.220	5.668	10.492	88.157
1902	7.404	10.200	4.579	25.030		5.212		15.777	5.524	9.138	82.864
1903	7.377	10.491	4.576	26.922		5.234		13.329	5.501	9.054	82.485
1904	10.398	10.554	4.267	22.883		5.347		10.582	5.916	9.717	79.665
1905	10.318	10.504	4.305	18.404		5.452		10.633	5.631	10.092	75.339
1906	9.842	10.633	4.178	20.907		5.509		10.845	6.507	7.382	75.803
1907	11.285	10.856	4.296	26.583		5.640		10.265	7.077	8.412	84.413
1908	11.197	11.546	4.309	19.606		6.811		11.068	6.763	8.990	80.291
1909	14.481	12.019	4.323	19.551		7.157		10.895	6.965	7.020	82.411
1910	11.105	13.357	4.473	21.257		6.955		9.968	7.372	8.194	82.682
1911	10.777	15.110	4.615	21.158		10.000		8.886	8.018	8.625	87.188
1912	12.329	14.999	4.840	22.910		14.653		13.055	8.092	9.912	100.789
1913	12.274	17.337	5.010	32.581		16.108		11.665	8.824	16.548	120.348
1914	12.411	15.847	4.705	27.490	7.178	18.070	4.268	26.946	7.897		124.812
1915	12.851	16.197	4.990	61.333	5.535	19.672	4.408	28.914	8.140	0.000	162.040
1916	10.413	16.523	4.818	65.362	3.789	25.048	4.248	26.888	9.015	0.000	166.104
1917	11.635	19.673	5.402	93.572	29.302	36.093	5.177	38.446	9.534	0.000	248.834
1918	19.928	25.311	6.554	134.662	198.166	46.698	8.022	66.325	15.017	0.000	520.683
1919	22.947	32.737	8.624	104.168	285.809	58.171	9.758	98.849	15.941	0.000	637.004
1920	27.259	54.355	12.995	65.655	268.855	71.487	14.187	137.819	18.529	0.000	671.141
1921	41.842	63.923	17.611	63.142	298.021	92.859	23.554	156.445	28.249	0.000	785.646
1922	55.089	72.112	14.781	61.633	92.486	95.263	18.643	146.612	27.463	0.000	584.082
1923	68.674	73.747	14.387	53.835	128.964	71.158	19.965	119.091	26.068	0.000	575.889
1924	88.383	70.465	14.682	49.554	45.878	75.906	22.921	112.597	25.310	0.000	505.696
1925	101.268	67.613	14.137	48.384	37.851	88.697	21.759	99.788	24.419	0.000	503.916
1926	105.177	57.232	15.393	48.349	25.720	83.709	20.026	80.083	23.535	0.000	459.224
1927	89.776	64.379	14.585	43.237	18.418	82.583	19.079	73.712	22.305	0.000	428.074
1928	80.861	59.854	14.157	45.287	40.051	79.416	16.140	68.425	21.920	0.000	426.111

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
1929	83.721	54.571	13.889	39.634	23.997	72.876	14.869	88.641	20.256	0.000	412.454
1930	82.319	54.073	14.256	39.237	30.053	67.621	14.013	64.742	20.724		387.038
1931	83.691	55.731	14.553	38.955	11.737	73.208	14.480	62.612	21.498	0.000	376.465
1932	83.443	57.308	14.192	38.726	8.166	72.429	16.602	62.859	21.721	0.000	375.446
1933	94.204	53.359	13.539	37.275	11.344	70.909	12.730	67.254	21.316	0.000	381.930
1934	83.313	50.589	13.419	36.925	10.015	77.994	12.845	71.099	21.574	0.000	377.773
1935	86.876	51.348	13.450	37.698	13.173	86.916	13.056	90.139	21.519	0.000	414.175
1936	75.868	52.718	13.991	40.198	15.504	101.188	14.239	124.398	22.316	0.000	460.420
1937	74.570	57.816	16.656	45.775	13.048	111.647	12.809	150.643	24.885	0.000	507.849
1938	72.669	64.817	18.552	52.664	11.029	159.872	19.282	153.284	27.526	0.000	579.695
1939	70.944	73.112	19.328	67.306	11.089	175.163	20.828	173.759	29.225	0.000	640.754
1940	70.722	70.620	22.191	194.465	14.405	160.134	23.391	209.205	29.851	0.000	794.984
1941	62.936	76.205	32.229	48.277	493.394	184.548	22.523	250.523	25.405	0.000	1 196.040
1942	81.575	70.941	38.800	17.840	1 335.427	188.412	23.621	325.786	30.205	0.000	2 112.607
1943	94.544	84.793	39.357	14.538	1 041.997	204.690	24.255	430.361	35.162	0.000	1 969.697
1944	119.974	85.299	49.632	18.554	1 310.176	220.550	26.001	466.268	47.874	0.000	2 344.328
1945	146.637	69.125	53.145	24.395	373.889	205.586	26.853	329.153	49.529		1 278.312
1946	166.733	96.887	98.675	419.659	318.657	314.377	32.165	430.458	57.520	249.057	2 184.188
1947	153.595	131.251	83.052	351.648	411.938	475.109	49.131	711.994	70.846	152.032	2 590.596
1948	142.228	147.220	75.433	206.178	245.176	499.116	47.801	950.333	90.249	401.448	2 805.182
1949	143.273	163.201	71.741	314.653	384.862	553.806	56.952	1 012.092	102.413	148.114	2 951.107
1950	168.829	176.332	69.069	338.448	157.183	602.522	60.567	1 076.771	110.809	498.221	3 258.751
1951	166.046	202.395	68.063	481.676	182.443	677.190	65.659	790.312	123.650	468.781	3 226.215
1952	170.490	225.829	78.662	700.649	182.598	839.360	75.460	752.072	132.962	467.229	3 625.311
1953	181.722	260.108	86.590	1 027.851	266.736	981.798	85.051	960.838	152.186	330.894	4 333.774
1954	191.972	311.144	92.645	1 166.088	266.782	1 144.697	90.867	990.396	169.060	534.332	4 957.983
1955	218.762	298.451	93.769	1 137.057	254.003	1 215.232	96.690	1 059.191	164.001	359.297	4 896.453
1956	259.940	358.215	123.148	827.816		1 198.932	113.853	1 532.758	227.286	462.052	5 104.000
1957	278.083	431.296	133.769	1 004.422		1 409.579	127.641	1 629.966	253.116	490.128	5 758.000
1958	283.269	465.651	143.023	987.431		1 562.237	140.156	1 954.150	278.196	420.887	6 235.000
1959	316.328	509.177	153.857	1 084.541		2 407.020	161.901	1 811.866	303.992	399.318	7 148.000
1960	335.322	622.269	165.529	1 017.676		2 326.373	186.939	2 226.799	331.537	350.558	7 563.000
1961	353.462	753.854	176.094	1 144.276		2 805.912	202.624	2 358.767	340.192	466.819	8 602.000
1962	367.518	890.491	197.624	1 344.866		3 128.639	219.193	2 507.666	414.717	698.286	9 769.000
1963	406.702	1 082.699	215.509	1 414.104		3 525.536	228.286	2 817.137	452.385	760.642	10 903.000
1964	446.467	1 238.229	237.882	1 532.775		4 024.269	271.174	3 028.516	599.164	656.524	12 035.000
1965	488.215	1 412.971	257.883	1 866.724		4 467.681	288.551	3 370.192	646.339	815.444	13 614.000
1966	513.590	1 644.696	281.263	1 907.293		4 965.120	318.300	3 464.321	664.369	978.048	14 737.000

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
1967	543.877	1 912.873	313.937	2 087.834		5 414.531	358.628	3 782.918	808.392	1 151.010	16 374.000
1968	608.329	2 147.765	355.710	2 288.080		6 226.176	422.410	4 210.371	901.074	1 120.085	18 280.000
1969	662.382	2 406.201	410.918	2 505.728		7 425.023	485.418	4 702.727	995.802	1 453.801	21 048.000
1970	800.284	2 622.588	442.802	2 792.270		10 917.652	298.876	4 952.856	1 112.833	1 944.839	25 885.000
1971	988.589	3 236.342	525.654	3 009.586		12 878.993	341.606	5 738.609	1 273.061	2 191.560	30 184.000
1972	1 165.305	3 783.869	574.262	3 215.975		14 998.771	390.009	6 398.874	1 500.156	557.387	32 584.608
1973	1 366.684	4 286.918	641.883	3 479.779		17 402.508	427.141	7 623.373	1 674.023	270.330	37 172.639
1974	1 687.328	4 937.804	796.475	3 929.637		19 724.832	524.959	8 724.226	2 105.661	1 486.018	43 916.940
1975	1 956.175	5 761.187	945.057	4 765.733		23 469.469	580.631	12 588.912	2 428.539	-413.592	52 082.111
1976	2 728.424	6 848.381	1 196.371	5 315.765		27 520.561	724.855	15 981.382	3 069.902	220.900	63 606.541
1977	3 576.922	7 747.393	1 374.621	6 018.072		30 746.357	989.462	19 850.683	3 353.538	83.956	73 741.004
1978	3 876.240	8 589.298	1 484.452	6 902.405		36 990.287	1 271.711	21 211.830	3 851.441	2 706.691	86 884.355
1979	4 167.159	9 074.417	1 669.353	7 853.688		43 122.361	1 271.481	23 636.291	3 969.581	1 560.733	96 325.064
1980	4 167.159	10 426.000	1 747.000	8 337.000		51 778.092	1 366.413	21 319.000	4 513.000	8 671.880	112 325.544
1981	5 653.191	11 760.000	2 117.000	10 737.000		59 504.000	969.000	23 689.000	5 085.000	9 814.525	129 328.716
1982	8 722.235	13 503.000	2 365.000	11 781.000		68 825.000	1 121.000	26 175.000	6 189.000	5 229.445	143 910.680
1983	9 862.520	15 089.000	2 587.000	13 204.000		78 722.000	2 292.000	27 766.000	6 972.000	5 376.490	161 871.010
1984	10 982.000	16 673.000	2 815.000	13 701.000		89 341.000	2 263.000	29 670.000	7 481.000	4 223.311	177 149.311
1985	13 118.000	17 394.000	3 083.000	15 235.000		80 296.000	19 257.000	32 051.000	8 146.000	8 981.000	197 561.000
1986	17 670.000	18 963.000	3 481.000	16 438.000		84 178.000	20 833.000	36 793.000	9 261.000	15 744.000	223 361.000
1987	18 556.000	20 355.000	4 227.000	19 041.000		91 519.000	24 504.000	41 060.000	10 118.000	15 515.000	244 895.000
1988	16 322.000	22 826.000	4 470.000	19 123.000		87 548.000	26 183.000	44 168.000	11 797.000	25 437.000	257 874.000
1989	17 170.000	26 609.000	4 837.000	21 414.000		98 341.000	28 787.000	39 973.000	12 304.000	30 992.000	280 427.000
1990	18 018.000	29 588.000	5 223.000	23 784.000		107 603.000	30 709.000	45 110.000	13 792.000	30 103.000	303 930.000
1991	16 628.000	33 003.000	5 718.000	24 002.000		119 055.000	31 820.000	59 272.000	14 228.000	38 126.000	341 852.000
1992	17 617.000	36 149.000	6 243.000	24 160.000		127 309.000	34 378.000	51 785.000	15 103.000	43 494.000	356 238.000
1993	19 557.000	39 207.000	6 517.000	23 042.000		133 014.000	33 965.000	50 389.000	15 822.000	52 156.000	373 669.000
1994	20 690.000	39 789.000	6 924.000	24 818.000		135 211.000	34 812.000	51 201.000	16 509.000	52 439.000	382 393.000
1995	20 847.000	33 602.000	8 181.000	23 715.000		148 997.000	22 321.000	52 032.000	60 682.000	1.000	370 378.000
1996	20 538.000	33 814.000	8 837.000	25 103.000		155 794.000	24 978.000	53 660.000	61 671.000		384 395.000
1997	18 877.000	36 207.000	9 272.000	26 335.000		158 367.000	30 209.000	51 665.000	67 121.000		398 053.000
1998	18 751.000	37 412.000	10 302.000	26 495.000		169 834.000	38 107.000	55 147.000	69 501.000		425 549.000
1999	17 113.000	39 288.000	11 925.000	27 253.000		183 471.000	42 418.000	55 004.000	72 671.000	-1.000	449 142.000
2000	19 162.000	40 817.000	12 621.000	27 917.000		197 405.000	46 365.000	61 203.000	78 440.000	-1.000	483 929.000
2001	23 173.000	43 771.000	13 251.000	27 356.000		212 945.000	50 158.000	57 753.000	82 522.000		510 929.000
2002	21 686.000	46 211.000	15 409.000	31 087.000		226 823.000	87 646.000	58 221.000	105 356.000	2.000	592 441.000
2003	25 668.000	50 054.000	15 432.000	30 296.000		248 579.000	94 935.000	60 467.000	86 808.000	2.000	612 241.000
2004	24 061.000	49 981.000	15 562.000	30 679.000		266 364.000	102 941.000	60 828.000	88 499.000	2.000	638 917.000

Table 6.A.5: Central government expenditures, categories 1815–2021. Million kroner

Year	Interest	Education	Justice	Military	War	Social	Health	Capital	Civil administration	Other	Total expenditures
2005	28 716.000	52 294.000	14 949.000	29 597.000		277 167.000	105 526.000	66 742.000	96 858.000	-1.000	671 848.000
2006	47 701.000	53 646.000	15 794.000	34 350.000		292 023.000	112 833.000	68 616.000	102 006.000	1.000	726 970.000
2007	51 924.000	55 534.000	16 585.000	36 521.000		308 453.000	119 434.000	71 501.000	110 657.000		770 609.000
2008	42 704.000	60 072.000	17 886.000	39 025.000		335 996.000	126 028.000	80 927.000	121 086.000	1.000	823 725.000
2009	26 450.000	63 535.000	19 538.000	39 543.000		369 691.000	129 542.000	93 447.000	142 613.000		884 359.000
2010	22 338.000	65 867.000	20 466.000	37 705.000		391 537.000	136 621.000	91 168.000	152 643.000	1.000	918 346.000
2011	20 323.000	69 320.000	21 736.000	42 212.000		387 104.000	142 819.000	94 239.000	197 010.000		974 763.000
2012	14 940.000	72 301.000	23 039.000	39 972.000		407 881.000	151 414.000	101 434.000	208 745.000		1 019 726.000
2013	14 240.000	73 057.000	25 549.000	41 614.000		430 917.000	161 504.000	109 566.000	222 240.000		1 078 687.000
2014	13 595.000	82 713.000	27 006.000	45 095.000		455 316.000	173 561.000	121 839.000	236 099.000	1.000	1 155 225.000
2015	13 655.000	87 204.000	28 140.000	47 505.000		489 340.000	184 469.000	126 353.000	246 658.000	1.000	1 223 325.000
2016	11 539.000	92 662.000	30 415.000	48 429.000		513 419.000	190 128.000	131 493.000	251 028.000	-1.000	1 269 112.000
2017	10 173.000	96 345.000	32 203.000	55 557.000		528 751.000	200 031.000	138 280.000	262 578.000	-2.000	1 323 916.000
2018	11 748.000	101 816.000	34 398.000	60 362.000		538 432.000	209 450.000	142 460.000	270 521.000		1 369 187.000
2019	11 653.000	107 325.000	36 764.000	67 179.000		554 358.000	222 446.000	152 688.000	285 311.000	-1.000	1 437 723.000
2020	11 113.000	110 886.000	37 110.000	68 994.000		608 236.000	235 920.000	221 389.000	317 666.000	-1.000	1 611 313.000
2021	8 942.000	117 323.000	37 328.000	74 130.000		624 021.000	262 255.000	180 936.000	317 062.000		1 621 997.000

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Sources: See overview in Table 6.3 on page 304,
 Statistics Norway: <https://www.ssb.no/en/statbank/table/10725>, Central government expenditures, by sector and function (NOK million) 1995-2021.

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.6: Central government budget surplus and debt 1815–2021. Million kroner

Year	Total surplus	Primary surplus	Oil adj. surplus	Total surplus (in % of GDP)	Total surplus (in % of revenues)	Debt	Debt (in % of GDP)	Debt (in % of revenues)
1815	0.963	1.183			18.5	28.828		553.8
1816	0.788	0.817		0.4	11.5	28.828	13.4	421.1
1817	1.532	2.018		0.5	20.7	28.740	8.6	387.8
1818	0.158	0.311		0.1	2.3	28.723	13.9	415.7
1819	0.636	0.866		0.3	8.3	28.874	14.1	375.6
1820	-1.212	0.534		-0.7	-16.0	29.439	16.4	388.6
1821	-1.033	1.002		-0.6	-12.1	26.981	15.5	315.7
1822	1.400	2.181		0.7	16.7	26.291	13.5	313.2
1823	0.937	2.165		0.5	10.4	25.061	12.7	277.8
1824	1.456	2.562		0.8	13.4	23.868	12.9	219.9
1825	1.980	2.210		1.1	21.7	22.558	12.6	247.1
1826	0.802	1.117		0.4	9.4	21.325	11.8	249.3
1827	1.183	1.594		0.6	13.1	20.176	9.9	223.7
1828	-3.025	-0.413		-1.6	-36.8	20.501	10.8	249.7
1829	-0.374	0.810		-0.2	-4.3	19.825	10.3	229.8
1830	0.786	1.957		0.4	8.6	19.332	9.6	211.4
1831	0.462	1.599		0.2	5.3	18.848	8.9	216.9
1832	0.548	1.722		0.3	5.8	18.363	9.1	192.8
1833	1.166	2.259		0.6	11.2	17.850	8.7	171.8
1834	0.919	2.303		0.5	9.2	14.699	7.5	146.5
1835	0.973	2.246		0.5	9.9	14.174	7.1	144.2
1836	1.903	2.714		0.9	18.2	12.501	5.9	119.3
1837	1.581	2.142		0.7	15.8	12.196	5.6	121.6
1838	0.724	1.257		0.3	6.9	11.880	5.2	113.6
1839	0.103	0.627		0.0	1.0	11.554	5.0	110.7
1840	-0.237	0.272		-0.1	-2.2	11.217	4.7	103.3
1841	-2.080	-1.599		-1.0	-23.3	10.868	5.1	121.7
1842	-0.883	-0.461		-0.4	-9.4	10.506	5.0	112.0
1843	0.304	0.733		0.1	3.0	10.133	4.6	101.5
1844	-0.549	-0.138		-0.2	-5.9	9.746	4.2	105.4
1845	0.425	0.836		0.2	4.2	9.345	3.8	92.8
1846	0.401	0.795		0.2	3.9	8.215	3.1	80.5
1847	-0.817	-0.581		-0.3	-8.4	7.686	2.6	79.0
1848	-3.817	-1.390		-1.5	-36.6	13.641	5.3	130.7
1849	-1.059	-0.493		-0.4	-10.3	14.459	5.7	141.4
1850	0.161	0.717		0.1	1.4	14.305	5.5	124.5
1851	-1.359	-0.555		-0.5	-11.3	18.863	6.8	157.0
1852	-3.047	-2.413		-1.0	-26.8	18.576	6.3	163.4
1853	-1.027	-0.321		-0.3	-8.8	18.307	5.7	157.7
1854	-1.133	-0.459		-0.3	-8.3	18.011	4.7	132.6
1855	-0.943	-0.260		-0.2	-7.2	17.705	4.3	134.2
1856	0.812	1.555		0.2	5.7	17.386	4.0	121.2
1857	-0.632	0.043		-0.2	-4.3	18.137	4.5	124.3
1858	-4.046	-2.913		-1.0	-31.9	32.074	8.3	253.0
1859	-3.256	-1.998		-0.8	-21.8	31.508	8.2	210.6
1860	-5.141	-3.819		-1.2	-34.1	30.919	7.2	204.9
1861	-1.808	-0.536		-0.4	-12.1	30.304	6.8	202.6
1862	-0.995	0.262		-0.2	-6.2	29.819	6.4	186.4
1863	-0.223	1.132		0.0	-1.3	35.064	7.7	199.8
1864	-3.427	-2.675		-0.7	-19.2	35.408	7.6	198.1
1865	0.962	3.258		0.2	5.3	34.918	7.1	192.9
1866	0.152	1.061		0.0	0.9	33.592	6.7	188.2
1867	-1.643	-0.348		-0.3	-9.6	32.630	6.3	191.7
1868	0.477	1.806		0.1	2.7	31.659	5.9	178.4
1869	-0.590	0.697		-0.1	-3.6	30.647	5.6	187.1
1870	0.832	2.081		0.1	4.8	29.755	5.3	171.9
1871	-0.641	0.550		-0.1	-3.5	29.933	5.0	164.8

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.6: Central government budget surplus and debt 1815–2021. Million kroner

Year	Total surplus	Primary surplus	Oil adj. surplus	Total surplus (in % of GDP)	Total surplus (in % of revenues)	Debt	Debt (in % of GDP)	Debt (in % of revenues)
1872	1.584	2.865		0.2	8.2	34.867	5.3	181.3
1873	-0.573	0.886		-0.1	-2.6	33.686	4.7	153.2
1874	-2.722	-0.928		-0.4	-11.2	52.764	7.1	217.8
1875	-8.019	-6.319		-1.1	-32.6	51.228	6.9	208.2
1876	-12.231	-10.018		-1.6	-46.3	73.294	9.7	277.4
1877	-13.019	-9.828		-1.7	-45.1	71.586	9.4	248.0
1878	-14.916	-9.866		-2.2	-54.3	70.541	10.3	256.9
1879	-17.938	-12.755		-2.7	-76.2	100.422	14.9	426.5
1880	-8.833	-2.777		-1.2	-31.2	105.743	14.6	373.9
1881	-9.170	-3.823		-1.3	-33.2	105.197	14.6	381.4
1882	-6.704	-1.951		-0.9	-22.3	106.772	14.3	355.4
1883	0.276	5.106		0.0	0.8	108.198	14.5	320.9
1884	-1.368	4.146		-0.2	-4.4	107.687	15.0	347.1
1885	4.313	7.222		0.6	12.7	108.728	16.0	321.0
1886	3.529	5.541		0.5	10.7	105.387	15.7	320.4
1887	0.605	3.035		0.1	1.9	108.482	16.3	340.5
1888	1.144	3.167		0.2	3.5	105.390	14.9	320.8
1889	0.561	4.231		0.1	1.7	115.821	15.0	349.2
1890	3.800	7.698		0.5	10.0	115.455	14.7	305.0
1891	-1.516	2.426		-0.2	-4.0	116.199	14.4	304.1
1892	-1.301	2.601		-0.2	-3.4	125.734	15.9	333.0
1893	-7.574	-3.626		-1.0	-19.5	125.125	16.1	321.4
1894	-7.408	-3.258		-0.9	-18.6	164.059	20.8	410.9
1895	-7.549	-3.163		-0.9	-18.6	146.958	17.9	362.3
1896	-12.790	-7.858		-1.5	-29.5	157.353	18.1	362.6
1897	-11.288	-5.864		-1.2	-22.8	181.339	19.5	367.1
1898	-4.665	1.335		-0.5	-8.1	180.171	18.0	314.6
1899	-4.385	0.648		-0.4	-6.8	198.549	18.8	309.5
1900	-10.952	-6.788		-1.0	-15.9	231.065	20.4	336.1
1901	-22.111	-15.806		-2.0	-33.5	228.734	20.4	346.3
1902	-13.695	-6.291		-1.2	-19.8	262.598	23.8	379.6
1903	-16.130	-8.753		-1.4	-23.9	262.045	23.4	389.1
1904	-12.153	-1.755		-1.1	-17.7	265.043	23.7	386.9
1905	-10.219	0.099		-0.9	-15.5	304.924	26.3	461.2
1906	-6.176	3.666		-0.5	-8.7	342.407	27.5	484.8
1907	-8.798	2.486		-0.7	-11.5	338.799	25.2	442.2
1908	2.283	13.480		0.2	2.7	334.744	23.8	400.5
1909	-0.440	14.041		0.0	-0.5	329.305	23.2	396.9
1910	3.914	15.020		0.3	4.5	329.298	21.6	375.9
1911	6.199	16.976		0.4	6.6	367.653	22.4	389.5
1912	2.737	15.067		0.2	2.6	362.806	20.1	347.1
1913	-4.402	7.872		-0.2	-3.8	362.744	18.6	310.2
1914	-10.570	1.841		-0.5	-9.1	357.395	17.6	307.5
1915	-35.926	-23.075		-1.3	-28.0	421.324	15.4	328.9
1916	-1.929	8.484		0.0	-1.2	422.975	10.6	257.6
1917	24.883	36.518		0.5	9.0	455.505	9.8	165.2
1918	-45.087	-25.159		-0.8	-9.5	736.600	13.8	154.9
1919	-107.768	-84.821		-1.8	-20.4	1 008.039	16.4	190.5
1920	-62.951	-35.692		-0.9	-10.4	1 129.605	15.7	185.7
1921	-285.184	-243.342		-5.3	-57.0	1 190.561	22.2	237.9
1922	-163.366	-108.277		-3.2	-38.8	1 282.073	25.5	304.7
1923	-214.601	-145.927		-4.3	-59.1	1 394.007	27.8	383.7
1924	-150.265	-61.882		-2.7	-41.8	1 549.994	28.3	431.2
1925	-82.808	18.460		-1.5	-19.5	1 731.626	32.3	407.3
1926	-46.901	58.276		-1.0	-11.3	1 610.568	34.8	386.9
1927	-25.588	64.188		-0.6	-6.3	1 568.420	36.0	385.8
1928	-21.820	59.041		-0.5	-5.3	1 634.825	37.7	400.4

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.6: Central government budget surplus and debt 1815–2021. Million kroner

Year	Total surplus	Primary surplus	Oil adj. surplus	Total surplus (in % of GDP)	Total surplus (in % of revenues)	Debt	Debt (in % of GDP)	Debt (in % of revenues)
1929	-22.677	61.044		-0.5	-5.8	1 578.898	35.2	401.0
1930	-2.196	80.123		0.0	-0.5	1 565.037	34.9	386.8
1931	-19.278	64.413		-0.5	-5.1	1 518.054	38.2	402.3
1932	-31.694	51.749		-0.8	-8.7	1 526.050	38.4	418.6
1933	-28.384	65.820		-0.7	-6.6	1 496.025	37.9	349.4
1934	-2.082	81.231		-0.1	-0.5	1 461.739	35.3	329.2
1935	-21.837	65.039		-0.5	-4.7	1 476.181	32.8	318.5
1936	-0.569	75.299		0.0	-0.1	1 481.809	29.7	279.1
1937	24.606	99.176		0.4	4.1	1 493.297	26.0	246.8
1938	15.039	87.708		0.2	2.2	1 428.744	23.7	210.2
1939	27.002	97.946		0.4	3.5	1 464.213	22.8	192.5
1940	-76.9	-6.1		-1.0	-10.1	1 496.7	20.4	195.8
1941	-104.0	-41.0		-1.1	-9.5	1 915.2	21.0	175.4
1942	-718.9	-637.3		-7.8	-51.6	2 857.8	30.9	205.0
1943	-372.3	-277.8		-4.0	-23.3	4 285.1	46.5	268.3
1944	-700.9	-581.0		-7.9	-42.7	5 238.8	59.3	318.8
1945	275.3	421.9		2.8	17.7	6 544.8	66.0	421.3
1946	-395.0	-228.3		-3.7	-22.4	6 958.2	64.4	394.2
1947	-43.0	110.6		-0.3	-1.7	6 693.1	52.9	268.8
1948	288.0	430.2		2.1	9.5	6 284.3	45.4	206.4
1949	662.0	805.3		4.4	18.5	6 165.5	41.4	172.7
1950	886.0	1 054.8		5.4	21.6	4 705.0	28.5	114.7
1951	1 286.0	1 452.0		6.3	28.8	4 884.4	23.8	109.2
1952	782.0	952.5		3.4	17.9	4 873.8	21.5	111.5
1953	518.0	699.7		2.2	10.8	5 373.7	23.2	111.5
1954	-39.0	153.0		-0.2	-0.8	5 478.2	21.8	112.3
1955	293.0	511.8		1.1	5.7	6 347.5	23.6	123.4
1956	498.0	757.9		1.6	9.0	7 230.5	23.8	130.2
1957	465.0	743.1		1.4	7.6	7 648.5	23.5	124.6
1958	532.0	815.3		1.6	8.0	7 762.1	23.8	116.4
1959	1 050.0	1 366.3		3.0	13.6	8 812.5	25.4	114.4
1960	1 288.0	1 623.3		3.5	15.4	9 299.9	25.1	111.5
1961	891.0	1 244.5		2.2	10.2	9 437.5	23.3	107.5
1962	870.0	1 237.5		2.0	8.9	9 771.8	22.3	99.5
1963	879.0	1 285.7		1.9	8.1	10 264.8	21.8	94.8
1964	917.0	1 363.5		1.8	7.7	10 877.3	21.0	91.6
1965	919.0	1 407.2		1.6	6.9	11 447.6	20.0	85.6
1966	1 386.0	1 899.6		2.2	9.3	12 142.9	19.6	81.4
1967	2 323.0	2 866.9		3.4	13.7	13 792.4	20.3	81.4
1968	1 718.0	2 326.3		2.4	9.0	14 720.7	20.2	77.5
1969	1 784.0	2 446.4		2.2	8.3	15 824.1	19.9	73.4
1970	1 175.0	1 975.3	1 175.000	1.3	4.7	18 878.7	20.6	75.6
1971	2 942.0	3 930.6	2 942.000	2.9	10.0	21 653.9	21.0	73.6
1972	1 332.4	2 497.7	1 290.347	1.2	3.8	25 671.2	22.4	72.9
1973	2 164.4	3 531.0	2 095.086	1.7	5.3	29 521.0	22.7	72.8
1974	2 477.1	4 164.4	2 356.285	1.6	5.3	33 943.0	22.6	72.6
1975	2 212.9	4 169.1	2 004.411	1.3	4.1	41 082.8	23.9	76.5
1976	510.5	3 238.9	-1 447.271	0.3	0.8	50 290.3	25.6	79.5
1977	-1 127.0	2 449.9	-4 248.774	-0.5	-1.6	66 786.0	30.2	95.0
1978	-6 739.4	-2 863.1	-10 558.648	-2.8	-8.5	85 994.7	35.3	108.8
1979	-5 849.1	-1 681.9	-12 448.064	-2.2	-6.6	102 747.9	38.2	116.0
1980	19 452.5	23 619.6	882.856	6.1	17.3	106 907.4	33.6	95.1
1981	27 476.3	33 129.5	233.084	7.5	20.3	107 662.4	29.5	79.4
1982	29 160.3	37 882.6	-719.380	7.2	19.6	103 799.5	25.7	69.6
1983	19 159.0	29 021.5	-11 220.110	4.3	11.9	92 406.1	20.6	57.4
1984	34 554.7	45 536.7	-4 658.011	6.8	18.5	115 805.3	22.9	62.1
1985	38 910	52 028	-6 985.6	6.9	17.6	142 392.6	25.3	64.3

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.6: Central government budget surplus and debt 1815–2021. Million kroner

Year	Total surplus	Primary surplus	Oil adj. surplus	Total surplus (in % of GDP)	Total surplus (in % of revenues)	Debt	Debt (in % of GDP)	Debt (in % of revenues)
1986	35 266	52 936	364.8	6.1	14.5	194 287.5	33.4	79.6
1987	23 688	42 244	8 418.6	3.7	9.4	165 247.7	26.0	65.7
1988	21 843	38 165	13 882.6	3.3	8.4	166 470.6	25.1	64.3
1989	17 259	34 429	-699.1	2.4	6.3	176 546.2	24.9	64.2
1990	22 025	40 043	-13 820.3	2.9	7.3	164 944.8	22.0	54.7
1991	-30 370	-13 742	-73 826.9	-3.8	-9.5	178 026.0	22.5	55.9
1992	-34 669	-17 052	-71 121.5	-4.3	-10.9	217 041.7	26.7	68.0
1993	-43 249	-23 692	-85 841.5	-5.1	-13.2	296 381.5	34.6	90.5
1994	-28 271	-7 581	-70 275.7	-3.2	-8.1	290 216.5	32.3	82.7
1995	12 553	33 400	-36 699.2	1.3	3.3	290 757.9	30.2	75.9
1996	48 527	69 065	-27 572.8	4.6	11.2	284 892.4	27.0	65.8
1997	80 157	99 034	-16 853.3	7.0	16.8	276 219.3	24.2	57.8
1998	45 781	64 532	-15 257.3	3.9	9.7	253 594.4	21.8	53.8
1999	50 429	67 542	-16 103.8	4.0	10.1	258 827.9	20.4	51.8
2000	159 722	178 884	-12 113.3	10.6	24.8	285 925.0	19.0	44.4
2001	247 513	270 686	-6 860.7	15.8	32.6	278 692.4	17.8	36.7
2002	98 630	120 316	-74 404.1	6.3	14.3	291 039.6	18.6	42.1
2003	87 954	113 622	-91 323.6	5.4	12.6	339 840.7	21.0	48.5
2004	107 491	131 552	-102 552.6	6.0	14.4	320 758.3	18.0	43.0
2005	188 988	217 704	-92 071.6	9.5	22.0	334 131.6	16.8	38.8
2006	267 930	315 631	-88 730.2	12.1	26.9	269 362.2	12.2	27.1
2007	259 515	311 439	-55 368.1	11.0	25.2	265 348.1	11.3	25.8
2008	358 905	401 609	-54 286.9	13.8	30.3	349 973.3	13.4	29.6
2009	167 531	193 981	-114 940.5	6.9	15.9	627 665.7	25.8	59.7
2010	146 418	168 756	-128 706.4	5.6	13.8	653 246.9	25.2	61.4
2011	248 761	269 084	-103 562.7	8.9	20.3	557 411.8	20.0	45.6
2012	271 009	285 949	-129 642.7	9.1	21.0	617 245.2	20.8	47.8
2013	213 132	227 372	-145 229.5	6.9	16.5	604 045.0	19.7	46.8
2014	123 533	137 128	-195 853.9	3.9	9.7	485 453.3	15.5	38.0
2015	4 087	17 742	-223 677.8	0.1	0.3	482 817.2	15.5	39.3
2016	-106 629	-96 502	-244 697.8	-3.4	-9.2	515 617.1	16.6	44.4
2017	-98 028	-87 855	-280 465.9	-3.0	-8.0	522 047.2	15.8	42.6
2018	-18 595	-6 847	-274 027.0	-0.5	-1.4	523 868.9	14.7	38.8
2019	-30 316	-18 663	-290 743.3	-0.9	-2.2	510 624.7	14.3	36.3
2020	-322 485	-311 372	-439 405.8	-9.5	-25.0	637 962.9	18.7	49.5
2021	-119 277	-110 335	-418 696.2	-2.9	-7.9	652 533.0	15.7	43.4

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.7: Central government debt, domestic and foreign, 1815-2021. Million kroner

Year	Total debt	Foreign debt	of this: fixed debt	of this: temporary debt	Domestic debt	of this: fixed debt	of this: temporary debt
1815	28.828	12.000	12.000		16.828	16.828	
1816	28.828	12.000	12.000		16.828	16.828	
1817	28.740	12.000	12.000		16.740	16.740	
1818	28.723	12.000	12.000		16.723	16.723	
1819	28.874	12.000	12.000		16.874	16.874	
1820	29.439	14.400	14.400		15.039	15.039	
1821	26.981	13.091	13.091		13.890	13.890	
1822	26.291	12.977	12.977		13.314	13.314	
1823	25.061	12.726	12.726		12.335	12.335	
1824	23.868	12.716	12.716		11.152	11.152	
1825	22.558	12.408	12.408		10.150	10.150	
1826	21.325	12.084	12.084		9.241	9.241	
1827	20.176	11.745	11.745		8.431	8.431	
1828	20.501	12.588	12.588		7.912	7.912	
1829	19.825	12.180	12.180		7.644	7.644	
1830	19.332	11.754	11.754		7.578	7.578	
1831	18.848	11.307	11.307		7.540	7.540	
1832	18.363	10.840	10.840		7.523	7.523	
1833	17.850	10.352	10.352		7.499	7.499	
1834	14.699	7.239	7.239		7.459	7.459	
1835	14.174	6.726	6.726		7.448	7.448	
1836	12.501	5.241	5.241		7.260	7.260	
1837	12.196	4.948	4.948		7.248	7.248	
1838	11.880	4.644	4.644		7.236	7.236	
1839	11.554	4.330	4.330		7.224	7.224	
1840	11.217	4.005	4.005		7.212	7.212	
1841	10.868	3.668	3.668		7.200	7.200	
1842	10.506	3.318	3.318		7.188	7.188	
1843	10.133	2.957	2.957		7.176	7.176	
1844	9.746	2.582	2.582		7.164	7.164	
1845	9.345	2.193	2.193		7.152	7.152	
1846	8.215	1.075	1.075		7.140	7.140	
1847	7.686	0.558	0.558		7.128	7.128	
1848	13.641	6.525	6.525		7.116	7.116	
1849	14.459	6.371	6.371		8.088	8.088	
1850	14.305	6.213	6.213		8.092	8.092	
1851	18.863	10.783	10.783		8.080	8.080	
1852	18.576	10.508	10.508		8.068	8.068	
1853	18.307	10.251	10.251		8.056	8.056	
1854	18.011	9.967	9.967		8.044	8.044	
1855	17.705	9.673	9.673		8.032	8.032	
1856	17.386	9.366	9.366		8.020	8.020	
1857	18.137	9.031	9.031		9.106	9.106	
1858	32.074	23.018	23.018		9.056	9.056	
1859	31.508	22.504	22.504		9.004	9.004	
1860	30.919	21.967	21.967		8.952	8.952	
1861	30.304	21.408	21.408		8.896	8.896	
1862	29.819	20.824	20.824		8.995	8.995	
1863	35.064	26.168	26.168		8.896	8.896	
1864	35.408	25.434	25.434		9.974	9.974	
1865	34.918	25.067	25.067		9.852	9.852	
1866	33.592	23.866	23.866		9.726	9.726	
1867	32.630	23.034	23.034		9.596	9.596	
1868	31.659	22.164	22.164		9.496	9.496	
1869	30.647	21.255	21.255		9.392	9.392	
1870	29.755	20.310	20.310		9.445	9.445	
1871	29.933	19.320	19.320		10.614	10.614	
1872	34.867	18.288	24.288		16.580	16.580	

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.7: Central government debt, domestic and foreign, 1815-2021. Million kroner

Year	Total debt	Foreign debt	of this: fixed debt	of this: temporary debt	Domestic debt	of this: fixed debt	of this: temporary debt
1873	33.686	17.214	23.214		16.472	16.472	
1874	52.764	36.091	42.024		16.673	16.673	
1875	51.228	34.922	40.732		16.306	16.306	
1876	73.294	57.354	63.056		15.940	15.940	
1877	71.586	55.732	61.334		15.854	15.854	
1878	70.541	54.280	59.794		16.260	16.260	
1879	100.422	83.955	89.380		16.467	16.467	
1880	105.743	88.784	94.068		16.959	16.959	
1881	105.197	88.581	93.739		16.616	16.616	
1882	106.772	89.774	94.798		16.998	16.998	
1883	108.198	90.888	95.779		17.310	17.310	
1884	107.687	89.828	94.564		17.859	17.859	
1885	108.728	97.462	97.462		11.265	11.265	
1886	105.387	96.798	96.798		8.589	8.589	
1887	108.482	105.531	105.531		2.951	2.951	
1888	105.390	104.894	104.894		0.496	0.496	
1889	115.821	115.396	115.396		0.426	0.426	
1890	115.455	115.112	115.112		0.343	0.343	
1891	116.199	114.697	114.697		1.502	1.502	
1892	125.734	124.216	124.216		1.518	1.518	
1893	125.125	123.665	123.665		1.460	1.460	
1894	164.059	162.698	162.698		1.361	1.361	
1895	146.958	143.108	143.108		3.850	3.850	
1896	157.353	142.642	142.642		14.711	14.711	
1897	181.339	167.262	167.262		14.077	14.077	
1898	180.171	166.424	166.424		13.748	13.748	
1899	198.549	186.190	186.190		12.359	12.359	
1900	231.065	219.163	219.163		11.902	11.902	
1901	228.734	217.205	217.205		11.529	11.529	
1902	262.598	251.513	251.513		11.085	11.085	
1903	262.045	249.152	249.152		12.893	10.710	2.183
1904	265.043	250.835	250.835		14.208	10.142	4.066
1905	304.924	289.401	289.401		15.522	9.654	5.869
1906	342.407	328.288	328.288		14.119	9.119	5.000
1907	338.799	325.131	325.131		13.668	8.668	5.000
1908	334.744	321.642	321.642		13.102	8.102	5.000
1909	329.305	316.733	316.733		12.572	7.572	5.000
1910	329.298	312.957	312.957		16.341	11.341	5.000
1911	367.653	349.004	349.004		18.649	13.649	5.000
1912	362.806	344.966	344.966		17.839	12.839	5.000
1913	362.744	340.791	340.791		21.953	16.953	5.000
1914	357.395	336.473	336.473		20.922	15.922	5.000
1915	421.324	354.094	354.094		67.230	62.230	5.000
1916	422.975	357.231	357.231		65.745	60.745	5.000
1917	455.505	346.862	346.862		108.643	103.643	5.000
1918	736.600	336.328	336.328		400.272	154.752	245.520
1919	1 008.039	331.863	331.863		676.176	250.988	425.188
1920	1 129.605	337.339	337.339	9.438	792.266	400.061	392.205
1921	1 190.561	408.311	408.311	9.907	782.250	445.826	336.424
1922	1 282.073	466.887	466.887		815.186	669.497	145.689
1923	1 394.007	510.997	510.997		883.010	719.884	163.126
1924	1 549.994	596.030	596.030	4.962	953.964	769.706	184.258
1925	1 731.626	726.211	726.211	9.820	1 005.415	708.100	297.315
1926	1 610.568	713.741	713.741	2.767	896.827	743.322	153.505
1927	1 568.420	705.411	705.411	0.055	863.009	759.028	103.981
1928	1 634.825	811.430	811.430		823.395	780.341	43.054
1929	1 578.898	793.828	793.828		785.070	769.482	15.588
1930	1 565.037	782.325	782.325		782.712	769.835	12.877

6.A Appendix, Central government's revenues, expenditures and debt 1815-2021

Table 6.A.7: Central government debt, domestic and foreign, 1815-2021. Million kroner

Year	Total debt	Foreign debt	of this: fixed debt	of this: temporary debt	Domestic debt	of this: fixed debt	of this: temporary debt
1931	1 518.054	757.625	757.625		760.429	744.569	15.860
1932	1 526.050	742.731	742.731		783.319	739.547	43.772
1933	1 496.025	726.207	726.207		769.818	742.901	16.836
1934	1 461.739	706.279	706.279		755.460	728.830	16.372
1935	1 476.181	705.450	705.450		770.732	725.665	32.859
1936	1 481.809	711.455	711.455		770.354	715.834	54.520
1937	1 493.297	692.118	692.118		801.179	758.077	43.102
1938	1 428.744	653.638	653.638		775.106	741.327	33.778
1939	1 464.213	596.393	596.393		867.820	836.690	31.130
1940	1 496.698	570.602	570.602		926.096	827.039	99.057
1941	1 915.227	543.565	543.565		1 371.662	968.419	403.243
1942	2 857.772	512.196	512.196		2 345.576	1 241.638	1 103.938
1943	4 285.079	479.313	479.313		3 805.766	1 738.813	2 066.953
1944	5 238.807	448.654	448.654		4 790.153	2 002.705	2 787.448
1945	6 544.836	423.397	423.397		6 121.439	2 789.349	3 332.090
1946	6 958.189	505.326	401.730	103.595	6 452.863	2 661.384	3 791.479
1947	6 693.085	702.132	429.775	272.357	5 990.953	3 396.683	2 594.270
1948	6 284.254	801.760	524.064	277.697	5 482.494	3 344.701	2 137.784
1949	6 165.458	914.932	914.932		5 250.526	3 311.788	1 757.253
1950	4 704.962	1 052.156	1 052.156		3 652.806	3 251.605	379.600
1951	4 884.391	1 151.523	1 151.523		3 732.868	3 306.939	412.858
1952	4 873.824	1 198.475	1 198.475		3 675.348	3 053.338	622.010
1953	5 373.723	1 221.730	1 221.730		4 151.993	2 954.281	1 197.712
1954	5 478.241	1 420.480	1 420.480		4 057.761	2 753.136	1 304.094
1955	6 347.473	1 714.508	1 714.508		4 632.965	3 641.533	991.432
1956	7 230.478	1 723.119	1 723.119		5 507.359	4 428.423	1 078.936
1957	7 648.461	1 593.643	1 593.643		6 054.817	4 781.811	1 273.007
1958	7 762.110	1 512.152	1 512.152		6 249.958	4 807.163	1 442.795
1959	8 812.549	2 174.650	1 533.808	640.842	6 637.899	4 922.423	1 715.476
1960	9 299.898	2 331.798	1 544.304	787.494	6 968.099	5 231.890	1 736.209
1961	9 437.485	2 259.343	1 671.768	587.575	7 178.142	5 370.380	1 807.762
1962	9 771.770	2 376.010	1 898.968	477.042	7 395.760	5 432.121	1 963.639
1963	10 264.811	2 658.731	2 288.505	370.226	7 606.080	5 678.415	1 927.665
1964	10 877.325	2 713.502	2 429.200	284.301	8 163.823	6 032.667	2 131.156
1965	11 447.603	2 816.838	2 548.155	268.683	8 630.765	6 424.147	2 206.618
1966	12 142.920	2 968.515	2 439.610	528.905	9 174.405	7 045.928	2 128.477
1967	13 792.429	2 900.305	2 371.401	528.905	10 892.123	7 830.105	3 062.019
1968	14 720.705	2 798.200	2 269.295	528.905	11 922.506	9 352.242	2 570.264
1969	15 824.086	2 136.258	2 136.258		13 687.828	10 707.647	2 980.181
1970	18 878.708	1 987.205	1 987.205		16 891.503	12 516.411	4 312.949
1971	21 653.852	1 767.166	1 767.166		19 886.686	13 447.751	6 396.793
1972	25 671.223	1 602.422	1 602.422		24 068.801	14 836.597	9 102.261
1973	29 521.004	1 296.304	1 296.304		28 224.700	17 681.300	10 444.657
1974	33 943.024	1 138.741	1 138.741		32 804.283	20 636.228	12 117.955
1975	41 082.787	5 492.218	5 492.218		35 590.568	23 145.609	12 438.170
1976	50 290.267	9 560.538	9 560.538		40 729.729	22 657.369	18 065.360
1977	66 786.044	16 304.758	16 304.758		50 481.286	22 718.968	27 701.878
1978	85 994.742	27 390.764	27 390.764		58 603.978	28 886.533	29 648.666
1979	102 747.904	31 549.147	31 549.147		71 198.757	36 530.837	34 636.028
1980	106 907.393	29 084.044	29 084.044		77 823.349	38 506.792	39 314.057
1981	107 662.445	25 366.813	25 366.813		82 295.633	37 853.769	44 439.364
1982	103 799.451	20 583.499	20 583.499		83 215.952	42 438.376	40 775.076
1983	92 406.084	8 607.843	8 607.843		83 798.242	50 049.274	33 748.968
1984	115 805.325	1 184.214	1 184.214		114 621.111	63 095.504	51 525.607
1985	142 392.579	52.465	52.465		142 340.115	76 140.872	66 199.242
1986	194 287.463	6 532.649	6 532.649		187 754.814	105 320.200	82 434.614
1987	165 247.720	9 713.200	9 713.200		155 534.520	98 964.089	56 570.431
1988	166 470.560	15 908.556	15 908.556		150 562.005	92 952.927	57 609.078

Central government revenues, expenditures and debt, 1815-2021

Table 6.A.7: Central government debt, domestic and foreign, 1815-2021. Million kroner

Year	Total debt	Foreign debt	of this: fixed debt	of this: temporary debt	Domestic debt	of this: fixed debt	of this: temporary debt
1989	176 546.163	16 939.358	16 939.358		159 606.805	93 228.641	66 378.164
1990	164 944.816	15 915.217	15 915.217		149 029.599	81 568.659	67 460.940
1991	178 025.993	25 439.196	25 439.196		152 586.797	78 601.255	73 985.542
1992	217 041.663	52 549.502	52 549.502		164 492.161	91 221.047	73 271.114
1993	296 381.527	70 780.883	70 780.883		225 600.644	122 655.349	102 945.295
1994	290 216.469	64 663.487	64 663.487		225 552.982	138 874.477	86 678.505
1995	290 757.906	58 452.047	58 452.047		232 305.859	156 955.789	75 350.070
1996	284 892.400	42 449.854	42 449.854		242 442.546	155 309.972	87 132.573
1997	276 219.292	21 193.405	21 193.405		255 025.887	173 593.380	81 432.507
1998	253 594.359	6 292.193	6 292.193		247 302.166	176 344.081	70 958.085
1999	258 827.909	6 822.932	6 822.932		252 004.978	179 849.554	72 155.424
2000	285 924.998	7 314.329	7 314.329		278 610.669	209 287.172	69 323.497
2001	278 692.379	6 255.585	6 255.585		272 436.794	200 505.182	71 931.612
2002	291 039.581	3 514.185	3 514.185		287 525.396	196 101.317	91 424.079
2003	339 840.657	260.991	260.991		339 579.666	224 037.876	115 541.790
2004	320 758.287				320 758.287	207 244.774	113 513.513
2005	334 131.571				334 131.571	241 091.717	93 039.854
2006	269 362.150				269 362.150	184 639.624	84 722.526
2007	265 348.121				265 348.121	185 307.409	80 040.712
2008	349 973.318				349 973.318	213 007.328	136 965.990
2009	627 665.660				627 665.660	204 356.328	423 309.332
2010	653 246.873				653 246.873	236 556.328	416 690.545
2011	557 411.799				557 411.799	210 406.328	347 005.471
2012	617 245.183				617 245.183	274 406.328	342 838.854
2013	604 045.034				604 045.034	288 862.328	315 182.705
2014	485 453.347				485 453.347	343 656.328	141 797.018
2015	482 817.188				482 817.188	337 737.328	145 079.859
2016	515 617.124				515 617.124	382 959.328	132 657.795
2017	522 047.240				522 047.240	390 000.052	132 047.188
2018	523 868.883				523 868.883	400 101.052	123 767.831
2019	510 624.748				510 624.748	394 000.052	116 624.696
2020	637 962.936				637 962.936	469 005.052	168 957.884
2021	652 533.000				652 533.000	466 000.000	186 533.000

Sources: Tvethe (1848), Woxen (1889), Ministry of Finance (1878), Statistics Norway (1926) and Statistics Norway (1978).
 Statistics Norway, <https://www.ssb.no/en/statbank/table/05830>, General government financial assets and liabilities, 1965-2021.

Table 6.A.8: The central government's foreign debt distributed across different currencies, 1815-2003. Million kroner

Year	Foreign debt	CAD	DEM	LUX	FRF	NLG	CHF	JPY	USD	ECU/EUR	SEK	GBP	Multi	Other
1815	12.00		12.00											
1816	12.00		12.00											
1817	12.00		12.00											
1818	12.00		12.00											
1819	12.00		12.00											
1820	14.40		14.40											
1821	13.09		13.09											
1822	12.98		12.98											
1823	12.73		12.73											
1824	12.72		12.72											
1825	12.41		12.41											
1826	12.08		12.08											
1827	11.74		11.74											
1828	12.59		12.59											
1829	12.18		12.18											
1830	11.75		11.75											
1831	11.31		11.31											
1832	10.84		10.84											
1833	10.35		10.35											
1834	7.24		7.24											
1835	6.73		6.73											
1836	5.24		5.24											
1837	4.95		4.95											
1838	4.64		4.64											
1839	4.33		4.33											
1840	4.00		4.00											
1841	3.67		3.67											
1842	3.32		3.32											
1843	2.96		2.96											
1844	2.58		2.58											
1845	2.19		2.19											
1846	1.08		1.08											
1847	0.56		0.56											
1848	6.52		6.52											
1849	6.37		6.37											
1850	6.21		6.21											
1851	10.78		10.78											
1852	10.51		10.51											

Table 6.A.8: The central government's foreign debt distributed across different currencies, 1815-2003. Million kroner

Year	Foreign debt	CAD	DEM	LUX	FRF	NLG	CHF	JPY	USD	ECU/EUR	SEK	GBP	Multi	Other
1853	10.25		10.25											
1854	9.97		9.97											
1855	9.67		9.67											
1856	9.37		9.37											
1857	9.03		9.03											
1858	23.02		23.02											
1859	22.50		22.50											
1860	21.97		21.97											
1861	21.41		21.41											
1862	20.82		20.82											
1863	26.17		26.17											
1864	25.43		25.43											
1865	25.07		25.07											
1866	23.87		23.87											
1867	23.03		23.03											
1868	22.16		22.16											
1869	21.26		21.26											
1870	20.31		20.31											
1871	19.32		19.32											
1872	24.29		18.29										6.00	
1873	23.21		17.21										6.00	
1874	42.02		16.09										25.93	
1875	40.73		14.92										25.81	
1876	63.06		13.70									23.98	25.38	
1877	61.33		12.43									23.97	24.94	
1878	59.79		11.42									23.79	24.58	
1879	89.38		10.67									23.62	55.09	
1880	94.07		0.20									23.37	70.50	
1881	93.74											23.11	70.63	
1882	94.80											22.83	71.96	
1883	95.78											22.55	73.23	
1884	94.56											22.25	72.31	
1885	97.46											21.94	75.52	
1886	96.80											21.61	75.19	
1887	105.53												105.53	
1888	104.89												104.89	
1889	115.40												115.40	
1890	115.11												115.11	

Table 6.A.8: The central government's foreign debt distributed across different currencies, 1815-2003. Million kroner

Year	Foreign debt	CAD	DEM	LUX	FRF	NLG	CHF	JPY	USD	ECU/EUR	SEK	GBP	Multi	Other
1891	114.70												114.70	
1892	124.22												124.22	
1893	123.66												123.66	
1894	162.70												162.70	
1895	143.11												143.11	
1896	142.64												142.64	
1897	167.26												167.26	
1898	166.42												166.42	
1899	186.19												186.19	
1900	219.16												219.16	
1901	217.21												217.21	
1902	251.51												251.51	
1903	249.15												249.15	
1904	250.83												250.83	
1905	289.40												289.40	
1906	328.29												328.29	
1907	325.13												325.13	
1908	321.64												321.64	
1909	316.73												316.73	
1910	312.96												312.96	
1911	349.00												349.00	
1912	344.97												344.97	
1913	340.79												340.79	
1914	336.47												336.47	
1915	354.09								11.19			10.90	332.01	
1916	357.23								29.84				327.39	
1917	346.86								24.25				322.62	
1918	336.33								18.65				317.68	
1919	331.86								18.65				313.21	
1920	337.34								18.65			9.44	309.25	
1921	408.31								93.25			9.91	305.15	
1922	466.89								93.25			72.72	300.92	
1923	511.00								141.74			72.72	296.54	
1924	596.03								216.34			72.72	292.01	
1925	726.21								346.89			19.82	72.18	287.32
1926	713.74								346.89			12.77	71.60	282.48
1927	705.41								346.89			10.06	70.99	277.47
1928	811.43								458.79			10.00	70.35	272.29

Table 6.A.8: The central government's foreign debt distributed across different currencies, 1815-2003. Million kroner

Year	Foreign debt	CAD	DEM	LUX	FRF	NLG	CHF	JPY	USD	ECU/EUR	SEK	GBP	Multi	Other
1929	793.83								457.22			69.66	266.94	
1930	782.32								451.99			68.94	261.40	
1931	757.62								444.41			57.54	255.67	
1932	742.73								436.38				306.35	
1933	726.21								426.96				299.25	
1934	706.28								414.39				291.89	
1935	705.45								401.06		20.00		284.39	
1936	711.46								395.63		38.96		276.86	
1937	692.12								386.35		36.85		268.91	
1938	653.64						33.48		374.89		34.67		210.60	
1939	596.39						33.48		360.15		32.41		170.36	
1940	570.60						32.84		344.56		30.07		163.12	
1941	543.57						32.19		328.08		27.65		155.65	
1942	512.20						31.52		307.61		25.15		147.92	
1943	479.31						30.82		286.01		22.56		139.93	
1944	448.65						30.11		267.00		19.87		131.67	
1945	423.40						29.37		252.07		17.09		124.86	
1946	505.33	45.37					28.61		241.32		72.45		117.58	
1947	702.13	92.42					27.83		294.44		176.48		110.97	
1948	801.76	117.10					27.02		386.52		166.63		104.48	
1949	914.93	117.10					26.19		669.28		4.98		97.38	
1950	1 052.16	117.10					25.34		645.00		174.27		90.45	
1951	1 151.52	104.10					24.45		706.00		172.59	59.90	84.48	
1952	1 198.48	91.09					23.55		732.69		172.59	100.00	78.56	
1953	1 221.73	78.07					22.61		776.03		172.59	100.00	72.42	
1954	1 420.48	65.06					21.65		785.23		310.67	100.00	137.88	
1955	1 714.51	52.05				65.79	20.65		861.60		308.32	96.76	309.33	
1956	1 723.12	39.04				65.79	19.63		794.84		303.53	90.08	410.21	
1957	1 593.64	26.02				65.79	18.58		694.81		280.78	83.11	424.55	
1958	1 512.15	13.01				65.79	17.49		612.26		278.41	75.84	449.35	
1959	2 174.65					65.79	16.37		1 294.36		254.98	68.26	474.89	
1960	2 331.80					65.79	15.22		998.96	71.43	316.79	60.36	517.24	286.02
1961	2 259.34					61.47	95.10		856.76	66.86	287.11	47.85	558.18	286.02
1962	2 376.01					59.98	109.32		950.15	62.14	275.96	39.07	605.03	274.36
1963	2 658.73					55.45	204.43		1 046.87	57.29	333.43	29.91	666.75	264.61
1964	2 713.50					50.91	201.44		1 070.54	52.29	319.40	20.36	733.96	264.61
1965	2 816.84					46.37	198.36		1 210.28	47.15	301.34	10.39	738.34	264.61
1966	2 968.51					41.83	195.19		1 146.45	41.85	282.48		731.82	528.90

Table 6.A.8: The central government's foreign debt distributed across different currencies, 1815-2003. Million kroner

Year	Foreign debt	CAD	DEM	LUX	FRF	NLG	CHF	JPY	USD	ECU/EUR	SEK	GBP	Multi	Other
1967	2 900.31					37.29	191.92		1 097.96	36.38	262.77		745.08	528.90
1968	2 798.20					32.75	188.55		1 043.75	30.76	242.21		731.27	528.90
1969	2 136.26					28.22	185.08		983.83	24.97	224.28		689.88	
1970	1 987.20					23.68	181.51		921.05	19.00	209.18		632.79	
1971	1 767.17					19.87	190.36		786.94	12.98	193.39		563.62	
1972	1 602.42					15.16	190.36		713.84		176.91		506.15	
1973	1 296.30					10.45	194.54		537.79		144.49		409.05	
1974	1 138.74					5.83	226.55		431.30		131.04		344.02	
1975	5 492.22		1 160.85			208.00	1 086.05		1 791.45		113.06		1 132.82	
1976	9 560.54		2 489.74			368.64	2 139.18		3 398.63		94.05		1 070.29	
1977	16 304.76		4 254.31			848.25	3 879.95		5 368.05		66.02		1 888.18	
1978	27 390.76		6 456.96	248.24		1 210.30	6 692.76	2 068.00	8 468.93		52.08		2 193.50	
1979	31 549.15		6 539.60	501.65	245.20	1 745.89	7 893.76	2 472.00	9 757.12		33.54		2 360.39	
1980	29 082.04		5 949.00	482.33	228.20	1 396.68	6 918.34	3 067.20	8 931.42		25.52		2 083.36	
1981	25 366.81		4 259.48	403.56	146.57	1 177.50	6 004.08	3 171.60	7 970.48		18.61		2 214.94	
1982	20 583.50		2 524.08	431.44	150.53	806.85	4 812.36	3 610.80	6 810.10		13.19		1 424.16	
1983	8 607.84		1 272.15	204.45	132.98	503.20	1 981.56	1 330.80	2 376.33		9.03		797.35	
1984	1 184.21		722.58				351.23		27.36		9.12		73.93	
1985	52.46								0.67		8.61		43.18	
1986	6 532.65							2 779.80	3 700.00		8.92		43.93	
1987	9 713.20							6 557.44	3 116.25		8.32		31.19	
1988	15 908.56							9 330.76	6 570.00		7.80			
1989	16 939.36							8 193.34	6 615.00		7.22	2 123.80		
1990	15 915.22							7 734.10	5 907.50		6.62	2 267.00		
1991	25 439.20							5 637.10	9 562.77	7 997.50	6.23	2 235.60		
1992	52 549.50	2 729.40	6 431.40					11 545.46	18 792.80	10 944.51	5.14	2 100.80		
1993	70 780.88	9 905.00	12 999.30					13 988.42	16 644.53	15 017.62	4.22	2 221.80		
1994	64 663.49	8 428.35	13 096.20					13 561.80	14 970.78	14 602.65	3.71			
1995	58 452.05	8 109.68	13 236.30					9 206.10	13 569.44	14 327.24	3.30			
1996	42 449.85	8 231.13	12 429.30					8 312.55	7 392.14	6 082.08	2.65			
1997	21 193.40	8 932.53	6 138.00						738.89	5 132.14	2.01			249.84
1998	6 292.19	3 720.23							769.52	1 523.80	1.39			277.26
1999	6 822.93	4 153.43							811.74	1 607.40	0.71			249.66
2000	7 314.33	4 403.40							890.67	1 763.70				256.56
2001	6 255.58	4 214.25								1 793.86				247.47
2002	3 514.18	3 288.90												225.28
2003	260.99													260.99

Table 6.A.9: New central government debt in foreign currencies, 1946-2003. Million kroner

Year	USD	GBP	DEM	CHF	SEK	NLG	JPY	LUF	SAR	FRF	ITL	ECU	CAD	Other	Total
30.06.1946					58								45		104
30.06.1947	64				107								47		218
30.06.1948	105				17								117		239
30.06.1949	415														415
30.06.1950	3				173										176
30.06.1951	91	60													151
30.06.1952	59	40													99
30.06.1953	80														80
30.06.1954	44				138									71	254
30.06.1955	109					66								179	354
30.06.1956														107	107
30.06.1957														20	20
30.06.1958					21									39	59
30.06.1959	125													679	804
30.06.1960					86									414	499
31.12.1961	168			82										91	340
31.12.1962	215			14										74	303
31.12.1963	264			98	69									86	517
31.12.1964	179													93	271
31.12.1965	214													38	252
31.12.1966														299	299
31.12.1967														65	65
31.12.1968														31	31
31.12.1969															
31.12.1970															
31.12.1971				11											11
31.12.1972															
31.12.1973				4											4
31.12.1974				32											32
31.12.1975	1 395		1 161	962		208			829						4 555
31.12.1976	1 791		1 338	1 059		161									4 348
31.12.1977	2 056		1 765	1 741		480								835	6 876
31.12.1978	3 263		2 203	3 198		362	2 068	248	520					54	11 917
31.12.1979	1 478		771	1 418		536	824	255		245				502	6 029
31.12.1980	431		661	293			595							18	1 997
31.12.1981	847			551			104		20					133	1 656
31.12.1982	1 184		330	422		100	439	28	94	4				106	2 708
31.12.1983	194						127							34	356

Table 6.A.9: New central government debt in foreign currencies, 1946-2003. Million kroner

Year	USD	GBP	DEM	CHF	SEK	NLG	JPY	LUF	SAR	FRF	ITL	ECU	CAD	Other	Total
31.12.1984			16												16
31.12.1985															
31.12.1986	3 700						2 780							1	6 481
31.12.1987							3 778								3 778
31.12.1988	3 454						2 773								6 227
31.12.1989	45	2 124													2 169
31.12.1990		143													143
31.12.1991	6 609						510					7 998			15 117
31.12.1992	11 806		6 431				8 775					371	2 729		30 113
31.12.1993	1 535	121	6 568				2 443			3 826		26	7 176		21 695
31.12.1994			97				111								208
31.12.1995			140							76					216
31.12.1996	188												121		309
31.12.1997	263										250		701		1 214
31.12.1998	91										27				119
31.12.1999	126												433		559
31.12.2000	235										7		250		492
31.12.2001	30														30
31.12.2002															
31.12.2003											36				36

Industrial production and business cycles, 1896-2021

Jan Tore Klovland

7.1 Introduction

This chapter presents new indices for industrial production in Norway covering the years 1896-1948. Separate annual and monthly indices of gross output and labour productivity are computed for 45 manufacturing and mining industries, using annually updated weights based on value added at factor cost. The new industrial production index shows somewhat stronger growth of output in the years before WWI and, in particular, in the 1930s, than the existing index published by Statistics Norway. The new index is linked to the monthly Statistics Norway index in 1948. The new data set thus provides a basis for identifying a monthly business cycle chronology for Norway over the past 122 years.¹

The first part of the twentieth century represents the heydays of manufacturing industries in Norway. At the peak in 1948 the output share of manufacturing and mining industries accounted for 29.2 per cent of gross domestic output.² It is a fact that time series on industrial production constitute a firm basis for measuring output trends and business cycles. The construction of indices of industrial production was therefore of prime interest when efforts to measure aggregate economic behaviour in a systematic manner commenced in the 1930s. Statistics Norway presented the first annual index of industrial production in 1931, which was extended back to 1909 a few years later. It was duly acknowledged that index numbers prior to 1927 were quite uncertain because there were few output figures available before the comprehensive annual production statistics was launched in that year.³

The problem of the lack of annual production data is still a major concern for all who endeavour to reconstruct historical time series of industrial output in Norway before 1927. The methods which can be employed to circumvent the problems will be extensively discussed below. There is still some uncertainty regarding the actual rate of progress of Norwegian manufacturing in the early years of expansion. This is no doubt in part due to data limitations and measurement problems. But even for later periods there are episodes in which different approaches to measuring industrial production yield somewhat different growth patterns. Among the most uncertain periods are the years until the end of World War I and its immediate aftermath, the mid 1920s and the recovery years after the great depression of the early 1930s. These issues do not only concern statisticians, but they are crucial to the discussion of some long-standing issues in Norwegian economic history, to which we return later.

This paper presents new annual time series on real output in 45 industries within manufacturing and mining from 1896 to 1948. The aim is to measure both trends and cycles in output as accurately as possible. When available, actual production figures for specific commodities have been used for this purpose. This applies both to the years prior to 1927, when no annual manufacturing statistics

¹ I am grateful to Øyvind Eitrheim for splicing my data on aggregate industrial production, which are ending in 1948, with the index published by Statistics Norway for the subsequent years. He has also coauthored the section on the period from 1848 onwards.

² Computed from Statistics Norway (1968, pp. 68-69). Note that all statistical publications from Statistics Norway can be found in digitised form on the website <http://www.ssb.no/ahiststat/publikasjoner/>.

³ *Statistiske Meddelelser*, 1931, pp. 184-186 and 1934, pp. 224-237. This source, which is extensively used in this study, was published monthly by Statistics Norway from 1882. The contents included statistical time series and applied economic analyses of current problems.

7.2 Existing index numbers of industrial production 1896-1948

was published, but also to the following years. The archives of the original production returns handed in by the firms were scrutinized in order to extract more quantitative information on output and prices than was published by Statistics Norway.⁴

In order to increase the statistical basis for identifying the timing and amplitude of business cycles in Norway in this period an attempt is made to derive monthly estimates of output for each of the 45 industries. Using the annual output figures as benchmarks, monthly output data are estimated by using a number of monthly interpolators specific to each industry, largely based on labour market data and various production series. The new index is then linked to the existing monthly index published by Statistics Norway in 1948. On the basis of these data series it is thus feasible to construct a well-defined monthly chronology of business cycles in Norway from 1896 to the present.

We start out in section 2 by briefly reviewing the previous efforts that have been made by Statistics Norway and other researchers to construct annual indices of industrial production in Norway. In section 3 the principles underlying the new annual indices derived here are explained. In section 4 the performance of the new index is compared with existing indices at the aggregate level as well as for 13 industry groups. Using the annual indices of the 45 industries as benchmarks monthly estimates of output have been constructed, which are presented in section 5. A brief discussion of the construction of a business cycle chronology for Norway 1896-2017 is given in section 6. Further details about data sources and definitions are provided in Appendix 7.A. Selected data series are tabulated in Appendix 7.B and 7.C, respectively.

7.2 Existing index numbers of industrial production 1896-1948

The production index compiled by Statistics Norway in 1934 covered the years 1909-1932.⁵ Separate indices for 13 subsectors were calculated, weighted together to form an index for total manufacturing and mining, using nominal value added shares for 1927 as weights. This index was updated yearly with minor technical modifications through 1948, when a new industry classification was introduced. Value added weights were changed in 1935 and in 1938.⁶

This index is still the one that researchers are most likely to find when they search the publications of Statistics Norway for an industrial production index extending back to the early 1900s.⁷ This is somewhat unfortunate because by the early 1950s Statistics Norway had duly acknowledged that this index had some obvious shortcomings. This concerned in particular the infrequent change of the basis year weights and the principle of computing a Laspeyres quantity index on the basis of a fixed set of representative goods only.⁸ It also turned out that the assumed correction factors for productivity growth underlying some of the subindices based on hours worked were highly doubtful.

⁴ The source material for the two first years, 1927 and 1928, has been destroyed, but for later years it can be found in The National Archives of Norway (Riksarkivet) in Oslo.

⁵ *Statistiske Meddelelser*, 1934, pp. 224-237.

⁶ In 1935 arithmetic averages of industry group indices were substituted for geometric averages.

⁷ Statistics Norway (1978, p. 218).

⁸ See *Norges Industri*, 1951, pp. 12-14 and Brenna (1951, pp. 51-53).

Industrial production and business cycles, 1896-2021

In the early post-WWII years Statistics Norway embarked on a comprehensive program to establish annual national account estimates for the Norwegian economy back to 1900, later extended to 1865. In this connection production figures for manufacturing and mining were thoroughly revised. No aggregate production estimates stemming from this project seems to have been published for the years prior to 1930, but annual index series for eight main industries for the period 1900-1950 can be found in Stoltz (1955, p. 195). These industries covered 84.1 per cent of the value added at factor cost in manufacturing and mining in 1927.

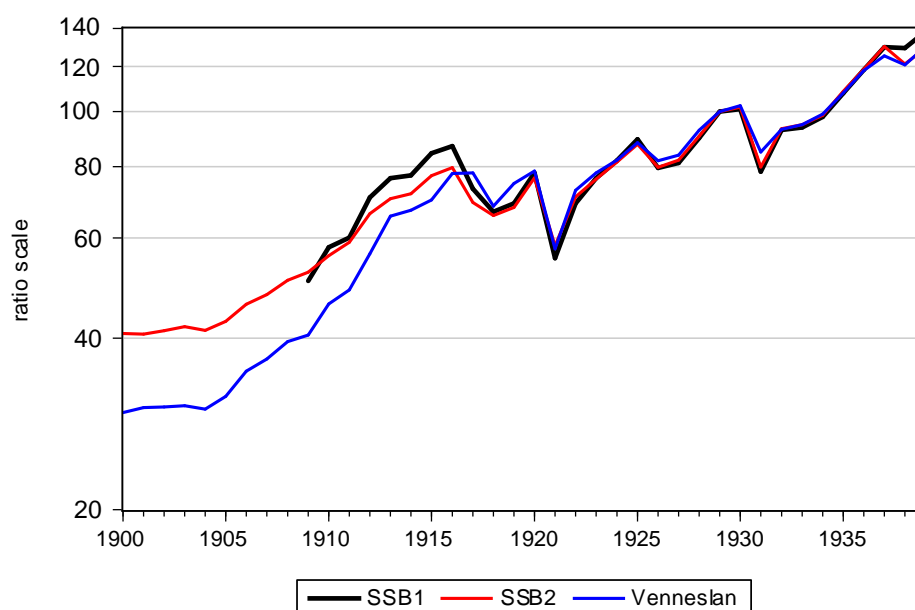


Figure 7.1 *Industrial production indices 1900 - 1939. 1929=100.*

An attempt has been made to reconstruct an aggregate index on this basis by adding index numbers for the missing industries to the revised output estimates in Stoltz (1955). For this purpose index numbers for the five missing industries (clothing, leather and rubber, oils and fats, printing and bookbinding and gas supply) from the original production index published by Statistics Norway were employed.⁹ This index will be referred to as SSB2; the original index as SSB1. The index numbers of the thirteen industries were weighted together following the principles underlying SSB1, using weights reflecting nominal value added at factor cost in 1927, 1935 and 1938.¹⁰

It should be noted, however, that this index is a hybrid measure, as the new series represent estimates of value added (gross domestic product) for the various industries, while the old data refer

⁹ A revised index along the same lines was presented by Venneslan (2008).

¹⁰ Although this was not explicitly stated in the original index it was assumed that value added figures were net of excise taxes, i.e. at factor cost (subventions to industries were negligible before WWII). This essentially concerned the food industry. The same principle was followed by Statistics Norway in the calculation of the new production index after 1948 (see *Norges Industri*, 1951, p. 12).

7.2 Existing index numbers of industrial production 1896-1948

to production values (gross output), both measured in constant prices. The former measure differs from the latter by the subtraction of the costs of raw materials, fuel, energy and packaging materials from the value of production. The levels of the series are therefore quite different, but growth rates may still be fairly close. In practice Statistics Norway must also have considered these two output measures to give approximately the same growth pattern, because it was explicitly stated in Statistics Norway (1952, p. 280) that the figures for net domestic product in manufacturing 1930-1939 were set proportional to the old (SSB1) production index.¹¹ The production series from SSB1 used as supplements to the gross product estimates represented 15.9 per cent of value added in 1927; hence, SSB2 is basically on a gross product basis. It is nevertheless somewhat surprising to find that the manufacturing industries's contribution to GDP for the 1930s were partly based on the old gross output estimates that were known to have certain defects. The results of the new index calculations presented below may indicate that the growth rates of manufacturing output were biased downward in the 1930s. The two indices, SSB1 and SSB2, are shown in Figure 7.1. The mean growth rates computed over the past 3 years are shown in Figure 7.3.

Also included in Figure 7.1 is an index based on the annual estimates of gross product recently derived by Venneslan (2007). A brief presentation of this study is given in Venneslan (2008). These estimates represent a major effort to quantify the production and employment growth of Norwegian manufacturing industries in the years 1896 to 1939. The data are presented on a very disaggregated level (51 industries). In order to derive annual production figures for the period before the annual production statistics commenced in 1927 time series on manufacturing production were extended back to 1896 and recalculated, using information from hours worked and energy installation as well as benchmark estimates from the Censuses of Production undertaken in 1909 and 1916.¹² Trend values were also adjusted in light of censuses of population and handicraft. The time series of aggregate gross product for manufacturing emanating from this work was published by Statistics Norway in 2008, which might suggest that these figures were considered to be an improvement over the existing estimates.¹³ Further details of Venneslan's approach will be discussed below.

Turning to Figure 7.1 it will be seen that the three indices give the same broad picture of the long-run course of industrial production, but there are nevertheless significant differences during some periods, in particular before 1920. Venneslan (2008) claimed that the existing figures had overestimated the level of production in the year 1900, and that the reverse was true for 1910 and later benchmark years. This implied that output growth had been underestimated in the early years of the twentieth century. We return to this topic after having presented the new index constructed here.¹⁴

¹¹ The data in Venneslan (2007) indicate that movements over time in gross product (value added) and production value follow much the same cycles, with slight deviations in trends. Between 1896 and 1939 the average annual growth rate of gross product according to Venneslan's estimates was 3.5 per cent, for gross output 3.9 per cent.

¹² Statistics Norway (1915), Statistics Norway (1922).

¹³ Statistics Norway (2008, p. 107).

¹⁴ New time series for industrial production covering the interwar years were also published in Klovland (1997b), but these estimates are superseded by the new index calculations presented here.

7.3 A new gross output index for manufacturing and mining

This section presents the salient features that distinguish the new annual index numbers covering the years from 1896 to 1948 from the existing indices discussed above. More detailed data series and further notes on sources and estimation methods for the 45 industry groups can be found in Klovland (2015).

Gross product vs. gross output

Within a national accounting framework value added is a key measure of production. This was the point of departure for the bulk of the material underlying the SSB2 index constructed by Statistics Norway in the early 1950s. Venneslan (2007) gives estimates of both gross output (production value) and gross product (value added) in constant prices, thus comprising both concepts. The new index presented here is based on estimates of gross output. There are several reasons for choosing this alternative, given that the perspective is confined to measuring trends and cycles in industrial output. Thus, the focus is on growth and cycles in the manufacturing and mining industries alone, rather than the absolute level of industrial production.

There are basically two reasons why gross output in constant prices provides a sharper and more consistent picture of the progress of manufacturing output in this case. In general, value added calculations necessitate the deflation of gross output as well as intermediate inputs, preferably by separate indices. Any errors in the price indices will often imply a relatively greater error in value added, which is the difference between the two items, than in gross output. This is the well-known pitfall inherent in the double deflation procedure.¹⁵

A second and even greater argument for focusing on gross output is the fact that, prior to 1927, there is virtually no exact information on which annual estimates of raw materials, fuel and energy input can be based. Such estimates must necessarily be founded on guesswork, possibly working from cost shares established on data series beginning 1927, which entails a considerable source of uncertainty. Many previous researchers have been facing this problem in the past and opted for similar ways out. Fabricant (1940, p. 33) noted that, for the United States, data on net physical output (value added) was not available for manufacturing industries, '[t]herefore we have followed what appeared to be the next best procedure: we have combined the indexes of gross physical output for individual industries, with value added as the weight, to measure the output of major groups and total manufacturing output.' This procedure is followed here. It may also be noted that with respect to productivity studies there are some benefits from using gross output rather than value added as the production measure, particularly at a disaggregated level.¹⁶

Because value added figures are needed as weights to construct the index numbers we do not

¹⁵ David (1962) provides a discussion of the sources of the 'potentially nasty index number problem raised by the residual deflation procedure'. Thomas and Feinstein (2004) address this issue with explicit reference to the construction of historical production indices for the UK. See also the discussion in Holmøy and Tødsen (2007).

¹⁶ See for example Cobbold (2003) for a general discussion. Statistics Norway has in recent years also employed gross output estimates for productivity assessments of manufacturing industries, cf. *Økonomiske Analyser*, no. 1/2009, p. 39, Statistics Norway, Oslo.

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escape the problem of estimating *nominal* value added for the years before 1927. This is done in a rather crude way as explained below.

Estimating gross output

There are two main sources for estimating gross output. Beginning 1927 the scope of the *Annual Manufacturing Statistics* (referred to as NI in the following) was greatly increased to include detailed information on quantities and nominal values of output and intermediate inputs in the various industries, thus giving figures for nominal gross output as well as value added.¹⁷ Previously such information had not been collected, except for the two Censuses of Production undertaken in 1909 and 1916.¹⁸ There are numerous problems, however, with the reconciliation of the two latter sources with the NI data from 1927 onwards with respect to coverage, industry classification and other measurement issues.

Before 1927 only man-hours for workers and salaried employees are available on an annual basis.¹⁹ These figures originated from information collected by *Riksforsikringsanstalten* (*National Insurance Institution*), starting with the year 1896. From 1921 Statistics Norway was given the task of preparing these data for publication. We refer to this data source as RTV data.

Beginning 1927 the basis for the gross output estimates at constant prices is in most cases the NI data. For metal mining, coal mining and basic metals annual issues of *Mining Statistics* were used. This source extends back to 1896 and beyond.²⁰ For many - but not all - industries unit price deflators with weights updated yearly can be derived from the published quantity and value information in the NI source. Gross output at constant prices was then computed by deflating nominal gross output by these indices. A similar procedure was followed by Venneslan (2007), but this was in fact not the way the original Statistics Norway index (SSB1) was computed. This index was constructed directly as a Laspeyres quantity index, using a fixed set of representative goods. With relatively infrequent changes in basis years this procedure cannot deal with the problem of new goods in a satisfactory way. As argued by Brenna (1951), this may impart a downward bias to the production index, because the output of new goods is often likely to increase faster than the goods included in the basis year basket. A more natural assumption is that the prices of the goods excluded from the representative basket follow the same course as those included. In their productivity studies undertaken in the 1950s and for the new production index covering the years after 1948 this principle was adopted by Statistics Norway.²¹

For several industries with a small number of firms detailed commodity data were not published due to secrecy requirements. For some of these industries unpublished annual summaries made by Statistics Norway were available in *Riksarkivet* (*National Archives of Norway*) for the years from

¹⁷ *Norges Industri*, annually from 1927.

¹⁸ Statistics Norway (1915), Statistics Norway (1922).

¹⁹ After 1921 only the number (not man-hours) of salaried employees are available.

²⁰ *Norges Bergverk*, annually from 1866.

²¹ *Norges Industri*, 1951, p. 14, Brenna (1951), Statistics Norway (1959).

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1929 onwards.²² In several cases, however, these summaries were missing or incomplete. In order to extract the required data it was then necessary to turn to the original returns submitted by the firms.²³ In a few industries where unit prices of goods produced are very difficult to calculate, such as shipbuilding as well as printing and allied industries, nominal gross output was deflated by specific price indices of materials input and wages originating from these sectors.

The estimation of gross output before 1927 is tricky for most industries because of the lack of output data. The standard procedure, which seems to be the only way out in many cases, is to start with nominal output figures (Z_t) for 1909, 1916 and 1927 (the first two from the Censuses of Production 1909 and 1916), applying a deflator (P_t) to these figures to derive an estimate of real gross output $Y_t = (Z/P)_t$. Labour productivity $Q_t = (Y/L)_t$ is then computed by making use of the annual data on man-hours (L_t). The mean growth rate of labour productivity g between the benchmark years, say 1916 and 1927, is computed as

$$g = (1/11) \cdot [\ln Q_{1927} - \ln Q_{1916}]$$

Using the estimated productivity growth rate and the annual industry specific series on man-hours, an annual output series is then derived for the years 1917 through 1927 ($J=1$ to 11) as

$$Y_{1916+J} = Y_{1916} \cdot [\exp(g)]^J \cdot L_{1916+J}$$

where the initial value, Y_{1916} , has been scaled so that the estimated output volume in 1927 equals the established index number for 1927.

Similar interpolations between 1909 and 1916 (or 1909 and 1927) can be made on the basis of the 1909 Census, but it is quite often the case that the quality of either the 1909 or the 1916 data is so poor that this information must be disregarded. Although the quality of the man-hours data are generally good, this method involves the heroic assumption that labour productivity develops smoothly between the benchmark years, which, of course, is not likely to be strictly true. It is often the case that the non-comparability of the Census data of 1909 and 1916 with the NI-data and the lack of suitable deflators create considerable problems. Although the 1916 Census data conform somewhat better to the NI data base than the 1909 Census, the extreme inflationary environment of the year 1916, when the annual inflation rate was about 40 per cent, creates additional uncertainty regarding the construction of price deflators as well as questioning the accuracy of price information given in the sources of the Census of Production.

Extending the output series backwards beyond 1909 requires an assumption that later productivity trends apply to the early years as well, which is of course even more doubtful. But in the absence of direct output data this is the only way out, and variants of this procedure have been extensively used

²² All source material for 1927 and 1928 appears to have been destroyed.

²³ The industries in question were chiefly: chemicals (matches and explosives, pharmaceuticals, electrochemicals, compressed gases and sundry other chemicals), basic metals (aluminium, ferro alloys), stone, clay and glass products (millstones, glass, china and pottery), leather (rubber products, leather belting), oils (hardened fats and vegetable oils). In an appendix to Venneslan (2007) quantity and value figures for goods produced are listed, but in many cases it seems that quantity figures have been derived by deflating value estimates by general wholesale price indices, not reflecting actual unit prices.

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by Statistics Norway and Venneslan (2007). Venneslan seemed to base his estimates largely on this method, but making an attempt to bring total factor productivity considerations into the interpolation procedure. In view of the incompleteness of the capital stock data - installed horse power is used as a proxy - as well as the limited capital stock of these industries in the early years, it is difficult to assess whether this feature is an improvement upon the use of man-hours as interpolators.

In the new index actual industry output figures, when they exist, have everywhere been substituted for the interpolation method based on man-hours. It turns out that fairly complete data do exist for some industries, mostly back to the early 1900s, and sometimes back to 1896. This applies to such goods as beer, spirits, margarine, cement, pulp and paper and electrochemicals (Norsk Hydro). Other cases, which are based on less complete or indirect data sources, include saw-mills, gas supply, slaughtering, dairying and canning of fish, the latter estimated from the volume of brisling (sprat) and small herring delivered to canning factories. Some of these sources were used by Statistics Norway in the construction of the gross product data for the national accounts project and are thus reflected in the SSB2 index.²⁴

As a necessary supplement to unit price deflators all indices have made use of the existing wholesale price indices, which are reasonably good after World War I.²⁵ In the new index the extensive price data underlying the construction of new monthly price indices for Norway from 1777 to 1920 presented in Klovland (2013) and Klovland (2014) have been used, which is likely to be an improvement, in particular for the years before 1920.

The weighting procedure

There is a long tradition for using nominal value added as weights with respect to aggregating the production series of individual industries to broader aggregates. This principle, which at an early stage was established practice internationally, is followed here and was also applied by Statistics Norway to its first production index in the 1930s.²⁶ The issue of whether value added should be evaluated at market prices or at factor cost (market values adjusted for excise taxes and subventions) was addressed explicitly by Statistic Norway in the early 1950s. The new production index beginning 1949 reflects the latter principle; presumably this was also the case in preceding years.²⁷ The discrepancies between market values and factor cost mainly concern the manufacturing industries producing beer, spirits, tobacco and chocolate, in which taxes roughly accounted for 40 to 60 per cent of value added at market prices. Separate estimates of excise taxes for these industries were found in *Norges Industri*, and for years prior to 1927, in various Parliamentary Papers.

The aggregation procedure followed here weighs together the annual output (Y) relatives in each industry, $b_{it} = Y_{it}/Y_{i,t-1}$, by nominal value added shares $V_{i,t-1}$ to calculate an aggregate quantity

²⁴ A detailed description of estimation procedures can be found in Statistics Norway (1953).

²⁵ The indices compiled by Farmand, Økonomisk Revue and Statistics Norway are tabulated in Statistics Norway (1949).

²⁶ For the practice followed in the United States, see Fabricant (1940) and Frickey (1947).

²⁷ This was changed in 1961, when gross product at market prices were substituted for value added at factor cost as weights. This had the slightly unfortunate consequence of producing a negative weight for one particular industry (dairying and milk products). See Statistics Norway (1979) and *Statistiske Meddelelser 1965, no. 6*.

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relative for year t

$$b_t = \sum_{i=1}^N b_{it} V_{i,t-1}$$

The index value in period t , X_t , is then chained to the previous period's value by calculating

$$X_t = b_t \cdot X_{t-1}$$

and rebasing the index sequence to equal 100 in a base year. The choice of base year is in a sense arbitrary; here, 1929 is chosen, which is a year of relatively high capacity utilization, without too many distortions caused by labour disputes.

A principle of frequently updated weights is in line with modern theory of index numbers.²⁸ The new index differs from the existing indices compiled by Statistics Norway covering this period by updating the value added weights each year. The problems caused by using the same weights for a number of years were in fact repeatedly voiced as a concern by Statistics Norway. In *Norges Industri*, 1950, p.15, it is explicitly stated that the use of a Laspeyres quantity index should have been accompanied by frequent changes of weights, but this was not done due to the wartime disruptions.

As explained above, direct estimates of value added cannot be made prior to 1927. Looking at the available value added figures by industry, it turns out that the ratio of nominal value added to nominal gross output varied quite a lot between the individual industries, but this ratio was confined to a relatively narrow range over time within a particular industry. It was therefore decided to use the average ratios of value added to gross output for each of the 45 industries in the years 1927-1930 to derive a crude approximation for the years before 1927. Nominal gross output were calculated by applying specific price indices to the real output series underlying the index numbers, linking these estimates to 1927 figures on nominal gross output from *Norges Industri*. To the extent that the price and quantity estimates of gross output are reasonably correct, the resulting figures for *relative* value added should be acceptable for our purpose.

The definition of manufacturing

The reliability and accuracy of the annual manufacturing statistics starting in 1927 (NI) is judged to be very good. Statistics Norway devoted much resources to the collection of the incoming returns, performing detailed consistency checks on the data supplied by the individual firms. However, the NI data did not cover all firms, generally excluding those with less than five workers (12,000 man-hours per year). The data based on the files of the National Insurance Institution, had a wider coverage, however. This source (RTV) comprised all establishments using mechanical or electrical power, irrespective of the size of the work force.²⁹ The ratio of man-hours from the two sources was often used as a measure of the coverage of the NI data for a particular industry. In most industry groups

²⁸ Diewert (1987).

²⁹ See for example Statistics Norway (1978, pp. 189-191) for a brief discussion of these sources. A more detailed analysis is given in the preface to the annual issues of the NI statistics (*Norges Industri*).

7.3 A new gross output index for manufacturing and mining

this ratio was well above 90 per cent, but for a few groups with a great number of very small firms, such as sawmills, it was lower.³⁰

The coverage ratio of man-hours for individual industry groups, as defined above, remained fairly invariant over the years for most groups, but the aggregate ratio showed a slight tendency to decline throughout the 1930s, from 93.0 per cent in 1930 to 91.8 per cent in 1938, and further to 90.2 per cent in 1947. This development indicates that the output shares of small establishments increased over time, which calls for an upward adjustment to NI figures. The fact that the ratio increased slightly in the first three years 1927 - 1929, however, was to some extent considered to be due to a more efficient collection of returns from small establishments.³¹ These facts speak in favour of adjusting the NI data to reflect the more consistent coverage of the RTV data. Man-hours of workers and an estimate of hours worked by salaried employees were collected at the most detailed industry level each year and production figures for each industry were multiplied by these RTV/NI ratios.³² The assumption underlying this procedure is strictly that that output per man-hour is the same in small and large establishments, which is not the case if economies of scale exist. On the other hand, it might be the case that worker effort, adding that of the owner, is greater in the very small firms. This assumption, if not being correct, will only impart a notable bias to the estimates to the extent that the coverage ratios for man-hours vary much over time, which is generally not believed to be the case. It should also be borne in mind that the adjustment ratios for most industries range are small, ranging between 1.0 and 1.1.

Benchmarking the output series to the RTV data thus ensures a more consistent definition of manufacturing over the period considered here. However, making the inclusion of establishments contingent on the use of mechanical or electrical power does not take into account the fact that, particularly in the early years, goods were also being produced outside the manufacturing industry as defined here. This applied in particular to industries such as clothing and footwear, in which the use of machinery might be very limited at the turn of the century. Because the fraction of firms using mechanical power increased over time, conducive to these firms being included in the RTV statistics, growth rates of output will be biased upwards in these industries in the early years of the sample. Information from the decadal Census of Population and a Census of Crafts undertaken in 1910 might have been employed in order to make adjustments for the fraction of output emanating from handicrafts, but such additions must in any case rest on a quite uncertain basis. The information in such sources may be rather vague concerning for example the issue of full-time versus part-time employment. Such corrections must surely be made within a national accounts framework, which comprises production from all sources, handicraft as well as manufacturing. For the index presented here, which is explicitly defined with reference to the basis of output originating from manufacturing establishments, it was decided to make no such adjustments.

³⁰ Sawmills had only a coverage ratio of 74.3 per cent in 1929; other groups falling below 90 per cent in 1929 were oils and fats (86.7) and printing and allied industries (87.5).

³¹ *Norges Industri*, 1929, p. 3.

³² Ratios had to be linearly interpolated over the years 1931 - 1933 because the RTV statistics was not published in these years.

The coverage of industries

The new index comprises some industries that were not included in SSB2 until the 1950s. These are dairying, bakeries, slaughtering and coal mining, which accounted for 5.2 per cent of value added of the new index in 1929. With respect to comparisons with the gross output data in Venneslan (2007) the new index comprises metal mining, coal mining and gasworks, which were not included in Venneslan's work. These industries accounted for 4.6 per cent of value added in 1929. This fact must be born in mind when comparing the new index with the indices compiled by Statistics Norway and Venneslan (2007).

7.4 A comparison of index numbers

In this section the new index is compared to the two Statistics Norway vintages, SSB1 and SSB2, described above, and the new data series provided by Venneslan (2007). In the latter case the simple sum time series of gross output in constant prices will be used.³³ All indices are set equal to 100 in 1929.

The aggregate indices

The new index is shown in Figure 7.2 together with SSB2 and Venneslan's gross output figures. At first glance the impression is largely one of congruence. This is hardly unexpected, given the fact that industrial output increased by a factor of more than five between 1896 and 1939, and a further increase was recorded from 1939 to 1948. The differences during some periods are, however, not inconsiderable, and may give rise to varying interpretations.

To help zooming in on the details of differing trends cyclical movements annual index numbers and growth rates are listed in Table 7.1.

Table 7.1: Industrial production indices 1896 - 1948.

Year	Index numbers			Growth rates		
	SSB2	Venneslan	New index	SSB2	Venneslan	New index
1896	NA	27.2	25.8	NA	NA	NA
1897	NA	29.6	29.2	NA	8.4	12.3
1898	NA	31.9	32.3	NA	7.6	10.2

³³ Annual data for the years 1896 - 1939 were extracted from an appendix volume to Venneslan (2007).

7.4 A comparison of index numbers

Table 7.1: **Industrial production indices 1896 - 1948.**

Year	Index numbers			Growth rates		
	SSB2	Venneslan	New index	SSB2	Venneslan	New index
1899	NA	33.9	34.8	NA	6.0	7.5
1900	40.8	34.4	35.6	NA	1.4	2.4
1901	40.6	34.8	36.1	-0.3	1.1	1.4
1902	41.2	34.6	36.2	1.4	-0.6	0.0
1903	41.9	34.9	36.5	1.6	1.1	0.8
1904	41.3	34.0	37.4	-1.5	-2.7	2.6
1905	42.8	35.5	38.7	3.7	4.3	3.2
1906	45.9	39.3	42.4	6.9	10.1	9.2
1907	47.7	41.6	44.9	3.8	5.8	5.6
1908	50.5	44.3	46.9	5.8	6.2	4.4
1909	52.2	45.9	47.9	3.3	3.7	2.2
1910	55.9	50.2	52.4	6.8	8.8	9.0
1911	58.9	51.7	55.0	5.3	3.0	4.9
1912	66.1	57.7	63.2	11.6	10.9	13.9
1913	70.3	63.9	68.4	6.1	10.2	7.8
1914	71.7	64.3	70.7	2.0	0.6	3.4
1915	77.1	66.9	74.1	7.2	4.1	4.7
1916	79.7	72.5	78.4	3.4	7.9	5.6
1917	69.2	72.8	70.1	-14.2	0.5	-11.2
1918	65.7	63.4	65.0	-5.3	-13.9	-7.5
1919	67.8	69.5	67.0	3.3	9.2	3.0
1920	76.5	72.4	71.7	12.0	4.0	6.7
1921	58.1	53.5	52.5	-27.5	-30.1	-31.0
1922	70.8	69.6	66.1	19.8	26.2	23.0
1923	76.1	75.1	71.6	7.2	7.7	7.9
1924	81.5	81.3	76.7	6.9	7.9	6.9
1925	87.6	87.0	82.3	7.1	6.8	7.1
1926	79.8	81.8	75.2	-9.2	-6.2	-9.0
1927	82.1	84.8	78.1	2.8	3.6	3.7
1928	90.5	91.9	86.6	9.7	8.0	10.3
1929	100.0	100.0	100.0	10.0	8.4	14.4
1930	101.8	103.2	100.3	1.7	3.1	0.3
1931	79.9	84.9	80.0	-24.2	-19.5	-22.5
1932	93.3	97.9	92.6	15.5	14.3	14.6

Table 7.1: Industrial production indices 1896 - 1948.

Year	Index numbers			Growth rates		
	SSB2	Venneslan	New index	SSB2	Venneslan	New index
1933	94.9	98.8	93.4	1.6	0.9	0.9
1934	98.5	102.6	100.1	3.7	3.7	6.9
1935	108.5	111.3	110.3	9.7	8.1	9.7
1936	118.6	120.2	121.5	8.8	7.8	9.6
1937	130.0	127.9	132.8	9.2	6.2	8.9
1938	121.2	123.8	131.2	-7.1	-3.3	-1.2
1939	129.2	134.7	140.4	6.4	8.5	6.8
1940	111.5	NA	120.3	-14.8	NA	-15.5
1941	107.9	NA	114.9	-3.2	NA	-4.6
1942	98.2	NA	103.3	-9.4	NA	-10.6
1943	93.9	NA	98.9	-4.5	NA	-4.4
1944	76.3	NA	92.8	-20.7	NA	-6.4
1945	67.3	NA	81.1	-12.5	NA	-13.4
1946	115.3	NA	130.2	53.8	NA	47.2
1947	136.8	NA	156.6	17.0	NA	18.5
1948	152.9	NA	173.9	11.2	NA	10.5

The deviations between the indices stand out more clearly in Figure 7.3, showing average annual growth rates over the past 3 years. The new index shows higher growth rates than the Venneslan index before 1900, but thereafter the course of the two indices is very similar up to 1910. This supports Venneslan's claim that Statistic Norway's index numbers may have underestimated growth rates in this decade. A comparison with the SSB2 index is evidence of this. Output growth was fast from 1910 to 1916, which is the peak year during WWI according to SSB2 and the new index.

We note that there are substantial deviations in the years 1914-1920, when Venneslan's growth pattern differs much from the SSB2 index and the new index. Both SSB2 and the new index fall by more than 10 per cent in 1917, but Venneslan's index is 0.5 per cent higher in 1917 than in 1916. This is rather strange in view of the mounting international trade disruptions, affecting both supplies of raw materials and sales of final products in the final years of WWI. The year 1917 also saw a ten per cent reduction in standard working hours from 10 to 9 hours per day, reducing the number of

7.4 A comparison of index numbers

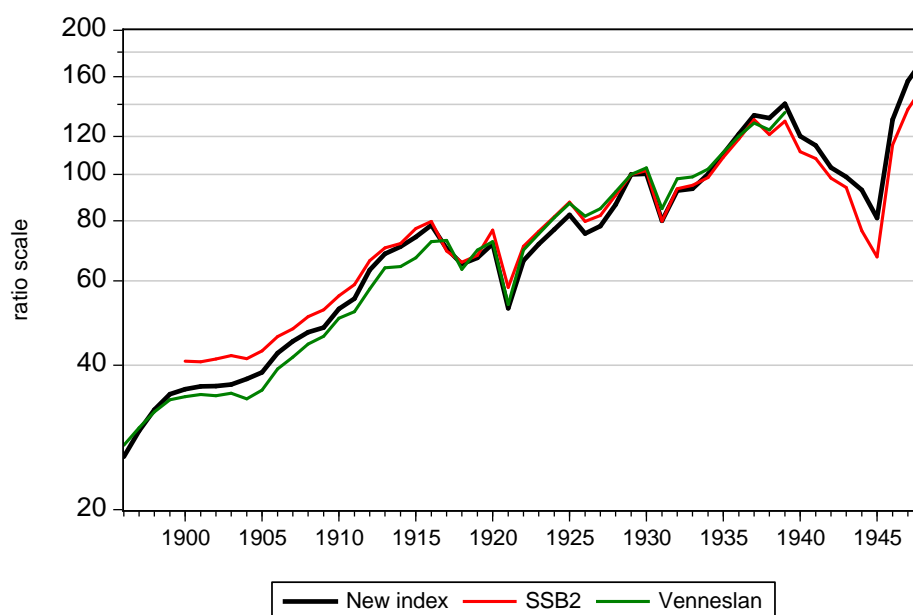


Figure 7.2. *Industrial production indices 1896 - 1948. 1929=100.*

man-hours per year from 3000 to 2700.³⁴ Beginning 1916 the cyclical fluctuations of the new index tend to be somewhat closer to SSB2 than to Venneslan's index. The correlation coefficient of annual growth rates 1917 - 1929 between SSB2 and Venneslan's index is 0.893; between SSB2 and the new index the correlation is 0.982. This fact might perhaps be attributed to more use of direct output figures and less reliance on interpolations based on hours worked in the latter two indices than in Venneslan's data.

The cyclical pattern is much the same in all three indices in the 1920s and the 1930s, but there are some features which warrant a few comments. The new index follows a slightly lower path through the 1920s up to 1928 (1929=100), after being approximately equal to SSB2 in the years 1917 - 1919. This may be of some interest in consideration of the sharply increased unemployment numbers beginning in 1921 which characterized the whole of the 1920s.³⁵ The business cycle expansion in 1928 - 1929 is stronger in the new index, with a flatter peak in 1929 - 1930 than in either of the two other indices. The effects of the great depression on industrial production in Norway is very similar, in particular comparing SSB2 with the new index. A noteworthy feature is a stronger rebound of the new index, with a notably higher growth rate in 1934 and a smaller decline in 1938 than in SSB2. The average annual growth rate (continuously compounded) of SSB2 between 1929

³⁴ In the early years, when the primary information in the RTV source is partly in terms of man-years rather than man-hours, all index calculations follow the standard assumption of 3000 man-hours per year through 1916, 2700 man-hours per year in the years 1917-1919, and 2400 thereafter. This convention was first adopted by Statistics Norway, see e.g. *Norges Industri*, 1922, p.

³⁵ Cf. also the revised GDP figures in Grytten (2015).

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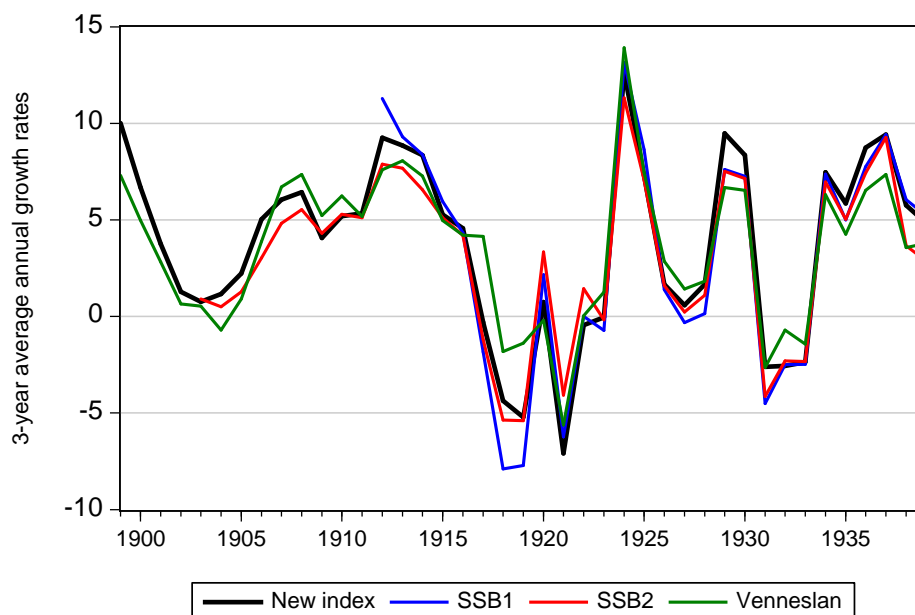


Figure 7.3 *Industrial production indices 1899 - 1939. Annual average growth rates over the past 3 years.*

and 1939 is 2.56 per cent, in the new index the corresponding figure is 3.38 per cent. Because index calculations represented in SSB2 were used by Statistics Norway in computing the gross product of manufacturing and mining for the 1930s this implies that the these industries' contribution to the growth in gross domestic product is underestimated by about 0.8 per cent per year in the 1930s.³⁶ This is noteworthy in view of the debate on the sources and strength of the recovery of the Norwegian manufacturing sector in the 1930s.

The movements of the new index and SSB2 from 1939 through WWII are quite parallel except that the new index records a much smaller decline in output in 1944, which is only marginally compensated for by a stronger reduction in 1945. The recovery in 1946 - 1948 is slightly smaller in the new index, but the overall picture is not much changed.

After WWII Statistics Norway was concerned about the fact that the aggregate production index might be somewhat misleading because it was still calculated on the basis of 1938 value added weights.³⁷ According to the new estimates presented here this concern was not wholly unwarranted, although essentially most relevant for the years 1944 - 1946. The fact that labour productivity in several manufacturing industries was very slow to regain its prewar level was an issue that was often

³⁶ A numerically similar result was discussed in more detail by Klovland (1997b,a). The new index differs somewhat from the one presented in that source with respect to technical details relating to the index number construction, weighting and coverage.

³⁷ *Norges Industri*, 1950, p.5.

7.4 A comparison of index numbers

brought into focus in the early postwar years.³⁸ The new index alleviates this problem slightly by raising the growth rate of output from 1938 to 1948 from about 26 per cent to 30 per cent.

In summary, the new estimates presented here support the claim made by Venneslan (2007) that industrial growth in the years from 1900 to World War I may have been underestimated in the early work published by Statistics Norway. On the other hand, it turns out that the growth pattern of the new index is definitely closer to the revised SSB2 index than to Venneslan's index figures thereafter. The behaviour of the latter index during the years 1914 to 1920 in particular seems rather suspect in view of the evidence presented here. The new index is based on actual physical production figures for individual commodities or specific unit price deflators for at the most disaggregated industry level, while Venneslan's estimates are based on deflating aggregate production values for main industries by general price deflators.

It is unfortunate that most students for many years have been guided to the old SSB1 index (cf. section 2 above), and that the revised estimates made by Statistics Norway for a number of industries in the early 1950s (SSB2) were never published in full and aggregated to an index for total industrial production. Now it seems that Statistics Norway has in some sense 'endorsed' the Venneslan (2007) results as revised and improved estimates, which, except for the first decade of the 1900s, we have argued may be a premature decision.³⁹ Further evidence on the difference between the various indices presented below support this view.

Comparisons for individual industries

We now turn to a comparison of the results for the major industry groups, for which Statistics Norway has published separate indices. As for the aggregate indices the Venneslan's index numbers are computed from his gross output estimates at constant prices. The new group indices are aggregated from the individual industry indices shown in Appendix Table A1, using annually updated value added weights as explained above. These time series are reproduced in Appendix Table A2. The graphs also show the SSB1 index, but note that in many cases this index is identical to SSB2 beginning 1927 or 1930, so that the curve is no longer visible in the graph.

Foods, beverages and tobacco

Foodstuffs, beverages and tobacco represent the largest group of industries in terms of value added. In 1929 they accounted for 23.4 of value added. The indices shown in Figure 7.4 present a fairly coherent picture until 1929, but thereafter the level of the three indices diverge. (SSB2 equals SSB1 after 1929.) The new index comprises several food industries that were only included by Statistics Norway in the 1950s (dairies, bakeries, slaughterhouses), which may account for some of the difference. Dairies, in particular, increased their output in the 1930s; in 1939 the index number for this industry had increased to 275.4 (1929=100). Other expanding industries were chocolate factories (174.2 in 1939) and grain mills (153.2).

³⁸ *Økonomisk Utstyn*, 1950, p. 143; Brenna (1951).

³⁹ Venneslan (2008).

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The Vennesslan data show the highest growth rates in the 1930s. His gross output figures were based on market prices, not factor cost. In the new index gross output as well as value added weights are calculated at factor cost. For this industry in particular this makes a difference in nominal terms. The increase in excise taxes, which were substantial for such products as sprits, beer and tobacco, will inflate gross output at market prices. If this development is duly reflected in the price deflators, output indices should not be affected, but this is nevertheless a potential source of the diverging behaviour.

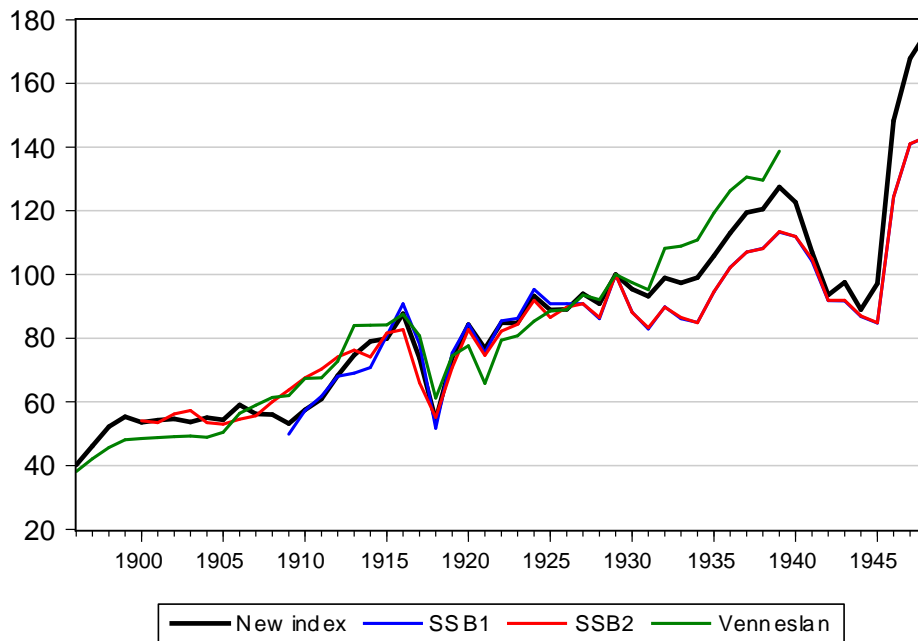


Figure 7.4 *Industrial production indices for foods, beverages and tobacco 1896 - 1948. 1929=100.*

7.4 A comparison of index numbers

Textiles

The textile industry accounted for about six to seven per cent of value added in manufacturing and mining throughout the half century studied here. No direct output figures exist before 1927, except for the Census of Production years 1909 and 1916. The difference between the index numbers will therefore be greatly influenced by the price deflators used to derive output estimates at constant prices in the benchmark years. In this case the price and quantity data for 1916 seem to warrant the use of specific unit prices for calculating real output. This procedure has been followed here. Before 1909 the underlying productivity growth estimate is set equal to the actual growth rate over the whole period between 1909 and 1927.

The new index corresponds very well to SSB2 beginning about 1914. Before WWI a faster growth is implied by the new index. It starts at a level slightly higher than Venneslan's index in 1896 but exhibits a stronger growth over the following two decades to reach the level of SSB2 on the eve of WWI.

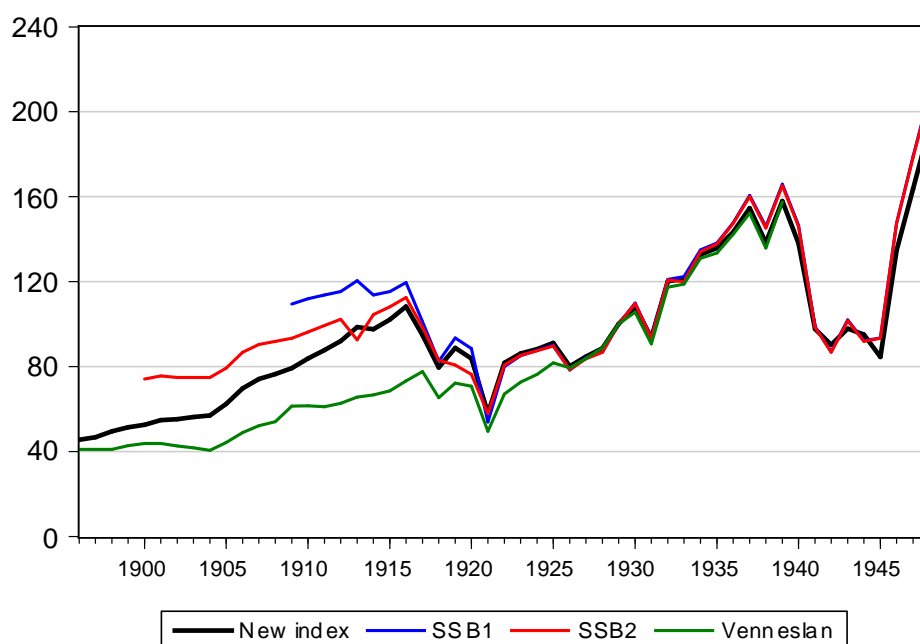


Figure 7.5 Industrial production indices for textiles 1896 - 1948. 1929=100.

Clothing and footwear

As discussed above, index numbers for the earliest decades this industry group are difficult to assess in view of the significant transition of workers from handicraft to industrial firms. Such considerations led Statistics Norway to base its first index calculated for the years 1909-1932 solely on

Industrial production and business cycles, 1896-2021

the manufacture of shoes.⁴⁰ In later vintages the index numbers back to 1927 were recalculated to include clothing as well, but no revisions were made for the years prior to 1927.⁴¹ No new index number (SSB2) was presented for this industry group in Stoltz (1955).

It is consequently no surprise that the SSB1 index deviates quite much from the two other indices in Figure 7.6 in the years before 1927. With the exception of the years before 1900, when the statistics on man-hours is particularly problematic, the new index and Venneslan's index are often fairly close until the early 1930s. Thereafter the new index and SSB1 show the same growth pattern in the 1930s. In the 1940s the new index is at a higher level.

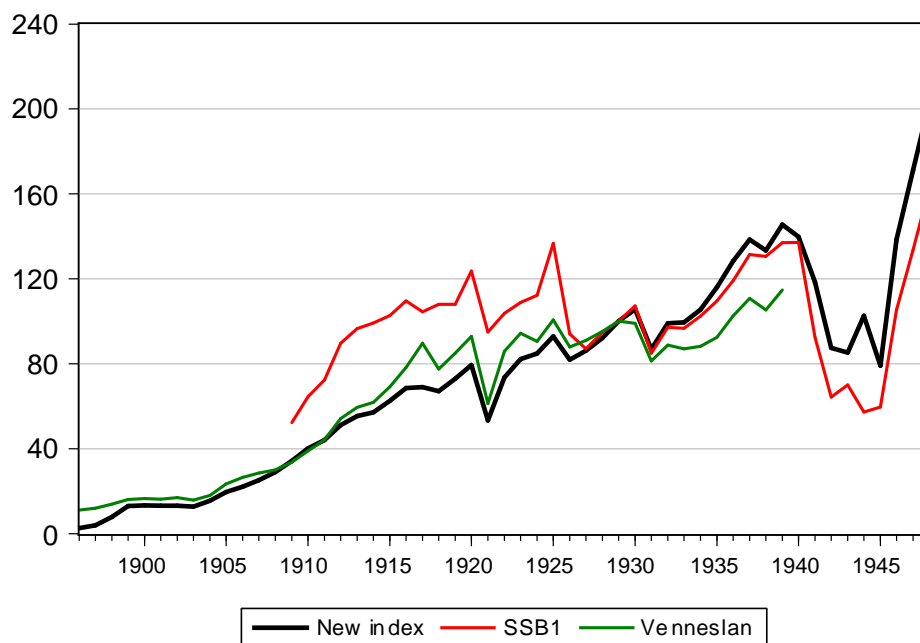


Figure 7.6 *Industrial production indices for clothing and footwear 1896 - 1948. 1929=100.*

Leather and rubber products

The firms within this group produced tanned leather, leather goods and rubber goods, mostly for the domestic market. The structural changes in these industries may be of some importance for the assessment of the course of the output indices. Tanneries and belting factories were most important in the first decades, the latter using initially leather but later primarily balata (a hard rubberlike material) for their products. The demand for transmission belts was great in the early stages of the electrification process but fell off with the coming of the electric motors. From the late 1920s the

⁴⁰ Statistics Norway (1934).

⁴¹ In Statistics Norway (1978, p. 218) the SSB1 index is therefore misleadingly labeled clothing and footwear for the whole period 1909-1948.

7.4 A comparison of index numbers

production of rubber goods for the consumer markets soared, in particular rubber footwear and tyres for bicycles and automobiles.

Output figures for all industries before 1927 are scarce, and even for the period after 1927 it is difficult to measure the output growth of the rubber industry. A detailed examination of the individual returns from the producers of rubber products was undertaken in order to estimate the output index for this industry. The index construction is made difficult in this case because of the rapid technological development, as new products were launched every year. In general, Statistics Norway performed a detailed check on the consistency of the incoming returns. In the case of rubber factories the Bureau was puzzled by the rapid growth of output relative to labour input in the early 1930s, but the correspondence with the management of the firms convinced Statistics Norway that the efficiency of the production process had increased very fast.⁴²

The indices in Figure 7.7 basically show the same pattern of growth until about 1930, but thereafter the new index exhibits more buoyancy than the other indices throughout the 1930s and 1940s. It is likely that the main reason for this stems from measurement problems associated with the technological progress in the rubber industry explained above.

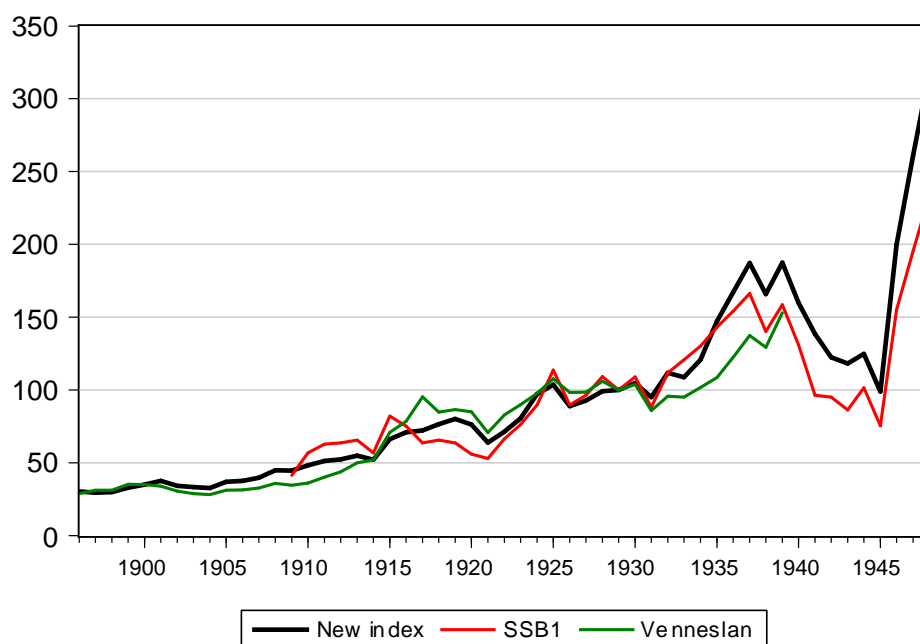


Figure 7.7 Industrial production indices for leather and rubber products 1896 - 1948. 1929=100.

⁴² See Klovland (1997a, p. 114) for a specific example.

Wood products and furniture

This group contains two industries, sawmills and other wood products, the latter essentially producing furniture, doors, windows and sundry manufacture of woods. The sawmill industry was a major export industry at the turn of the century, being the largest of the 44 industry groups listed in Table A1 of the appendix until the eve of WWI. During the interwar years it lost much of its competitive edge, ending up producing mostly for the domestic market. In terms of value added it was surpassed by the furniture industry in 1930. Measuring the output of these industries is not easy before 1927 because such calculations have to employ man-hours and benchmark figures of varying coverage in 1909 and 1916, rendering productivity assumptions rather uncertain. The estimates presented here rely on the contemporary study by Aaseth (1936), who had to struggle with the same patchy data base, but whose judgements seem to be well informed. The same source was in fact used in Statistics Norway (1953). A further problem is the large number of very small establishments; in 1929 the man-hours included in the NI data were barely 80 per cent of those of the RTV data, largely due to the existence of many very small sawmills. This implies that the new index reflects a substantial blow-up factor on the NI output figures beginning 1927. Even the RTV statistics did not comprise all sawmills in operation, although this is only a concern here if their share of output varied much over time.⁴³

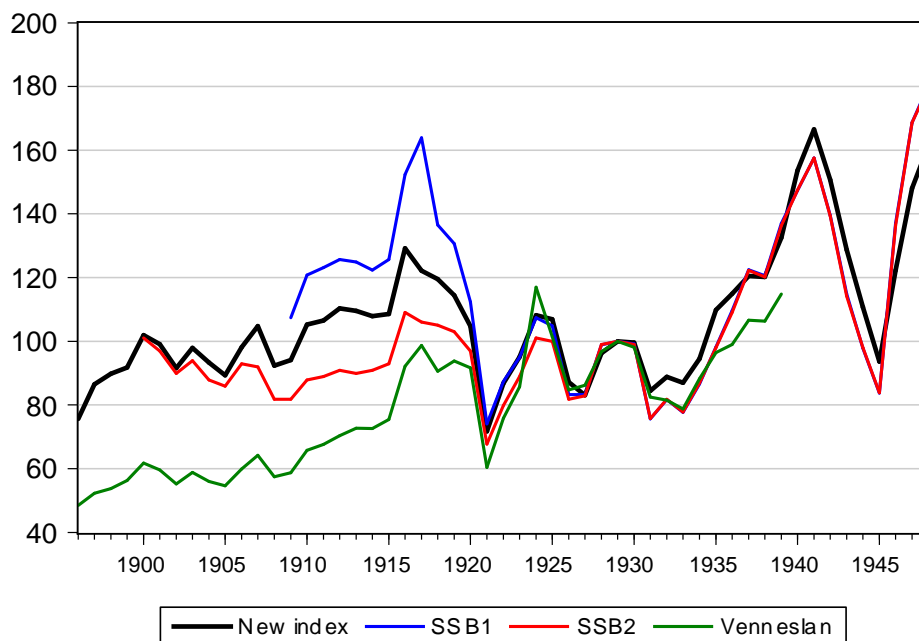


Figure 7.8 Industrial production indices for wood products 1896 - 1948. 1929=100.

Given these measurement problems it is perhaps little surprise that Figure 7.8 reveals a large

⁴³ See the analysis of this feature in *Statistiske Meddelelser*, 1936, pp. 283-292.

7.4 A comparison of index numbers

dispersion of output estimates. The new index starts out in 1900 at the same level as SSB2, but shows more buoyancy over the next decades, navigating between SSB1 and SSB2. The diverging index number estimates apply mostly to the decades before 1920, however. Thereafter the four index numbers move more closely together, although we note a stronger rebound in the early 1930s in the new index. This result is of some interest in view of the debate on the sources and strength of the recovery of the manufacturing industry in the 1930s. Following Sejersted (1982) a strand in this literature places much emphasis on the proliferation of very small industrial firms following the depression of the early 1930s. The wood industry has been viewed as the most typical example of this development. These small firms will in principle be included in the RTV statistics if they used any form of machinery driven by mechanical or electrical power, and thus reflected in the new index through the blow-up factor.

Pulp and paper

Pulp and paper represented a major export industry which had a share of 13.3 per cent of value added in 1929. It is evident from Figure 7.9 that the Statistics Norway indices and the new index are very close before 1940. They are both based on fairly extensive direct output data on mechanical and chemical pulp as well as paper for most of the period from 1900.⁴⁴ The discrepancies between Venneslan's index and the other ones prior to 1920 is probably due to the fact that these output data were presumably not used by him.⁴⁵ Beginning 1940 the new index shows a somewhat higher output level than the Statistics Norway index. It may be noted that by 1948 the Statistics Norway index number was still marginally below the prewar peak in 1937. In 1948 the new index had surpassed the 1937 figure by 15.6 per cent.

Printing and allied industries

This group comprises printing, engraving and plate printing, lithographing and bookbinding. Its share of total value added was about 3 to 4 per cent throughout the period. The estimation of real output for this industry is difficult because the reported production figures are confined to nominal values only; the volume of production is hard to quantify. The measurement problem was approached by constructing indices of industry-specific wage costs and prices of raw material inputs, using on cost shares in benchmark years to construct the index. For 1909 and 1916 and the years beginning 1927, when the nominal values of output are known, real output was calculated by deflating production values by this index. Prior to 1927 the output index was derived from annual time series of man-hours in the usual way. An additional source of uncertainty in the early years stems from the fact that some groups, chiefly bookbinding, were variously classified as belonging to the paper product industry or printing and allied industries.

⁴⁴ The original data series can be found in Norske Papirfabrikanter Forening (1918) and annual issues of *Statistisk-Økonomisk Oversikt* issued by Statistics Norway, beginning 1927. The data series were supplemented and employed as the basis for output estimates for the pulp and paper industries by Aaseth (1936). His estimates are adopted here.

⁴⁵ Venneslan (2007) employed in general the Census of Production figures of 1909 and 1916 to arrive at benchmark estimates for these years, interpolating between these years by means of hours worked and capital stock proxies. There is no specific information as to the use of specific industry output series in his study.

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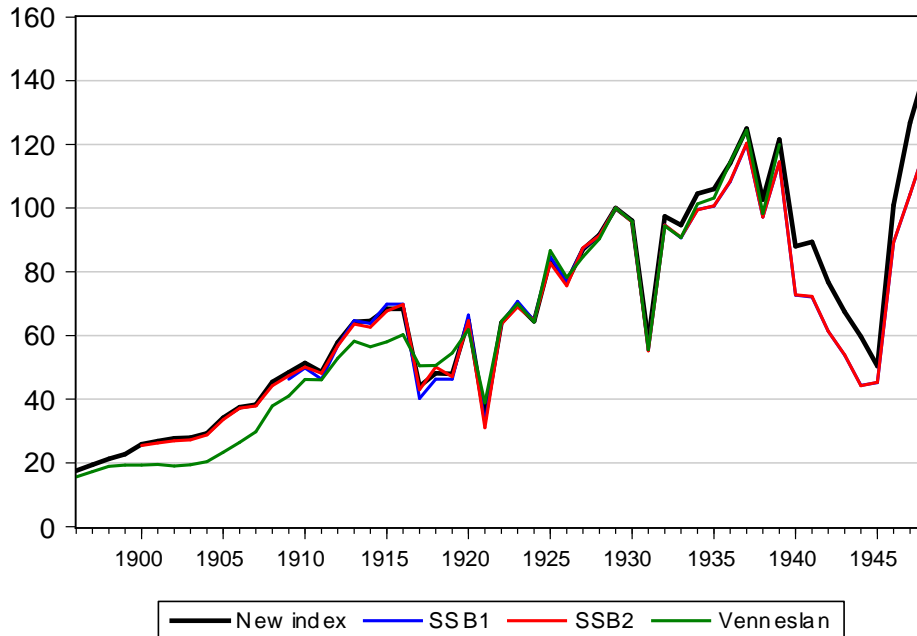


Figure 7.9 *Industrial production indices for pulp and paper 1896 - 1948. 1929=100.*

Given the uncertain data basis for the construction of a production index for this industry it is somewhat reassuring to note from Figure 7.10 that the new index conforms very well to the SSB1 index up to the early 1930s. The Venneslan index starts at a much lower level. In the 1930s and 1940s the new index is rising much faster than SSB1. The question is which of these indices is closest to the actual development is of course difficult to decide. One indicator that can be used is the course of labour productivity. Hours worked are known with certainty, so that any ‘unreasonable’ paths of this variable must be due to the output estimates. According to our labour productivity estimates this figure was 19.6 per cent higher in 1939 than in 1929, then showing a further very modest increase to 21.0 per cent above the 1929 level in 1948. The growth rate of labour productivity is relatively high in the 1930s, being 1.8 per cent per year on the average, but it is in no way an outlier in this connection. In the rubber industry, for example, our estimate for the 1930s is 4.9 per cent per year.

Chemicals

The manufacture of traditional chemical products, mostly produced in light industries, was dominated in the early years by matches and explosives; later such products as paints, cosmetics, detergents, compressed gases, acids, phosphates and tar were added. Another highly energy intensive industry group is electrochemicals, comprising the carbide industry, beginning 1899, and the production of artificial fertilizers, alkalies and other products from the plants of Norsk Hydro, whose output data begin in 1906. The output of the electrochemical industry grew rapidly in the 1900s

7.4 A comparison of index numbers

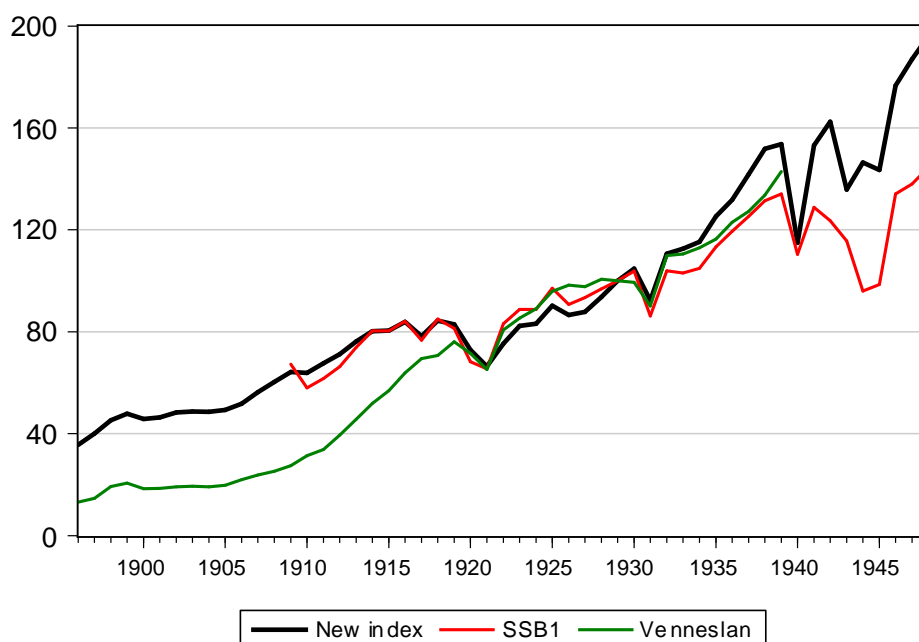


Figure 7.10 *Industrial production indices for printing and bookbinding 1896 - 1948. 1929=100.*

until 1916, when it accounted for 9.2 per cent of manufacturing value added. In contrast the other chemical industries only accounted for 1.9 per cent.

Beginning 1927 a detailed specification of quantities and prices of the various products of the electrochemical industry was obtained from the files in the National Archives of Norway.⁴⁶ Before 1929 a time series of the output of Norsk Hydro, as measured by the nitrogen content of its production from Olsen (1955) was employed. A particular problem with the Norsk Hydro data is the fact that all reported figures after 1910 do not refer to the calendar year, but the year ending in June.⁴⁷ These figures were shifted to calendar years by taking the means of two consecutive years. This may seem as an inconsequential transformation, but it does in fact play a role given the size of this company, in particular by placing the vast expansion of Norsk Hydro's output from its new plant completed in the summer of 1929 partly in this year and not entirely in 1930.

The pattern of the four indices in Figure 7.11 is one of fairly sustained growth over the whole period.⁴⁸ The new index indicates a more marked peak during WWI and its immediate aftermath and a smaller decline during WWII.

⁴⁶ Although the product was of no quantitative importance it may be noted that these files even include data on the production of heavy water, a product surrounded by much secrecy.

⁴⁷ See the table in Olsen (1955, p. 472).

⁴⁸ The SSB1 index is proportional to SSB2 and will therefore not be visible in the graph.

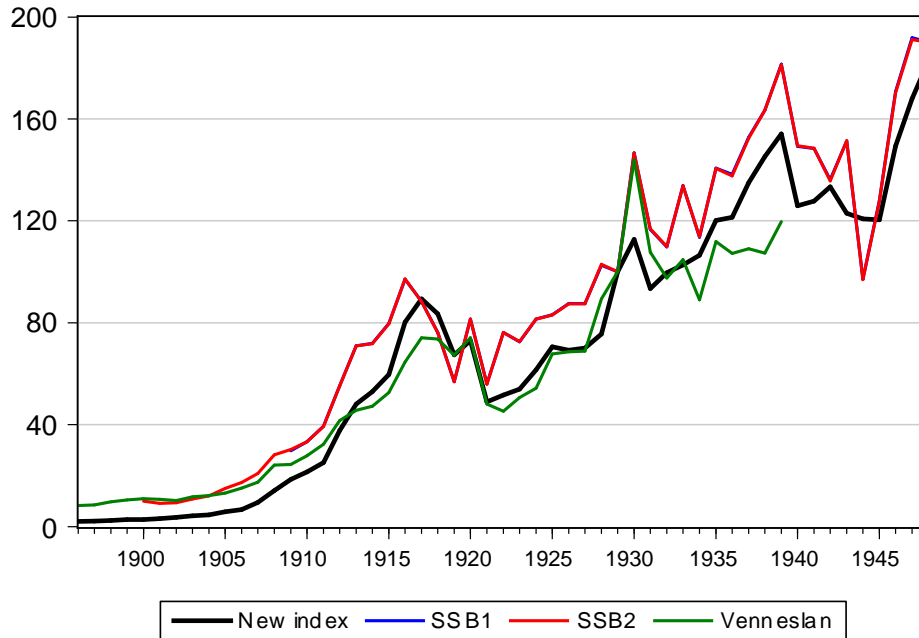


Figure 7.11 Industrial production indices for chemicals 1896 - 1948. 1929=100.

Mining and basic metals

Figure 7.12 shows the results for mining and basic metals. This group consists of metal mining, basic metal production and coal mining. Pyrites, copper ore, silver ore, nickel ore and zinc ore were the chief products of the metal mining industry. The extraction of other ores, such as molybdenite and wolfram, were of more ephemeral character. In these cases prices and quantities increased enormously during the two wars. The metals produced in the nineteenth century included copper, silver, nickel and pig iron; the iron industry was not particularly important at that time, however. Following the huge investments in electricity supply in the decade preceding WWI the new metallurgical industry expanded rapidly. Aluminium, ferro alloys and zinc then became very important export products. Output data from standard sources are excellent for these industries, except for the metallurgical products before the middle of the 1920s, which had to be pieced together from various sources, having recourse to export figures to bridge some gaps in the series.

The inclusion of coal mining is a novel feature of the new index. This industry was not included in the SSB indices in this period. However, the importance of this industry, which was located at Spitsbergen, was slight. At the peak of its relative share of value added in the 1920s it was still below one tenth of that of metal mining.

These industries experienced long periods of strong growth in the 1910s and in the interwar years

7.4 A comparison of index numbers

but collapsed during the two world wars. The new index is very close to the Statistics Norway indices, which is easily explained by the availability of the underlying output data.⁴⁹

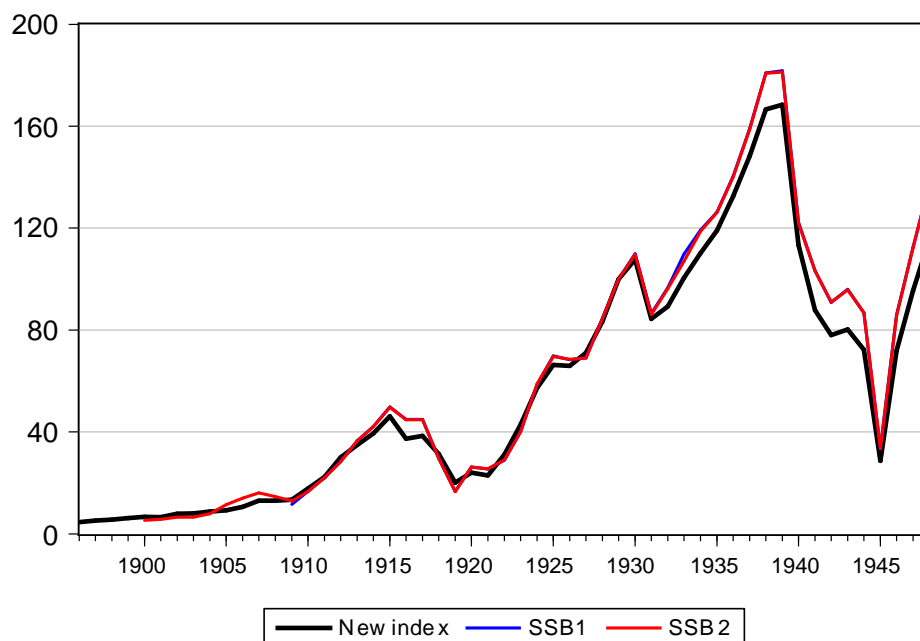


Figure 7.12 *Industrial production indices for mining and basic metals 1896 - 1948. 1929=100.*

Stone, glass and clay products

Stone quarrying, manufactured stone, cement and cement products, bricks, glass products, china and pottery were the products of this group. These industries accounted for 4.2 per cent of value added in 1929. Stone products, in particular paving stone, and cement became relatively important export industries in the 1920s, but these industries found it increasingly difficult to sell their products abroad after the Great Depression of the early 1930s.

Output figures before 1927 were only available for cement.⁵⁰ For the other industries benchmark figures from 1909 and 1916 were combined with productivity trends and data on man-hours to construct the output series. The indices in Figure 7.13 present a rather diverse picture before 1920, which may in large part be due to the weak data base. After 1920 the indices are much more internally consistent, in particular the SSB1 and the new index.

Iron and metal products

The indices for iron and metal products, which represented 19.6 of total value added in 1929, are shown in Figure 7.14. The most outstanding feature of this graph is the vast difference before the

⁴⁹ Venneslan (2007) did not present output estimates for metal mining.

⁵⁰ Christiania Portland Cementfabrik (1942); Gartmann (1990).

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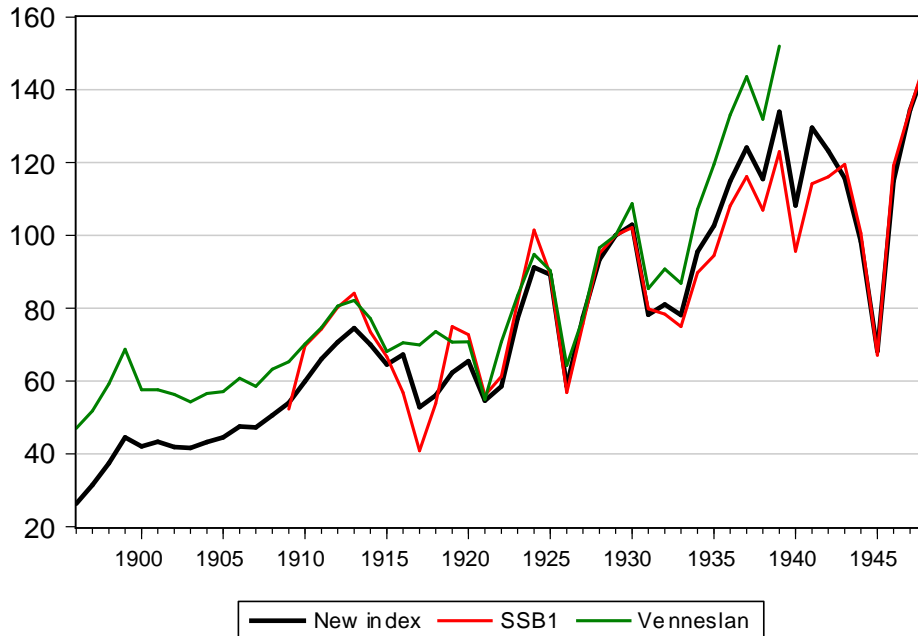


Figure 7.13 *Industrial production indices for stone, glass and clay products 1896 - 1948. 1929=100.*

early 1920s between SSB1 on one hand and SSB2 and the other indices on the other. When the original SSB1 index was constructed in the early 1930s it was based on hours worked. Clearly, the underlying productivity assumptions must have been rather wide of the mark, indicating a decline in output of about 39 per cent between 1916 and 1923, whereas SSB2 records an increase of 2 per cent. Yet it is the SSB1 index that unwary researchers are most likely to put into their computers because it is the only alternative tabulated in Statistics Norway (1978).

The reestimation of gross output for iron and metal industries for the years 1900 to 1929 in Statistics Norway (1953) was undertaken on a very disaggregate level, using indices of raw material prices and wage costs as deflators of nominal output figures. The new index employs partly the same procedure, but unit prices of semi-manufactured goods were also used to construct the price deflators. It is seen that SSB2 index is fairly close to the new index, although the latter moves at a lower level from the early 1910s through the 1920s. The Venneslan index starts at a lower level in 1896, indicating higher growth in the first decades. After 1929 the SSB2 index, as tabulated in Stoltz (1955, p. 195), was spliced with SSB1. Despite the fact that the latter was computed on the basis of man-hours only, the differences between this index and the new index are fairly small, except during the war years, when output seems to be somewhat overestimated according to SSB2.

7.4 A comparison of index numbers

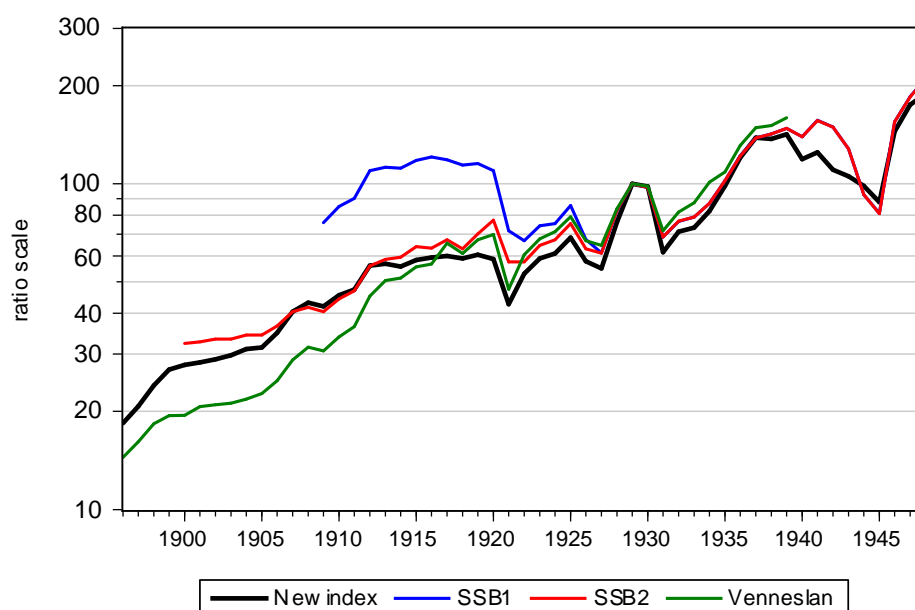


Figure 7.14 Industrial production indices for iron and metal products 1896 - 1948. 1929=100.

Oils and fats

Oils and fats from marine sources are dominating this group, which also comprises vegetable oils and meal as well as various consumer goods produced by soap factories and similar light industries. A particular problem arises from the fact that some of the main products, fish oils and herring meal, were produced in very small factories, many of which were not reporting to either the NI or the RTV statistics. Much higher output figures are to be found in the fishery statistics, which had a far better coverage of these products.⁵¹ Hence we use output data throughout the whole period from this source in the case of cod-liver oil, and foreign trade data as a supplement before 1927 in the case of herring meal and fish meal. This extension of the data base is presumably not incorporated in the SSB1 and Venneslan indices. Output data on hardened fats derived from crude whale oil and vegetable oils and meals were not published in NI but were recovered from the original sources in the National Archives.

Figure 7.15 discloses large discrepancies between the indices. The differences are very marked in the early years, which may largely be attributed to the extended data base of the new index. In addition, during WWI in particular, there were huge increases in the prices of export goods based on marine oils. By employing annually updated value shares as weights the new index may behave differently from the SSB1 index in this period. Beginning in the mid-1920s the SSB1 and the new index are quite close.

⁵¹ NOS Norges Fiskerier.

Industrial production and business cycles, 1896-2021

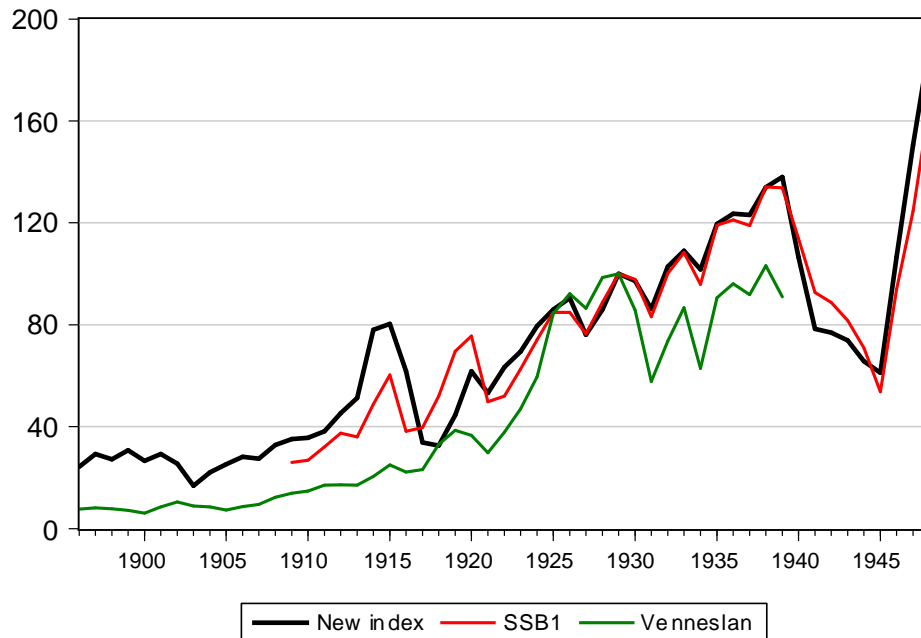


Figure 7.15 *Industrial production indices for oils and fats 1896 - 1948. 1929=100.*

Gas supply

Gas works only accounted for about one per cent or less of total value added. The gas companies, the largest of which were owned by municipalities, produced gas for public consumption, coke and coal tar. The construction of the output index prior to 1927 follows the approach taken in Statistics Norway (1953). In addition to man-hours and Census of Production data for 1909 and 1916 output figures from Oslo and Bergen gas works were used to arrive at estimates for the whole industry.⁵² The latter sources are not wholly complete, but do exist for most years.

Figure 7.16 shows that the new index behaves roughly like SSB1. The largest divergences are to be found before 1927, when the data sources are less complete.

⁵² This information can be found in annual issues of *Statistisk Årbok for Kristiania (Oslo)* and *Statistisk Årbok for Bergen*.

7.4 A comparison of index numbers

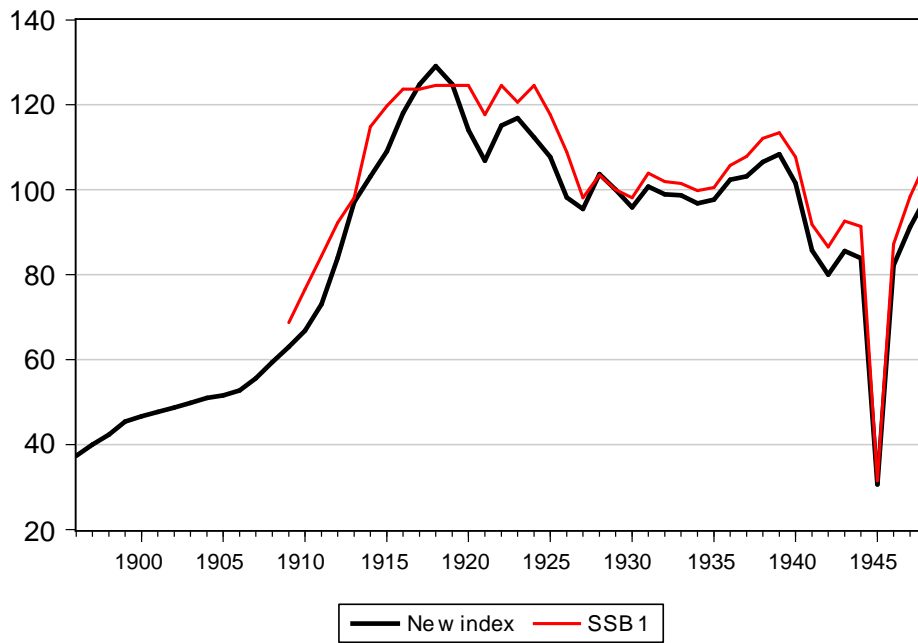


Figure 7.16 Industrial production indices for gas supply 1896 - 1948. 1929=100.

7.5 Monthly index numbers

The construction of the new index 1896-1948

On the basis of the annual production indices of the 45 industries monthly indices were constructed for each industry for the whole period 1896 to 1948.⁵³ This was achieved by applying a procedure suggested by Litterman (1983). This method distributes the annual values over the twelve months of the year, using related series as interpolators; in the case of no monthly related series being available only a constant and a time trend. The only parameter to be specified relates to the choice of the statistical time series properties of the error term arising from discrepancies between the average of preliminary monthly values and the annual figures of the index. In most cases a random walk specification for the error term was chosen, but in some cases more reasonable results were obtained with a first-order serial correlation assumption.⁵⁴ In addition to smoothing the intra-year movements, this method ensures that the annual average of the estimated monthly data equals the true annual average. Accordingly, the monthly and annual indices for a particular industry will be growing at similar rates over time.

To illustrate how the method works let us consider Figure 7.17, which employs data from the production of chemical wood pulp in the period 1920 to 1932. When the annual index numbers of this industry are distributed evenly over the year, this results in the green curve marked by discrete jumps at year-ends. By applying the Litterman (1983) algorithm to the annual data a much smoother time series is obtained, while still keeping the annual mean of the monthly figures equal to the annual benchmark.⁵⁵ Even if no true monthly related series are available, leaving only a constant term and a linear time trend as interpolators, this method produces a monthly curve (shown in red in Figure 7.17) that to some extent reflects the underlying intra-year fluctuations. Although the exact monthly fluctuations of time series that exhibit significant short-term fluctuations cannot be mimicked closely by this crude method, in many cases the general *direction* of intra-year movements are picked up by this simple method. This may be helpful in locating cyclical turning points. In this particular case there exist fairly complete and reliable monthly output figures, which can be employed as related series.⁵⁶ Monthly index values obtained by using the related series are shown in Figure 7.17 in black. This series reflects the intrinsic choppiness which is so characteristic of many monthly output series, but also the very significant decline in output during several months in 1921, 1924, 1926 and 1931. This phenomenon was caused by widespread labour conflicts in this case.

With a view to adding information on intra-year fluctuations in the construction of monthly index numbers of the 45 industries a large number of monthly time series that could be used as related

⁵³ Klovland (2015) contains a detailed discussion of these data series.

⁵⁴ The basic idea of this algorithm originates from early work by Friedman (1962) and Chow and Lin (1971) on how short-term information on related time series can be used to convert annual data into a monthly series.

⁵⁵ A slightly modified form of this method included with RATS version 9.0 was used for this purpose.

⁵⁶ Monthly data series on the production of mechanical and chemical pulp are available from various issues of *Statistiske Meddelelser* and *Statistisk-Økonomisk Oversikt* (later known as *Økonomisk Utsyn*), the latter beginning 1927, published by Statistics Norway.

7.5 Monthly index numbers

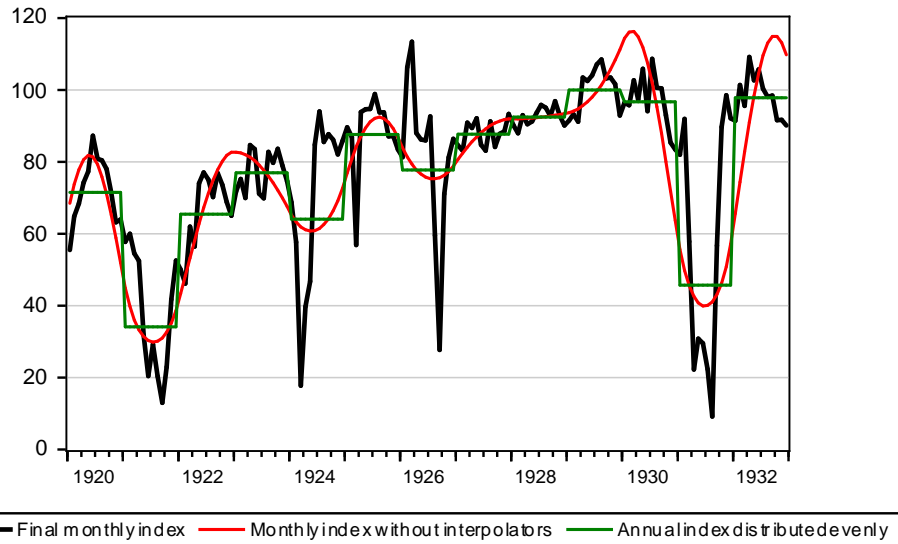


Figure 7.17 Monthly estimates of output indices for the chemical wood pulp industry, 1920 - 1932. 1929=100.

series were collected. In most cases these time series are specific to a particular industry or a group of industries. The following categories of monthly time series were considered:

- physical output series (1896-1948)
- employment figures (1904-1948)
- number of persons seeking employment at labour exchanges (1919-1939)
- trade union unemployment rates (1904-1939)
- workdays lost due to labour conflicts (1904-1939)
- export volumes (1896-1939)
- raw materials input (1909-1939)
- monthly production indices (Statistics Norway, 1933-1948)

In general, physical output series were used whenever such data existed; otherwise labour market variables turned out to be the most useful ones, basically due to the fact that these data were available at a fairly disaggregated level. Export volumes exist on a monthly basis for many important products, but due to fluctuations in stocks of finished goods such data may reflect monthly fluctuations in output rather poorly. Export volumes were only used in a few cases as a supplementary related series for some periods, chiefly in the case of basic metals and pulp and paper industries in the early years. Raw materials input in the form of quantity of fish delivered to canning factories were aggregated from weekly reports 1909-1939 in *Fiskets Gang* and used for estimating the output index of the canning industry. This is a very good short-term indicator of the often extreme month-to-month

Industrial production and business cycles, 1896-2021

fluctuations of output in this industry because of the short time lag between the delivery of sprat (brisling) and small herring to the factories and the canning process.

Beginning 1933 Statistics Norway constructed monthly indices for total industrial production. Separate indices for home and export industries as well as indices for the production of consumers' and producers' goods were also published.⁵⁷ At the most disaggregated level monthly time series for 9 of the most important industry groups were regularly published.⁵⁸ The coverage of these data in terms of hours worked by the reporting sources varied quite much across industries; from 11 per cent in the furniture and wood processing industry to 100 per cent in various industries within the stone and glass, oils and fats and foodstuffs groups.

The labour market variables and the production indices chosen as related series were as far as possible specific to the industry in question. It is important to recognize that as a rule each of the monthly time series only existed for part of the whole sample period, which necessitated a pragmatic selection procedure. Several specifications were often tried out for various subperiods. The criteria used for selecting the final set of related series in each period were basically that coefficients were of the right sign in the auxiliary regressions and that the resulting estimates passed a visual inspection.

Although one would have liked to have a fixed set of monthly interpolators covering the whole period this is not possible except in a few cases. The main implication of this fact is that the estimated volatility of intra-year fluctuations may exhibit some spurious changes over time. In particular, it is to be expected that the resulting monthly series are generally smoother in the first years, especially before 1904 when labour market variables first become available. It is therefore obvious that the new monthly estimates cannot be used to study how short-term (intra-year) output volatility developed over time.

The new monthly production index 1896-1948

Figure 7.18 presents the aggregate monthly production index. The aggregation of the 45 monthly indices was performed in a way similar to the annual index, using a Laspeyres quantity index formula with annually updated basis years and weights. For each month the ratio of the index value of each industry relative to previous year's average index number was computed, then using the previous year's shares of nominal value added as weights.⁵⁹ As explained above, the Litterman (1983) algorithm ensures that the means of the monthly index numbers are equal to the annual index number for each year.

The dominant feature of the total index shown in Figure 7.18 is the secular growth trend; the cyclical fluctuations will be more evident when the series is purged of the underlying trend. We return to this in the next subsection.

As a comparison the original Statistics Norway's monthly index is also shown in Figure 7.19 for

⁵⁷ *Statistiske Meddelelser*, 1934, pp. 42-44.

⁵⁸ In a personal communication dated 20 January 1995 Svein Longva (at that time director of Statistics Norway), kindly provided the monthly index numbers for the remaining industry groups that have not been published.

⁵⁹ This is in line with the procedure presently used by Statistics Norway, see Finci et al. (2014).

7.5 Monthly index numbers

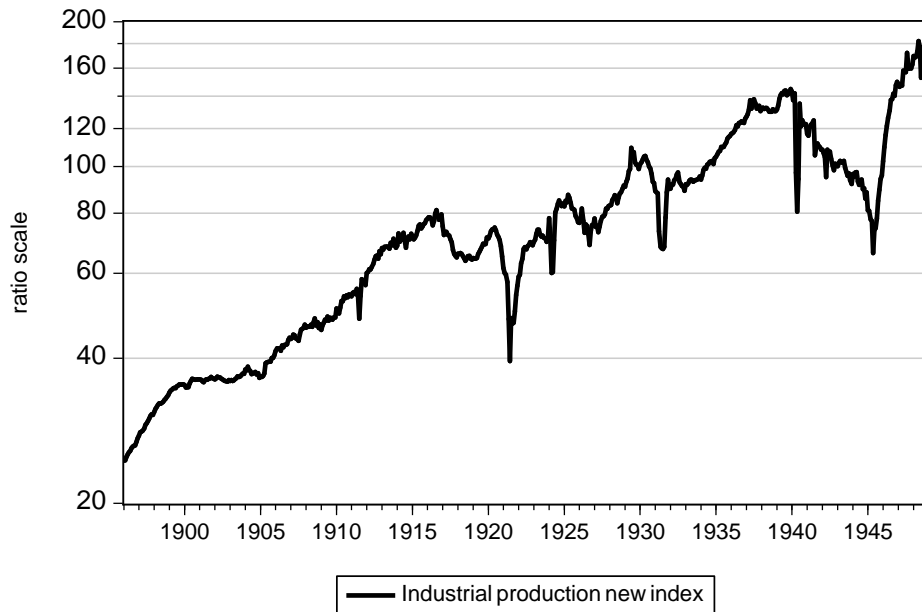


Figure 7.18 Total industrial production, monthly 1896 - 1948. 1929=100.

the period covered by this index, beginning in 1933. The Statistics Norway index has been seasonally adjusted by the X11 method and the level was shifted to equalize the mean of the new index for 1933. In contrast to the new index, the Statistics Norway monthly index was not regularly benchmarked to the annual index, which resulted in different growth rates over time.⁶⁰

In general, there is a good correspondence between these two monthly indices. The cyclical properties are very similar. Production growth was quite steady from 1933 in both indices, but initially somewhat faster in the new index. Business cycle peaks occurred in 1937 and 1939. The distortions to output following the German occupation in April 1940 and the subsequent persistent fall in output is highly visible in both indices. The same applies to the trough in May 1945. Thereafter the new index grows somewhat faster than the Statistics Norway index. In sum, this comparison gives some support to the feasibility of using the new index through 1948 and splicing it with the Statistics Norway monthly index thereafter, thus obtaining a continuous run of a monthly time series for industrial production for more than a century, beginning in 1896.

A link to the monthly industrial production index 1949-2017

Beginning 1949 Statistics Norway published an industrial production index that corresponded to the new industry classification. The methodology underlying this index was improved compared with

⁶⁰ This concerned in particular the index for metal products and machinery, see for example *Statistiske Meddelelser*, 1949, p. 304.

Industrial production and business cycles, 1896-2021

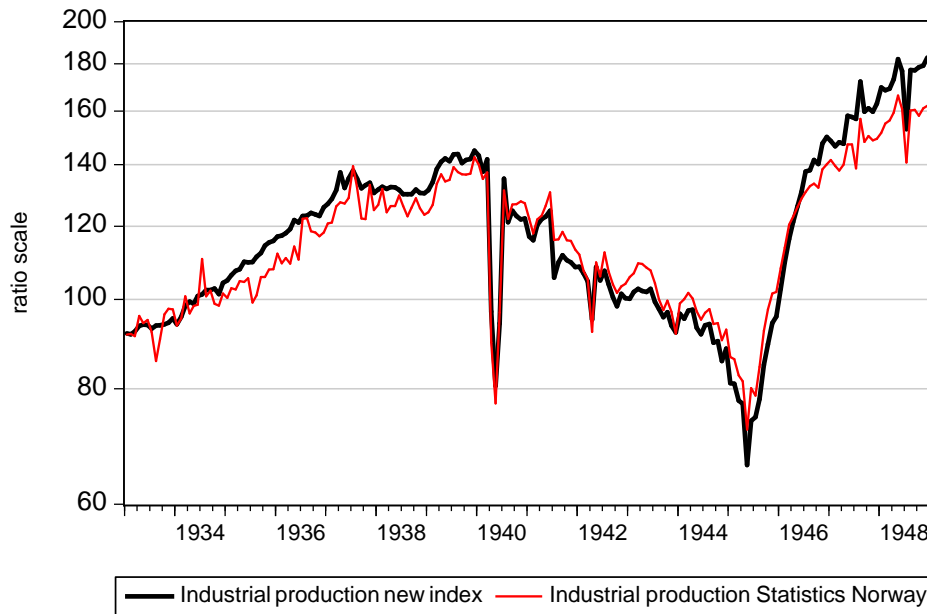


Figure 7.19 *The new index and Statistics Norway production index, monthly 1933 - 1948. 1929=100.*

the index published for earlier years. The original data series published by Statistics Norway changed basis years, weights and definitions at several points in time and had to be adjusted in various ways to form a consistent series. We have linked our monthly index for the years prior to 1949 to this index, thus providing a continuous monthly production index for the 122 years from 1896 to 2017. The index is tabulated in the appendix.

Figure 7.20 shows the seasonally adjusted monthly index 1948-2017. The fluctuations in the monthly industrial production index in Norway may be rather choppy, partly because particular events in one or a few major industries may significantly influence the total index, but also because the standard seasonal adjustment method applied here (X11) does not take into account the fact that Easter may be either in March or April, or both. Therefore we work with 3-months moving averages of the monthly index in the following analysis.

The postwar development in industrial production in Norway is well known, and here we only note two features that are relevant for our discussion of business cycles below. The first three decades of the postwar period were characterized by a strong and largely uninterrupted growth in industrial production. The trend rate of growth shifted sharply downwards in 1974. This was initially due to the protracted international recession following the first oil crisis, but subsequently structural changes in the Norwegian economy caused a persistent decline in the share of industrial production in total gross domestic product. We also note that there are few obvious marked cycles in the *level* of industrial production, particularly until the mid 1970s. It is only in the final two decades that we can identify

7.6 Cycles in industrial production

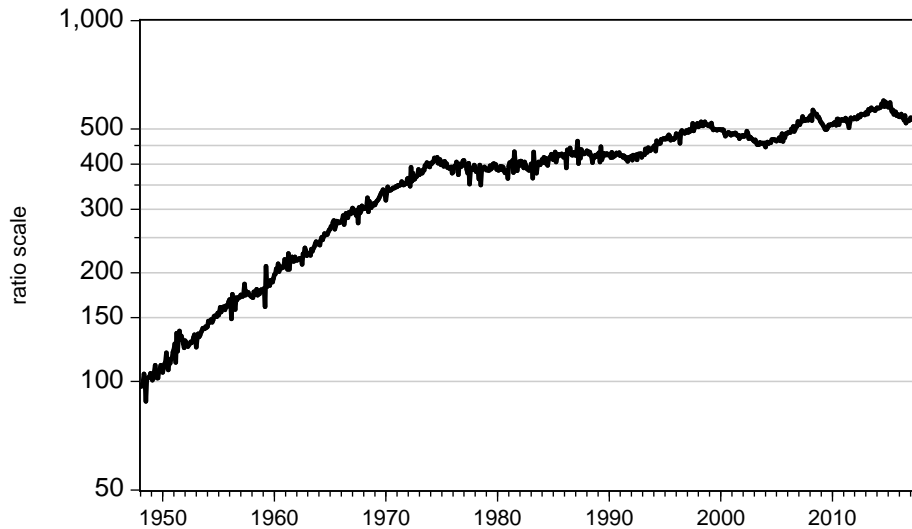


Figure 7.20 Industrial production, seasonally adjusted, 3-months moving average of monthly data January 1948 - March 2018. 1948 = 100.

well defined cycles. Hence, it is most fruitful to study growth cycles, in which deviations from trend are used, rather than classical cycles, which are based on movements in the level of production.⁶¹

7.6 Cycles in industrial production

The period 1896-1948

In order to extract the growth cycles from the new index the trend of the series was estimated by applying a Hodrick-Prescott filter with a smoothing parameter λ set equal to 140 000. The cycle series shown in Figure 7.21 is the difference between actual time series and the computed trend. The recurrent short periods of widespread labour conflicts, in particular during the interwar years, stand out in this picture. A crude attempt was made to smooth the cyclical series for these distortions by regressing the total index on the number of workdays lost for the period 1904 to 1939. This procedure modifies the cyclical fluctuations slightly in some periods, most evident in the summer of 1911, during 1924 and in the very extensive conflict in 1931. The deep but rather short-lived recession of 1921 is less affected by this adjustment.

The adjusted cycle series were used as the basis for determining the turning points of the cycles in industrial production. In order to assist in the selection of turning points the monthly cycle data were first run through a computer program which applies the algorithm suggested by Bry and Boschan

⁶¹ The turning points for the Norwegian economy studied by Aastveit et al. (2014) are defined in terms of classical cycles.

Industrial production and business cycles, 1896-2021

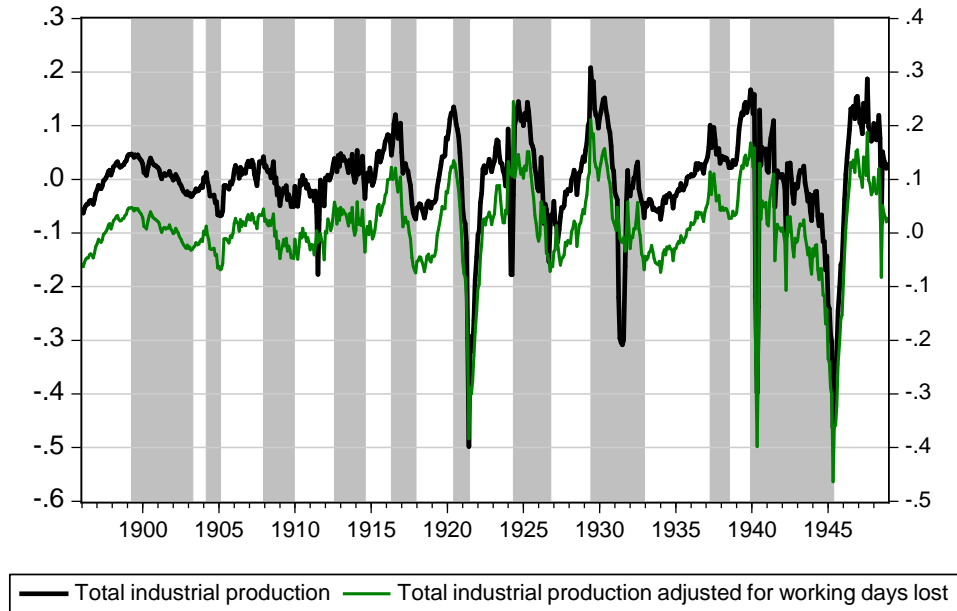


Figure 7.21 *Cycles in industrial production, monthly 1896 - 1948. Contraction periods are shaded.*

(1971).⁶² This method applies smoothing filters in several steps to locate the peaks and troughs of the time series, starting with a 12-month moving average filter, and ending with the raw data series. The identification rules comprise several constraints, including a minimum duration of the cycle phases and a minimum amplitude of the cyclical fluctuations.

The turning points shown in Table 7.2 are based on the application of this method except for the cycles in the early 1930s and during WWII.⁶³ Also shown in this table are the turning points of business cycles of Norway's trading partners. For the interwar years these are detailed measures based on the trade-weighted monthly industrial production indices of 14 of the most important trading partners as constructed in Klovland (1998). Before 1920 the information is less comprehensive as the corresponding turning points of only the most important trading partner, the United Kingdom, are shown in the table.⁶⁴

⁶² A procedure included with RATS version 9.0 was used for this purpose. Aastveit et al. (2014) applied a version of this algorithm in order to identify business cycles in Norway in recent years, concluding that the Bry-Boschan approach provided the most reasonable definition of business cycles.

⁶³ The dating of the turning points deviate somewhat from those suggested in Klovland (1989), where a more detailed narrative of the cycles is presented.

⁶⁴ These are the dates determined by the National Bureau of Economic Research, reproduced in Moore and Zarnowitz (1986).

7.6 Cycles in industrial production

Table 7.2: **Turning points of cycles in industrial production 1896-1948.**

Cycle no.	Peaks		Troughs	
	Norway	UK/Trading partners	Norway	UK/Trading partners
1	1899:4	1900:6	1903:3	1901:9
2	1904:3	1903:6	1905:2	1904:11
3	1907:12	1907:6	1910:3	1908:11
4	1912:8	1912:12	1914:8	1914:9
5	1916:5	1918:10	1917:12	1919:4
6	1920:6	1920:2	1921:6	1921:5
7	1925:4	1925:1	1926:10	1926:7
8	1929:6	1929:6	1932:12	1932:7
9	1937:4	1937:5	1938:7	1938:7
10	1939:12	NA	1945:5	NA

NOTE: Turning points of cycles abroad are those determined by the National Bureau of Economic Research for the UK prior to 1920 as published in Moore and Zarnowitz (1986); beginning 1919 the turning points are derived from monthly time series of industrial production in 14 of the most important of trading partners, weighted by trade flows of manufactured goods with Norway in 1929 as derived in Klovland (1998).

Industrial production and business cycles, 1896-2021

Prior to WWI the results shown in Table 7.2 indicate a fair degree of congruence regarding the timing of turning points in Norway and the UK. There are four whole cycles in this period. Three of the peaks in Norway fall within a year of the corresponding peak in the UK; in the first cycle the peak in Norway occurs 14 months prior to the UK peak. Two of troughs (1905 and 1914) are within 3 months of the UK turning points, but the other two (1903 and 1910) are substantially later in Norway. The dating of the trough in March 1910 is somewhat uncertain as there are additional local minima in January as well as December 1909. In the cycle around the turn of the century there are important events peculiar to each country which impinged on the timing of the cycles. In Norway the housing boom in Christiania had for several years caused an overheated economy, at least locally, during the final part of the 1890s, and it is no surprise that it finally matured in the spring of 1899. In the UK the Boer War may have created expansive impulses that prolonged the boom period.

The business cycle pattern during WWI was to a considerable extent shaped by the wartime distortions to established trade patterns. In Norway the first two years of the war were a definite boom period, but later comprehensive trade barriers and the concomitant lack of imported raw materials caused a widespread retardation in economic activity.

In the interwar period the turning points of the Norwegian economy, as represented by the new industrial production index, coincide well with those of her trading partners. All peaks and troughs are within 5 months of those abroad. In the four cycles of the interwar period peaks of economic activity in Norway lagged the peaks abroad by 1.5 months; for troughs the average lag is 2 months. Although the timing is well synchronized, the ranking of the severity of the various cycles differ substantially from that experienced abroad. The evidence discussed in Klovland (1998) points to the 'gold standard depression' in 1925 - 1927 being relatively deeper in Norway than in the sample of 14 trading partners, while the Great Depression of the early 1930s was relatively milder.⁶⁵

No other cycle in the twentieth century has attracted more attention than the Great Depression starting in the autumn of 1929. The peak in Norway selected by the Bry and Boschan (1971) algorithm is June 1929, which coincides exactly with the peak of the trading partners. A special feature of the Norwegian cycle is that output did not fall much once the peak was reached; after a weaker period in the final quarter of 1929 industrial production activity continued to show considerable buoyancy in the first half of 1930. The course of the cycle is nearly characterized by twin peaks, one in the summer of 1929 and one in May 1930, but the former peak is somewhat higher. This feature was duly recognized by Gjermoe (1951), who attributed the relative late impact of depressive impulses in Norway to favourable conditions in several export industries in this period. The significant increase in the production capacity of the electrochemical industry, the existence of long-term sales contracts in the pulp and paper industry as well as a greater decline in raw materials prices than in prices of manufactured goods in general may have contributed to this.

The location of the trough of the Great Depression is somewhat more ambiguous. The Bry and Boschan (1971) algorithm identifies troughs in September 1931 and January 1934, with a peak in

⁶⁵ The phrase 'gold standard depression' was used by Lester (1937) in his discussion of the output effects of the contractive monetary policy pursued by Denmark and Norway from about 1924, which led to the restoration of the gold standard in 1927 and 1928 in these two countries, respectively.

7.6 Cycles in industrial production

between in July 1932. Manufacturing output was severely affected by the six-month labour dispute lasting from the spring to the autumn of 1931. The temporary rebound of production in the autumn of 1931 is presumably caused by a belated effectuation of old orders, not representing a genuine turning point of the cycle. The weak cycle lasting from a peak in July 1932 to a trough in January 1934 suggested by the Bry-Boschan method was discarded because it most probably reflects various distortions to manufacturing output in this period caused by water shortage leading to problems with the supply of electricity and production cutbacks in several export industries as well as the influence of labour conflicts. This decision is fully supported by the contemporary assessment of business cycle situation and the detailed and incisive analysis in Gjermoe (1951). The depression in Norway is thus judged to have ended in December 1932, in line with Gjermoe (1951), 5 months later than abroad.

The 1937-1938 recession is not deep, but nevertheless quite marked in the data series for Norway. The turning points are nearly identical to those of the trading partners. The output level did not change much between October 1939 and March 1940, but there is a slightly higher output figure for December 1939, which is associated with the peak. The very significant decline in output following the German occupation in April 1940 is disregarded here, just as the minor cycle with a peak in June 1943 suggested by the Bry-Boschan algorithm. The whole of WWII is consequently viewed as years of recession. The definite trough is located at May 1945, the month of the liberation.

The period 1948-2017

Table 7.3: **Major and minor cycles in industrial production 1946 - 2017.**

Cycle no.	Major cycles		Minor cycles	
	Peaks	Troughs	Peak or trough	Peak or trough
1	1946:12	1950:8		
2	1951:7	1953:1		
3	1957:6	1959:2		
4	1960:4	1963:3		
5	1965:4	1968:12	1969:9 (P)	1971:10 (T)
6	1974:7	1978:6	1975:12 (T)	1977:1 (P)
7	1981:8	1983:2	1979:9 (P)	1980:11 (T)

Industrial production and business cycles, 1896-2021

Table 7.3: Major and minor cycles in industrial production 1946 - 2017.

Cycle no.	Major cycles		Minor cycles	
	Peaks	Troughs	Peak or trough	Peak or trough
8	1986:6	1991:8	1988:8 (T)	1989:11 (P)
9	1998:8	2003:12	2000:7 (T)	2002:5 (P)
10	2008:5	2009:6		
11	2014:7	2016:9		

NOTE: Turning points are computed applying the Bry-Broschan method to a series of three-month moving averages of deviations from the trend of industrial production.

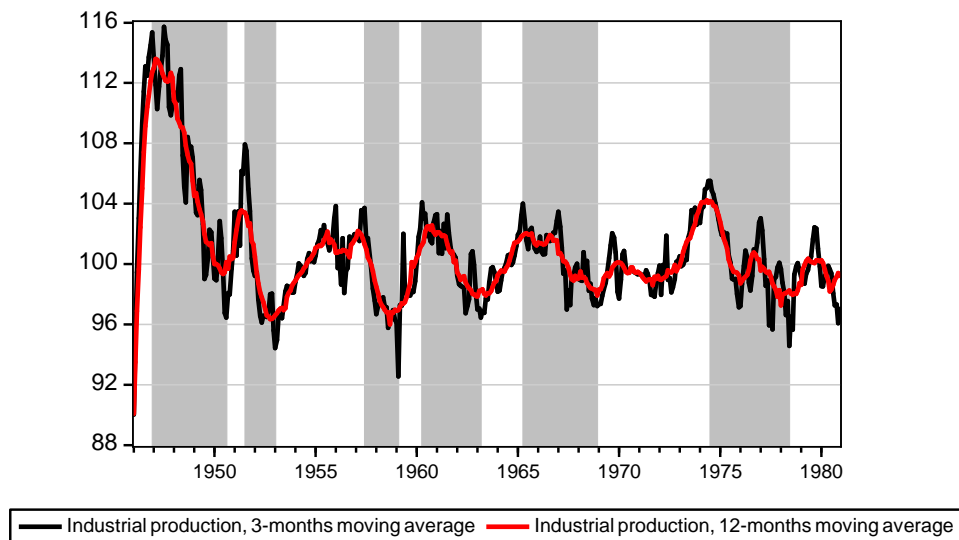


Figure 7.22 *Cycles in industrial production, monthly 1946 - 1980. Contraction periods are shaded.*

Table 7.3 lists the growth cycles that we have identified for this period, applying the Bry and Boschan (1971) method to 3-month moving averages of deviations from the HP-trend.⁶⁶ We have

⁶⁶ We continue to use a lambda value of 140 000 for the smoothing parameter.

7.6 Cycles in industrial production

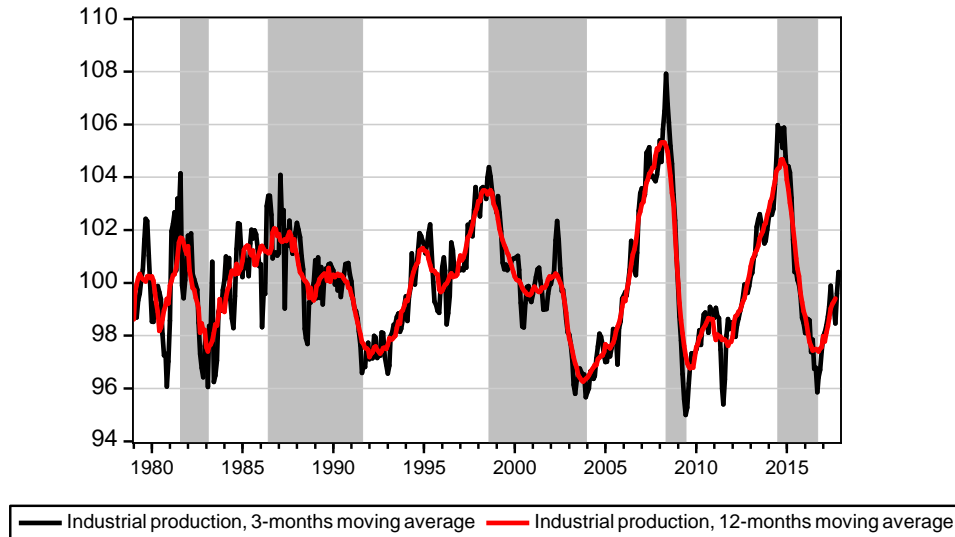


Figure 7.23 Cycles in industrial production, monthly 1979 - 2017. Contraction periods are shaded.

classified the cycle as major or minor, based on visual inspection. The underlying data series are shown in Figure 7.22 and Figure 7.23. The 12-month moving average is a guide to distinguishing between the major and minor cycles, although we acknowledge that this is to some extent a matter of subjective judgement.⁶⁷

In Figure 7.22 the first postwar years appear as a recession period, which may seem surprising in view of the strong rebound after the war. But it reflects the fact that the peak of the *growth rate* relative to trend occurred in late 1946, which then decelerated over the next few years, although still being quite high. In the middle of 1950 it shortly dipped below trend, perhaps somewhat influenced by the international setback of 1949. The Korean War boom may have given a short-lived boost to the economy because there was a renewed period of strong growth until the summer of 1951. Then followed a recession period from July 1951 to January 1953, but according to Statistics Norway (1965) this only concerned industrial production, not other industries. The cyclical downturn from July 1957 to February 1959 was more general and affected the whole economy as discussed in Statistics Norway (1965) and Wettergreen (1978). This was the first clearly defined general recession period in Norway in the postwar period, caused by an unintended contractionary fiscal policy impulse following the introduction of a new tax system, in addition to slower growth in the international economy.

The 1960s were characterized by solid growth and relative mild cycles, with peaks in 1960 and 1965, and troughs in 1963 and late in 1968. The boom of the early 1970s was strong, peaking in the summer of 1974. The following recession is of international character and widely discussed,

⁶⁷ The Bry-Boschan method produces four additional cycles, which we discard as too short or weak to classify as cycles. These are: 1956:1 (P) to 1956:6, 1967:6 (T) to 1968:4, 1995:5 (P) to 1995:11, 2010:10 (P) to 2011:7.

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presumably largely triggered by the strong increase in oil prices. With the prospects of a future boom in oil revenues and in the belief that this was solely a cyclical downturn, not a downward shift in trend growth (cf. Figure 7.20), Norwegian authorities launched a very expansive program of countercyclical policy in 1975 and 1976. This led to a minor expansion period in 1976, but strong imbalances in the economy caused a reversal of this policy in 1977, see Skånland (1978) for an outspoken storm warning.

From a recession culminating early in 1983 industrial production grew strongly until the middle of 1986, helped by expansion abroad, expansionary monetary and fiscal policy and domestic credit market liberalization. With collapsing oil prices and clear symptoms of overheating at the peak in 1986 economic policy was strongly reversed in several steps, leading to the most severe economic downturn in Norway since the interwar period. The trough in the middle of 1991 was accompanied by a complete collapse of the commercial bank sector.

The rest of the 1990s were mostly a period of expansion until the middle of 1998. The international 'dot-com' boom around 2002 reversed the recessionary impulses only slightly, and a relatively marked trough occurred at the end of 2003. The strong boom period leading up to the financial crisis in 2008 is very marked, and even more so is the decline after May 2008. Industrial production then staged a strong rebound, particularly from 2012. The last recession period started in the summer of 2014, and ended two years later.

The analysis in this section was based on data for industrial production which were updated until December 2017. The tabulated data for industrial production in Appendix 7.C have been updated until December 2021. The data have been slightly revised for the years 2014-2017.

7.7 Some concluding remarks

The new time series for industrial production in Norway presented here hardly alter the established view of the secular growth of manufacturing and mining industries in any fundamental way. But, hopefully, these data will contribute to a wider coverage and sharper measurement of trends and cycles in industrial production in the first half of the twentieth century. Beginning with the new industry classification launched in 1949 index numbers of industrial output are available from Statistics Norway on a more disaggregated level than for previous years and the methods of construction underlying these series were much improved.

Venneslan (2008) claimed that the existing industrial production index compiled by Statistics Norway was biased towards showing too low growth rates in the decades prior to WWI. The new index presented here basically corroborates this tendency at the aggregate level. But looking at the individual manufacturing groups there is often quite large divergences between the time pattern of the indices for the early years. This no doubt reflects the rather weak basis for quantifying output in many industries before the annual production statistics began in 1927. The new index reflects as far as possible the specific output series that do exist for individual industries. In accordance with most other studies value added at factor cost is used to weight the individual industry indices together, and

7.7 *Some concluding remarks*

in line with modern index theory weights are updated annually. The retention of the 1938 weights for the whole wartime period and through 1948, which was a concern voiced by Statistics Norway in the first prewar years, is thus a feature that is dispensed with here. Another extension that may help identifying the most likely trend rate of growth of output is the use of newly constructed price indices in Klovland (2013), which may help convert the nominal output figures in Statistics Norway (1915) and Statistics Norway (1922) into real output, on which the estimated mean rates of productivity growth and output indices are based.

In the interwar years both cycles and trends in the new index are in general closer to the Statistics Norway indices than to those recently estimated by Venneslan (2007). However, there are some interesting discrepancies between the new index and the partly reconstructed index based on the data in Stoltz (1955), which is labeled SSB2 here. The new index points to a weaker output growth from the end of WWI to the middle of the 1920s, thereafter a stronger growth to the peak, which according to the new monthly index was located at June 1929. The other annual indices, including Venneslan (2007), produce a relatively higher output level in 1930 than in 1929, which may be somewhat misleading with respect to the determination of the business cycle peak.

Another noteworthy feature is a higher growth rate in the new index in the 1930s, in particular the second half of the decade. Because the Statistics Norway index was constructed as a quantity index with a fixed basket of representative goods there is an underlying downward bias in the calculated index because of the proliferation of 'new goods' not included in the basket. This was duly recognized by Statistics Norway in the early 1950s.⁶⁸ This bias was never corrected in the aggregate Statistics Norway index, although revised index numbers for individual industries were published in Stoltz (1955) and Statistics Norway (1959). The unrevised index calculations for the 1930s were also fed into the national accounts constructed in the early 1950s, assuming that net domestic product in manufacturing grew in strict proportion to the index number of gross output.⁶⁹ According to the new index tabulated here the average annual growth rate of industrial output in the 1930s was 0.8 per cent higher than the Statistics Norway index shows. This discrepancy is not very large, but perhaps, large enough, for some to view the performance of the manufacturing industry in the 1930s in a slightly different light.

⁶⁸ Brenna (1951), Statistics Norway (1959, p. 29).

⁶⁹ Statistics Norway (1952, p. 280). Note also the equivalence of the indices referred to as SSB1 and SSB2 in the graphs for individual industry groups in the 1930s presented here.

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7.A Appendix, Industrial production - Data sources and definitions

In this appendix the industry classification is specified with reference to the two main sources used: (1) the annual production statistics beginning in 1927, *Norges Industri*, referred to as **NI** and (2) the data on man-hours by industry collected by *Riksforsikringsanstalten* (*National Insurance Institution*), referred to as **RTV**. The latter source was published annually by Statistics Norway as (*Rigsforsikringsanstaltens*) *Industristatistikk* 1896-1918 and 1921-1922, thereafter as *Norges Industri*. For the years 1919 and 1920 a slightly less comprehensive tabulation of these data can be found in *Ulykkesforsikringen for Industriarbeidere*.

For each of the 45 industries the underlying sector numbers are given for the 1929 volume of NI as well as the 1916 and 1929 volumes of RTV. In the latter source there were frequent changes in classifications and sector numbers. The changes in the years 1900, 1910 and, in particular, 1922 were extensive. An accurate tracking of a particular industry backwards is not always feasible; the most important cases are noted below.

Unpublished data for the years 1929-1948 in the National Archives of Norway have been extracted for several industries. In general these sources were supplemented by data series published in *Statistiske Meddelelser*, Statistics Norway (1949), Statistics Norway (1969) and *Statistisk Årbok for Norge*. Other important sources used for a particular industry are noted specifically below.

For each industry it is indicated in square brackets whether it belongs to export [EXPR] or home [HOME] industries as well as consumers' goods [CONS] or producers' goods [PROD] industries. The home industries are further divided into import competing [HOME-I] and sheltered [HOME-S] industries. The criterion for classifying an industry as an export industry is that at least 25 per cent of its output value was exported in 1929; import competing industries are those where the value of imported goods represent at least 25 per cent of domestic output. See also the classification listed in *Statistiske Meddelelser* 1937, p. 458.

Table A1 gives the annual index number of real gross output for 44 industries. These are aggregated to 13 groups of industries by annually updated weights representing previous year's value added at factor cost, shown in Table A2. Table A3 contains output indices at the most aggregated level. In Table A4 the value added shares of each of the 45 industries are shown. Table A5 contains labour productivity indices for industry groups and main aggregates. Monthly indices of gross output for the main aggregates can be found in Table A6. Monthly indices have been constructed for each of the 45 industries but are not printed here.

1-12 FOODSTUFFS, BEVERAGES AND TOBACCO

1 HER Canning [EXPR, CONS]

NI 1929 XII-e

RTV 1929 XII-10

RTV 1916 XII-172,173

Note: Data on deliveries of sprat and herring (brisling, småsild, mussa, storsild, fetsild) to canning

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factories were combined with Statistics Norway (1915) and Statistics Norway (1922) to estimate annual index numbers 1909 - 1927. The source is the weekly journal *Fiskets Gang*. Weekly data 1909-1939 from the main fishing waters from the same source were aggregated to monthly totals and used as related series to estimate monthly index numbers.

2 HER Slaughtering [HOME-S, CONS]

NI 1929 Not included in NI until 1951

RTV 1929 XII-9

RTV 1916 XII-174

Note: Annual data on the number of animals registered as controlled slaughtering were combined with estimates of carcass weights (horses, cattle, pigs, sheep, goats, suckling calves and fattened calves). Beginning 1932 monthly data on controlled slaughtering exist. Information on carcass weights was found in the Veterinary Statistics (*NOS Veterinærvesenet*). An output index computed from these sources were linked to benchmark output figures in 1909 and 1951.

3 MAR Manufacture of margarine [HOME-S, CONS]

NI 1929 XII-d

RTV 1929 XII-8

RTV 1916 XII-178,179

Note: Annual output data on margarine, which is virtually the only product of this industry, can be found from 1903 onwards in Bugge (1985).

4 MEI Dairies [HOME-S, CONS]

NI 1929 Not included in NI until 1958

RTV 1929 XII-6

RTV 1916 XII-177

Note: Monthly output series for cheese and butter can be found in *Statistiske Meddelelser* beginning 1925; annual figures in *NOS Meieribruket*. Before this decadal and quinquennial output data for broad categories of cheese and butter are available from the Agricultural Statistics (*Jordbruk og Fedrift 1896-1920, Jordbruksstatistikk 1924*).

5 MOL Grain mills [HOME-I, CONS]

NI 1929 XII-a

RTV 1929 XII-1,2

RTV 1916 XII-166,167

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6 BAK Bakeries [HOME-S, CONS]

NI 1929 Not included in NI until 1950

RTV 1929 XII-4

RTV 1916 XII-168

Note: No useful output data exist for this industry. The output index was crudely estimated from man-hours adjusted for productivity growth, which was set equal to the average of productivity series for grain mills, chocolate factories, manufacture of tobacco and other food industries.

7 KJK Manufacture of biscuits [HOME-S, CONS]

NI 1929 XII-c

RTV 1929 XII-5

RTV 1916 XII-171

8 SJO Manufacture of chocolate and candy [HOME-S, CONS]

NI 1929 XII-j

RTV 1929 XII-16,17

RTV 1916 XII-169,170

9 AFD Manufacture of other foodstuffs [EXPR, CONS]

NI 1929 XII-b,i,l

RTV 1929 XII-3,7,12,15,19

RTV 1916 XII-175,176,182,185,186,187,188

Note: This sector comprises the manufacture of condensed milk, potato flour, fruit juice, jam, vinegar and yeast and. Condensed milk was to a large extent sold abroad before WWI, but on a somewhat smaller scale in interwar years.

10 BRV Manufacture of spirits [HOME-I, CONS]

NI 1929 XII-f

RTV 1929 XII-11

RTV 1916 XII-180

11 BRV Breweries and manufacture of mineral water [HOME-S, CONS]

NI 1929 XII-g,h

RTV 1929 XII-13,14

RTV 1916 XII-181,183,184

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12 TOB Manufacture of tobacco [HOME-S, CONS]

NI 1929 XII-k

RTV 1929 XII-18

RTV 1916 XII-189

13 TEXTILES

13 TEK Manufacture of textiles [HOME-I, CONS]

NI 1929 X-a to X-f

RTV 1929 X-1 to 13

RTV 1916 IX-105 to 120

Note: Manufactures of artificial silk, which were transferred from NI sector IV-f (chemicals) to X (textiles) in 1944, is retained in industry 29 KJT (corresponding to IV-f) throughout 1948.

14-15 CLOTHING AND FOOTWEAR

14 KON Manufacture of clothing and wearing apparel [HOME-I, CONS]

NI 1929 XI-b,c,d,e

RTV 1929 XI-2 to 8

RTV 1916 XIII-190 to 195; XIII-197

15 SKO Manufacture of footwear [HOME-I, CONS]

NI 1929 XI-a

RTV 1929 XI-1

RTV 1916 XIII-196

16-18 LEATHER AND RUBBER PRODUCTS

16 GAR Tanneries [HOME-I, PROD]

NI 1929 IX-a

RTV 1929 IX-2

RTV 1916 X-129

17 LRV Manufacture of leather goods and machine belting [HOME-I, CONS]

NI 1929 IX-b

RTV 1929 IX-3,4

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RTV 1916 X-131,132,133

18 GUM Manufacture of rubber goods [HOME-I, CONS]

NI 1929 IX-c

RTV 1929 IX-5

RTV 1916 X-134,135,136

19-20 WOOD PRODUCTS AND FURNITURE

19 SAG Saw mills [EXPR, PROD]

NI 1929 VII-a

RTV 1929 VII-1 to 4

RTV 1916 XI-137 to 145

20 MOB Manufacture furniture and other wooden goods [HOME-I, CONS]

NI 1929 VII-b to h

RTV 1929 VII-5 to 16

RTV 1916 XI-146 to 165

21-24 PULP AND PAPER

21 TRM Manufacture of mechanical wood pulp [EXPR, PROD]

NI 1929 VIII-a

RTV 1929 VIII-1

RTV 1916 X-122

22 CEL Manufacture of chemical wood pulp [EXPR, PROD]

NI 1929 VIII-b

RTV 1929 VIII-2

RTV 1916 X-121

23 PPP Manufacture of paper [EXPR, CONS]

NI 1929 VIII-c

RTV 1929 VIII-3

RTV 1916 X-123

24 PPV Manufacture of paper products [HOME-I, CONS]

NI 1929 VIII-d

RTV 1929 VIII-4 to 6

RTV 1916 X-124 to 128

Note: The distribution of bookbinding between 24 PAP and 25 GRA is uncertain before 1927. Changes in industry classification in 1900 and 1910 may affect the index numbers.

25 PRINTING

25 GRA Printing and allied industries [HOME-S, CONS]

NI 1929 XIII-a,b,c

RTV 1929 XIII-1 to 3

RTV 1916 V-61; XV-239

Note: The distribution of bookbinding between 24 PAP and 25 GRA is uncertain before 1927. Changes in industry classification in 1900 and 1910 may affect the index numbers.

26-30 CHEMICALS

26 FEX Manufacture of matches and explosives [EXPR, CONS]

NI 1929 IV-a

RTV 1929 IV-1,2

RTV 1916 VII-89,90

27 FRT Manufacture of paints, varnishes and tar products [HOME-I, CONS]

NI 1929 IV-b,c

RTV 1929 IV-3,4

RTV 1916 VII-85,86,88

28 KJL Manufacture of light chemicals [HOME-I, CONS]

NI 1929 IV-d,e

RTV 1929 IV-5,6

RTV 1916 VII-80,84,87,92; VIII-99

Note: The products include pharmaceuticals, glue, polishes, detergents and sundry consumers' goods.

29 KJT Manufacture of heavy chemicals [HOME-I, PROD]

NI 1929 IV-f

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RTV 1929 IV-7

RTV 1916 VII-79

Note: The products include compressed gases, sulphuric acid, phosphates, iodine, potash and other heavy chemicals. See also notes to 13 TEK.

30 ELK Manufacture of electrochemicals [EXPR, PROD]

NI 1929 IV-g

RTV 1929 IV-8,9

RTV 1916 VII-81,82,83

31-33 ORES AND BASIC METALS

31 ORE Metal mining [EXPR, PROD]

NI 1929 I-a

RTV 1929 I-1

RTV 1916 IV-47 to 50

32 BME Basic metal industries [EXPR, PROD]

NI 1929 I-b

RTV 1929 I-2

RTV 1916 IV-51

33 KUL Coal mining [HOME-I, CONS]

Note: Coal mining was not included in NI until 1950. All data are taken from *NOS Norges Bergverk*.

34-37 STONE, CEMENT AND GLASS

34 STB Stone and mineral quarrying, manufactures of stone [EXPR, PROD]

NI 1929 II-a,b,c,d

RTV 1929 II-3,4,5,7,8,10,11

RTV 1916 III-22,23,25 to 28,33,34,43; IV-45,46

35 CEM Cement factories [EXPR, PROD]

NI 1929 II-e

RTV 1929 II-12

RTV 1916 III-31

36 MUR Manufacture of cement products and bricks [HOME-S, PROD]

NI 1929 II-f,g

RTV 1929 II-13,14,15

RTV 1916 III-32,35 to 38, 40

37 GLA Manufacture of glass products and earthenware [HOME-I, CONS]

NI 1929 II-h,i

RTV 1929 II-16,17

RTV 1916 III-39,44

38-41 METAL PRODUCTS, MACHINERY AND TRANSPORT EQUIPMENT

38 MMA Manufacture of metal products and machinery [HOME-I, PROD]

NI 1929 III-a,b,c,f,g,h,i

RTV 1929 III-1 to 7, 10,11,12, 15 to 18

RTV 1916 V-53 to 60,62,63,64; VI-65 to 68, 71 to 75

39 SKB Building and repairing of ships [EXPR, PROD]

NI 1929 III-d

RTV 1929 III-8,9

RTV 1916 VI-69,70

40 EMA Manufacture of electrical machinery and equipment [HOME-I, CONS]

NI 1929 III-e

RTV 1929 III-13

RTV 1916 VI-76,77

41 GSM Manufacture of gold and silver products, music instruments [HOME-I, CONS]

NI 1929 III-j,k

RTV 1929 III-14,20

RTV 1916 V-52; VI-78

42-44 OILS AND FATS

42 TRA Manufacture of fish-oil, herring meal and guano [EXPR, PROD]

NI 1929 V-a,b

RTV 1929 V-1,2,3,6

RTV 1916 VII-91,93,94; VIII-98,100

Note: Annual output data on fish-oil were taken from *NOS Norges Fiskerier*. Export figures were used as a supplement throughout the sample period. Employment figures were adjusted accordingly, but must be considered as uncertain.

43 FAT Manufacture of hardened whale fats, vegetable oils and petroleum products [EXPR, PROD]

NI 1929 V-c

RTV 1929 V-4

RTV 1916 VII-97,101

44 SOP Manufacture of soap [HOME-S, CONS]

NI 1929 V-d

RTV 1929 V-5

RTV 1916 VII-95,102,103

45 GAS

45 GAS Manufacture of gas, coke and coal tar [HOME-S, CONS]

NI 1929 VI

RTV 1929 VI-3

RTV 1916 VII-96

Note: The RTV-data before 1922 only comprise the privately owned gas companies. Estimates of man-hours and labour productivity are uncertain before 1922.

Industrial production and business cycles, 1896-2021

7.B Appendix, Disaggregated data for industrial production

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	1 HER	2 SLA	3 MAR	4 MEI	5 MOL	6 BAK	7 KJK	8 SJO	9 AFD	10 BRV	11 OEL	12 TOB
1896	3.7	46.4	23.6	40.9	77.9	19.0	28.2	6.8	26.5	118.9	80.5	29.5
1897	6.3	50.1	26.0	47.5	76.2	20.6	29.6	10.0	34.3	150.5	89.6	31.2
1898	6.7	50.9	29.2	54.0	77.6	23.3	33.3	13.2	38.2	173.4	105.7	35.1
1899	7.8	56.2	34.4	59.0	79.8	25.5	35.6	16.3	42.4	165.6	116.5	37.4
1900	10.9	56.3	38.3	62.8	76.2	27.7	37.5	13.3	39.4	138.8	113.9	37.2
1901	9.4	50.7	39.3	63.9	80.2	28.2	44.4	16.0	41.9	154.9	106.5	37.4
1902	9.4	54.9	41.1	66.4	78.5	30.9	50.0	17.7	48.9	157.8	99.6	36.7
1903	10.2	53.0	40.9	65.0	86.6	31.0	50.1	20.4	54.6	153.8	84.0	37.7
1904	12.1	56.4	42.4	64.8	82.5	31.1	50.2	22.3	55.0	166.4	80.4	37.3
1905	16.1	53.9	42.6	66.3	81.6	33.6	47.6	22.3	60.6	146.1	81.9	40.0
1906	19.0	56.7	45.4	65.9	86.3	33.8	51.9	26.6	61.5	174.0	81.4	43.2
1907	24.2	57.7	46.4	69.0	86.8	38.1	52.0	28.8	63.4	119.3	82.8	46.8
1908	29.1	60.4	47.8	70.0	91.8	40.7	51.7	33.1	71.1	88.4	84.1	50.2
1909	32.2	64.2	46.4	74.4	92.1	43.4	58.8	37.6	71.7	41.5	89.3	52.0
1910	38.3	68.4	50.1	77.1	89.0	47.9	71.0	43.6	77.4	53.8	90.0	53.4
1911	48.3	75.3	51.0	79.3	90.9	51.8	76.3	52.0	87.1	43.9	96.4	56.7
1912	58.0	72.8	55.5	75.6	86.7	56.1	79.3	69.3	90.6	76.6	100.8	59.3
1913	58.7	68.6	57.6	75.1	87.7	61.8	82.8	65.8	92.3	132.2	98.1	64.0
1914	71.2	75.6	58.6	74.9	90.9	61.3	94.7	68.0	94.5	138.4	104.2	62.2
1915	88.6	79.5	68.1	69.1	89.3	65.8	110.5	77.4	99.4	86.0	98.5	76.9
1916	90.4	60.8	74.0	71.5	94.6	71.8	118.8	95.2	99.0	128.7	117.1	86.6
1917	71.4	75.3	66.8	58.5	71.8	59.1	114.0	77.5	103.7	60.8	104.8	84.3
1918	39.7	67.0	50.9	47.8	66.6	44.8	92.5	47.7	82.5	21.1	79.8	76.6
1919	36.8	63.3	67.2	57.2	80.8	58.6	100.8	68.9	84.3	100.9	110.2	97.6
1920	40.1	78.6	68.9	60.8	80.4	58.2	120.2	99.4	92.4	116.8	158.0	87.5
1921	32.8	79.0	70.4	54.1	74.7	61.0	103.7	110.0	83.2	64.0	151.7	69.2
1922	44.1	86.2	75.4	64.8	88.8	72.9	137.1	114.7	99.5	59.0	153.6	80.0
1923	37.4	96.4	82.7	66.9	93.3	82.5	145.3	106.3	105.6	43.9	147.6	82.8
1924	105.5	93.1	90.4	71.7	95.8	85.3	150.0	98.0	109.6	40.9	133.8	81.3
1925	54.6	80.7	93.4	83.0	98.4	96.8	128.2	102.4	115.8	41.0	137.1	91.2
1926	60.7	89.5	90.3	84.9	104.0	93.4	116.6	96.5	106.3	49.8	123.2	92.9
1927	81.8	97.9	91.2	93.8	105.2	95.0	84.8	95.5	96.4	79.9	108.3	94.1
1928	63.0	100.6	98.3	93.2	102.7	98.0	85.8	95.4	101.8	71.0	100.0	95.5
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	38.6	103.7	99.9	105.9	113.7	109.9	104.9	99.6	98.8	105.1	101.8	106.3
1931	51.0	112.5	100.3	131.9	129.5	120.2	111.7	103.4	86.5	74.6	83.0	97.2
1932	80.8	114.9	102.0	149.1	128.0	118.8	111.8	108.6	85.6	76.0	84.4	98.7
1933	68.8	123.6	102.8	162.0	134.5	115.9	128.4	99.3	82.7	78.3	78.9	98.0
1934	51.1	120.7	106.3	172.5	139.8	124.7	164.5	112.4	79.4	81.8	80.0	102.2
1935	70.7	117.1	110.1	176.3	148.9	134.4	173.3	122.7	94.9	83.3	83.4	105.8
1936	77.0	119.8	116.8	209.5	149.6	131.6	193.1	137.4	98.0	93.5	93.3	112.9
1937	80.8	118.3	115.0	217.9	145.5	137.2	206.5	140.8	114.6	109.2	103.0	122.8
1938	73.5	117.4	119.9	246.5	146.5	141.3	213.9	159.5	110.6	98.9	104.2	124.8
1939	74.6	123.4	126.0	275.4	153.2	150.9	236.1	174.2	117.7	97.2	112.0	134.0

HER = canning, SLA = slaughtering, MAR = manufacture of margarine,
MEI = dairies, MOL = grain mills, BAK = bakeries,
KJK = manufacture of biscuits, SJO = manufacture of chocolate, AFD = other food industries,
BRV = production of spirits, OEL = breweries, TOB = manufacture of tobacco,

7.B Appendix, Disaggregated data for industrial production

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	1 HER	2 SLA	3 MAR	4 MEI	5 MOL	6 BAK	7 KJK	8 SJO	9 AFD	10 BRV	11 OEL	12 TOB
1940	77.4	114.1	109.9	212.6	119.1	146.3	269.6	150.5	120.1	86.7	129.0	144.3
1941	66.2	31.9	88.8	146.2	87.3	132.1	326.9	125.3	130.9	97.2	148.9	106.9
1942	51.9	31.1	52.5	150.7	73.0	110.7	357.0	75.3	121.0	114.6	139.1	87.6
1943	47.5	26.0	57.6	115.3	93.5	114.8	380.2	40.7	134.3	183.8	142.1	74.2
1944	43.8	22.6	50.8	84.9	90.7	105.4	354.1	33.0	118.1	167.2	139.8	67.4
1945	48.5	30.0	56.3	59.0	98.7	126.4	247.6	45.1	113.7	192.6	122.0	98.5
1946	62.8	59.8	116.3	117.0	130.1	211.3	384.2	124.1	216.8	177.1	153.7	177.3
1947	88.9	78.2	136.4	144.6	136.7	229.9	457.6	147.7	236.3	181.8	157.4	202.7
1948	99.7	53.1	169.1	168.0	147.6	252.8	595.0	155.9	283.7	171.1	148.1	203.2

HER = canning, SLA = slaughtering, MAR = manufacture of margarine,
MEI = dairies, MOL = grain mills, BAK = bakeries,
KJK = manufacture of biscuits, SJO = manufacture of chocolate, AFD = other food industries,
BRV = production of spirits, OEL = breweries, TOB = manufacture of tobacco,

Industrial production and business cycles, 1896-2021

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	13 TEK	14 KON	15 SKO	16 GAR	17 LRV	18 GUM	19 SAG	20 MOB	21 TRM	22 CEL	23 PPP	24 PPV
1896	45.5	1.7	4.1	71.3	0.6	2.3	126.0	9.8	35.2	14.6	11.0	17.2
1897	46.6	2.3	6.2	68.8	0.9	2.4	144.2	11.1	36.1	17.4	12.5	18.9
1898	49.4	3.1	14.5	67.3	0.9	6.7	146.6	15.6	41.4	18.3	12.9	24.8
1899	51.4	4.2	25.4	71.2	1.3	10.8	146.6	19.9	45.0	19.1	13.9	25.9
1900	52.6	6.8	22.8	77.7	1.1	8.8	163.9	20.8	44.8	27.1	15.0	25.8
1901	54.8	6.8	22.4	81.5	0.9	12.5	159.7	19.8	49.1	26.6	15.2	25.8
1902	55.1	8.2	20.6	73.1	2.2	11.7	146.5	19.8	53.7	25.4	15.4	26.7
1903	56.2	7.1	21.0	71.8	6.4	7.7	157.2	20.5	51.8	25.5	16.4	29.8
1904	57.0	9.0	24.9	66.2	7.5	11.6	149.0	20.6	50.2	27.9	18.5	31.1
1905	62.4	11.7	31.3	72.0	8.4	16.2	140.8	22.0	53.7	32.7	24.2	36.8
1906	69.7	14.8	33.1	72.0	10.8	16.5	155.0	23.7	54.3	37.9	27.3	44.4
1907	74.2	16.6	37.9	76.7	14.4	14.7	164.6	26.4	56.3	37.5	27.8	49.8
1908	76.5	17.4	46.2	81.7	17.8	21.2	140.6	29.3	64.0	49.0	31.8	55.9
1909	79.3	19.4	55.9	84.3	20.7	15.8	141.0	32.9	69.4	49.3	35.6	57.7
1910	83.8	24.9	62.4	85.6	27.0	20.6	156.8	37.9	68.3	53.6	40.2	61.0
1911	87.7	28.9	66.7	82.7	35.4	26.6	156.2	41.6	63.3	49.3	38.5	65.6
1912	91.9	34.2	76.2	81.4	40.1	28.1	161.6	43.5	69.1	66.2	44.9	70.0
1913	98.6	38.8	80.3	79.0	47.4	33.5	157.5	46.9	73.7	71.6	53.5	75.0
1914	97.6	40.8	82.0	76.6	49.9	26.7	152.5	49.7	69.1	75.3	53.5	76.7
1915	102.2	49.0	84.1	89.9	67.0	41.9	144.9	61.3	71.2	76.9	60.8	78.0
1916	108.3	57.3	88.3	92.9	83.1	41.1	164.5	83.3	75.2	73.5	61.1	83.2
1917	94.7	60.7	85.1	92.2	96.1	28.5	152.2	83.1	54.4	50.3	28.8	79.0
1918	79.5	55.0	87.4	108.9	87.0	23.1	149.4	80.6	56.0	51.5	38.3	76.7
1919	88.7	66.0	87.7	112.0	96.3	20.6	138.7	82.9	64.6	48.2	36.6	78.8
1920	83.7	70.0	97.9	104.6	91.4	24.6	129.3	72.8	68.4	71.5	58.9	79.5
1921	57.9	37.0	82.5	88.2	62.4	37.6	86.2	52.9	44.3	34.1	25.2	61.4
1922	81.8	63.6	91.6	96.4	71.2	43.9	105.2	62.7	65.4	65.4	60.8	71.3
1923	86.1	75.1	95.2	108.3	79.5	51.0	108.4	77.9	70.9	76.9	63.2	69.4
1924	88.1	77.7	97.9	125.8	87.0	75.8	124.9	86.4	70.7	64.0	59.9	75.4
1925	91.1	79.8	117.2	127.6	78.7	99.2	121.4	88.1	87.5	87.6	79.8	74.0
1926	80.2	80.2	84.8	94.3	91.9	80.1	95.3	76.7	85.4	77.7	72.0	68.9
1927	84.7	85.4	87.4	97.8	101.3	80.7	84.0	82.1	87.3	87.6	88.4	71.5
1928	88.6	88.4	98.3	106.9	100.6	89.3	101.7	89.2	93.4	92.4	91.1	85.1
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	108.1	98.0	118.9	116.0	94.5	101.5	91.9	109.1	99.8	96.7	92.8	106.0
1931	93.6	86.8	86.1	100.3	70.6	110.6	73.6	97.1	69.0	45.7	56.7	107.8
1932	120.2	92.4	109.9	119.5	81.3	130.0	70.3	109.0	94.4	97.8	93.7	126.9
1933	121.3	92.3	111.5	118.2	84.6	119.9	66.8	109.1	90.4	94.2	90.7	137.6
1934	132.7	97.4	119.1	124.3	92.1	142.7	77.4	112.5	105.3	107.2	95.5	143.5
1935	135.8	108.2	128.9	126.3	104.6	203.2	83.3	139.4	77.9	110.6	106.6	160.1
1936	143.3	124.7	132.5	130.0	123.7	239.3	83.2	151.0	95.3	121.3	108.3	177.4
1937	154.7	135.1	141.9	146.0	161.6	247.6	93.5	150.2	106.3	136.6	118.4	163.6
1938	138.3	128.9	139.3	129.2	153.1	212.8	93.3	150.0	86.9	114.2	90.9	169.7
1939	158.0	141.7	149.3	137.4	163.3	253.6	99.2	169.0	91.8	123.3	119.4	222.4

TEK = manufacture of textiles, KON = clothing, SKO = manufacture of footwear,
GAR = tanneries, LRV = manufacture of leather goods,
GUM = manufacture of rubber goods, SAG = saw mills,
MOB = manufacture of furniture and wooden goods,
TRM = manufacture of mechanical wood pulp, CEL = manufacture of chemical pulp,
PPP = manufacture of paper, PPV = manufacture of paper goods

7.B Appendix, Disaggregated data for industrial production

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	13 TEK	14 KON	15 SKO	16 GAR	17 LRV	18 GUM	19 SAG	20 MOB	21 TRM	22 CEL	23 PPP	24 PPV
1940	138.0	129.6	158.0	146.6	144.7	191.8	116.6	193.9	34.9	101.0	89.6	172.2
1941	97.8	122.0	110.0	122.4	129.1	166.7	123.1	214.5	39.1	95.5	80.2	286.9
1942	90.2	93.8	73.8	90.6	104.6	175.8	100.1	211.3	32.9	79.5	61.4	339.0
1943	97.8	85.6	84.1	98.9	88.3	168.8	75.0	194.6	25.1	71.1	53.2	315.2
1944	95.0	103.1	100.7	85.1	80.0	207.2	64.2	167.6	14.8	58.1	51.0	294.8
1945	84.5	74.1	88.8	90.6	77.4	134.6	50.2	146.8	20.6	39.0	43.1	253.9
1946	134.7	131.5	151.5	169.6	141.8	290.8	78.8	176.1	54.8	60.6	101.3	291.2
1947	163.6	170.2	169.1	215.7	193.0	377.9	92.9	216.0	60.8	82.8	122.8	432.3
1948	192.9	200.7	204.9	260.2	221.4	476.1	101.4	235.7	85.3	99.9	128.9	462.5

TEK = manufacture of textiles, KON = clothing, SKO = manufacture of footwear,
GAR = tanneries, LRV = manufacture of leather goods,
GUM = manufacture of rubber goods, SAG = saw mills,
MOB = manufacture of furniture and wooden goods,
TRM = manufacture of mechanical wood pulp, CEL = manufacture of chemical pulp,
PPP = manufacture of paper, PPV = manufacture of paper goods

Industrial production and business cycles, 1896-2021

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	25 GRA	26 FEX	27 FRT	28 KJL	29 KJT	30 ELK	31 ORE	32 BME	33 KUL	34 STB	35 CEM	36 MUR
1896	35.6	16.9	12.6	8.3	6.8	0.0	8.6	1.6	0.0	46.1	3.9	40.3
1897	40.0	16.0	14.4	8.9	7.4	0.0	10.2	1.6	0.0	56.4	4.7	47.5
1898	45.2	18.3	14.4	9.8	9.4	0.0	11.0	1.4	0.0	64.7	5.8	65.0
1899	47.8	19.1	17.6	13.5	12.0	0.4	12.1	1.8	0.0	78.4	6.2	76.5
1900	45.8	19.5	16.2	10.9	13.1	0.4	13.2	1.8	0.0	78.4	7.2	46.1
1901	46.3	20.9	17.2	12.3	15.1	0.6	13.1	1.7	0.0	89.6	4.9	36.9
1902	48.4	23.2	16.6	12.9	14.9	0.9	15.5	2.2	0.0	81.7	5.4	45.4
1903	48.7	27.4	17.9	14.8	16.2	1.3	15.7	2.4	0.0	79.8	7.9	45.7
1904	48.6	29.5	17.9	17.3	19.7	1.3	16.2	3.2	0.0	84.2	7.6	46.2
1905	49.3	33.7	24.1	18.5	19.3	2.1	18.4	2.6	0.0	87.6	8.4	45.9
1906	51.8	35.3	22.1	21.7	23.2	2.9	20.7	3.1	0.0	94.8	10.1	46.1
1907	56.3	38.4	23.7	24.1	23.4	5.7	25.2	4.1	0.6	88.3	11.1	48.3
1908	60.3	45.3	24.4	28.8	28.1	10.1	26.5	3.1	2.4	99.3	4.0	50.2
1909	64.2	48.5	25.0	32.3	30.0	14.8	26.0	4.3	1.6	103.5	7.8	55.4
1910	63.8	54.3	35.5	37.6	22.4	17.7	31.6	7.7	1.8	109.0	23.4	59.2
1911	67.7	57.0	25.8	43.4	22.3	22.2	37.2	11.6	8.8	117.9	28.8	69.6
1912	71.2	58.0	28.9	50.0	22.4	37.6	53.1	13.3	9.4	119.8	32.1	82.3
1913	76.2	60.1	40.7	52.7	22.1	49.9	58.1	18.5	13.1	127.8	38.4	88.0
1914	80.1	57.2	40.2	61.2	21.9	55.9	60.2	25.3	15.3	120.2	38.4	74.5
1915	80.5	55.5	46.1	67.8	27.5	63.6	68.6	31.0	7.1	91.0	40.7	73.0
1916	83.8	73.9	51.4	80.4	33.9	86.7	42.4	36.2	7.7	80.4	41.8	97.8
1917	78.2	80.0	52.2	82.3	43.6	97.0	43.0	37.6	9.9	76.0	36.1	83.6
1918	84.3	79.7	78.8	93.8	60.1	83.8	36.8	28.0	22.1	79.1	37.9	86.6
1919	83.0	76.2	95.0	96.4	79.9	59.7	32.4	10.8	27.2	66.5	54.9	83.5
1920	72.9	92.0	68.8	79.0	133.9	64.4	29.9	23.6	30.6	56.5	63.6	83.6
1921	66.4	65.2	79.5	74.0	74.6	39.1	21.2	25.9	43.5	50.5	57.6	67.4
1922	75.3	70.6	105.7	84.1	49.8	40.9	40.4	22.7	83.0	47.1	51.9	81.8
1923	82.3	80.2	106.8	77.7	48.8	42.8	52.7	34.7	91.4	57.9	78.7	113.1
1924	83.1	104.0	116.6	89.7	42.9	47.7	57.4	56.7	106.0	74.0	104.7	107.3
1925	90.3	97.1	118.6	95.1	46.8	60.5	66.1	66.4	113.9	77.7	99.1	89.3
1926	86.5	89.6	121.5	99.3	67.1	58.3	56.9	71.9	110.5	59.9	30.9	70.3
1927	87.8	79.0	118.3	94.7	76.6	61.8	68.2	72.0	127.2	75.9	83.8	74.8
1928	93.6	86.5	125.9	100.6	83.9	66.6	84.0	82.3	109.5	95.5	99.0	99.6
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	104.8	92.1	103.2	117.4	102.3	120.2	102.4	112.6	75.0	105.2	100.1	97.7
1931	92.3	67.3	105.3	125.6	65.0	98.0	65.4	98.8	96.8	82.9	68.6	71.6
1932	110.6	61.7	106.5	132.0	97.6	105.5	77.9	98.4	101.7	74.1	73.0	93.0
1933	112.6	71.4	118.8	152.0	105.0	103.9	94.4	105.7	117.2	82.9	69.0	76.0
1934	115.2	71.8	135.4	159.2	110.9	106.6	102.3	116.7	124.9	110.2	77.4	87.2
1935	125.3	88.0	152.4	190.2	116.0	117.4	115.4	123.8	123.0	107.6	82.1	109.9
1936	131.8	86.0	176.8	189.6	116.5	116.7	129.1	137.6	122.9	122.2	93.3	126.1
1937	141.7	105.7	199.5	217.2	131.7	126.0	139.2	158.7	118.1	126.4	99.4	125.9
1938	151.8	97.1	193.7	236.8	173.1	139.4	161.2	175.4	118.9	120.0	102.8	115.3
1939	153.6	107.8	234.4	273.4	196.9	140.6	155.5	183.3	124.0	129.5	121.2	145.3

GRA = printing and allied industries, FEX = manufacture of matches and explosives,
 FRT = manufacture of paints, varnishes and tar products,
 KJL = manufacture of pharmaceuticals and other light chemicals
 KJT = manufacture of compressed gases and other heavy chemicals
 ELK = manufacture of electrochemicals, ORE = metal mining,
 BME = basic metal industries, KUL = coal mining, STB = stone and mineral quarrying,
 CEM = manufacture of cement, MUR = manufacture of cement products and bricks,

7.B Appendix, Disaggregated data for industrial production

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	25 GRA	26 FEX	27 FRT	28 KJL	29 KJT	30 ELK	31 ORE	32 BME	33 KUL	34 STB	35 CEM	36 MUR
1940	114.9	101.7	145.2	238.4	175.7	115.1	96.1	129.0	106.9	90.7	104.8	111.5
1941	153.1	128.5	136.8	263.2	175.6	111.0	101.8	85.1	58.2	126.7	97.0	161.5
1942	162.4	137.2	147.2	278.4	161.5	115.6	81.3	83.7	0.0	139.5	115.9	124.2
1943	135.8	104.8	171.6	257.6	193.2	102.8	73.2	95.2	0.0	129.3	96.5	118.0
1944	146.5	96.6	182.0	278.6	206.3	97.3	72.8	80.2	0.0	91.4	99.3	109.2
1945	143.5	72.3	151.0	231.1	155.4	121.1	26.8	33.7	2.4	59.6	44.0	95.7
1946	176.6	86.0	286.8	293.1	226.7	131.9	42.8	103.5	38.4	85.4	135.3	173.1
1947	187.0	108.6	369.2	375.8	257.8	136.5	58.7	129.6	134.0	100.4	146.6	221.7
1948	196.2	110.7	386.7	433.0	326.9	147.6	64.2	164.2	173.6	108.0	163.2	240.9

GRA = printing and allied industries, FEX = manufacture of matches and explosives,
 FRT = manufacture of paints, varnishes and tar products,
 KJL = manufacture of pharmaceuticals and other light chemicals
 KJT = manufacture of compressed gases and other heavy chemicals
 ELK = manufacture of electrochemicals, ORE = metal mining,
 BME = basic metal industries, KUL = coal mining, STB = stone and mineral quarrying,
 CEM = manufacture of cement, MUR = manufacture of cement products and bricks,

Industrial production and business cycles, 1896-2021

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	37 GLA	38 MMA	39 SKB	40 EMA	41 GSM	42 TRA	43 FAT	44 SOP	45 GAS
1896	39.2	16.5	29.0	8.1	14.0	41.4	7.5	12.5	37.3
1897	44.3	18.6	32.3	10.0	16.1	52.6	6.5	16.0	40.0
1898	51.1	21.0	37.2	17.7	18.6	44.8	6.8	23.1	42.4
1899	61.9	23.1	42.1	21.6	20.9	46.1	10.5	26.8	45.4
1900	64.2	24.4	42.1	21.4	22.6	35.3	10.2	28.8	46.7
1901	68.2	23.4	47.6	19.8	22.1	42.1	10.3	28.8	47.7
1902	65.7	23.5	50.4	18.5	22.7	32.6	10.0	30.2	48.7
1903	60.9	24.2	51.9	18.2	23.8	14.0	10.2	34.6	49.8
1904	64.0	25.2	53.9	20.9	25.3	21.2	10.5	37.8	51.0
1905	65.6	25.9	53.7	19.9	26.6	26.4	10.0	39.8	51.6
1906	69.8	29.6	57.1	21.9	31.1	29.5	11.0	44.9	52.7
1907	72.4	34.5	63.5	31.2	37.1	27.7	11.1	46.1	55.6
1908	83.2	38.3	63.2	33.5	42.0	34.6	12.5	53.1	59.4
1909	85.5	40.1	52.3	35.3	45.0	38.1	13.1	54.3	63.0
1910	85.6	43.2	55.9	40.8	51.3	38.6	13.6	53.2	66.8
1911	89.5	45.9	55.8	40.3	57.5	42.9	13.6	55.7	73.0
1912	94.8	53.7	64.9	54.5	71.1	50.9	17.2	59.1	84.0
1913	92.1	55.3	63.5	52.6	77.3	45.4	28.7	60.0	97.0
1914	91.1	54.4	61.4	51.4	80.3	67.9	49.3	59.3	103.1
1915	98.4	56.9	62.4	58.0	88.8	60.6	57.8	61.1	109.0
1916	98.2	58.9	59.6	59.2	97.2	44.7	43.5	69.6	118.1
1917	55.6	56.5	63.7	72.4	93.6	9.3	49.5	65.6	124.8
1918	63.2	52.7	64.0	95.0	87.5	15.4	41.1	58.6	129.1
1919	70.5	54.4	69.4	82.7	90.7	37.1	48.0	63.7	124.9
1920	75.7	53.0	67.4	76.4	88.7	64.8	61.7	62.4	114.1
1921	52.4	38.3	49.7	55.2	64.3	55.8	48.7	66.0	106.8
1922	71.5	54.8	44.3	59.7	92.4	52.0	71.1	69.5	115.1
1923	79.7	60.5	52.3	60.6	102.3	52.1	79.9	80.6	116.9
1924	94.1	62.8	52.1	69.5	106.5	56.2	103.0	75.8	112.4
1925	100.7	67.2	64.5	82.9	114.6	50.0	119.1	88.7	107.7
1926	82.0	58.7	51.2	66.6	100.3	84.7	98.3	86.0	98.2
1927	76.6	56.9	43.4	70.9	97.6	68.0	76.4	90.4	95.5
1928	76.8	80.8	62.6	89.2	95.3	76.9	91.5	93.6	103.7
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	106.5	98.4	94.8	103.2	106.6	88.2	104.0	101.0	95.9
1931	85.1	65.6	44.4	76.6	109.8	68.4	89.9	105.7	100.8
1932	91.9	75.9	45.6	114.8	108.6	99.1	105.4	105.9	98.9
1933	80.7	77.6	50.3	110.0	108.8	111.4	111.7	104.7	98.7
1934	94.3	86.3	55.5	143.8	92.9	88.6	109.1	108.4	96.8
1935	109.3	101.2	72.7	170.4	92.1	113.9	126.7	121.9	97.6
1936	113.3	123.0	90.3	211.9	101.4	119.4	137.3	115.7	102.4
1937	148.6	139.3	108.5	239.8	131.6	95.7	147.3	124.3	103.2
1938	121.5	133.9	112.3	255.3	133.7	119.2	149.7	134.2	106.5
1939	146.3	140.5	108.9	274.1	145.5	117.4	139.9	159.2	108.3

GLA = manufacture of glass, clay products and cement,
MMA = manufacture of metal products and machinery, SKB = building and repairing of ships
EMA = manufacture of electrical machinery and equipment,
GSM = manufacture of gold and silver products, music instruments,
TRA = manufacture of fish-oil and meal, FAT = manufacture of whale fats and vegetable oils,
SOP = manufacture of soap, GAS = manufacture of gas, coke and coal tar

7.B Appendix, Disaggregated data for industrial production

Annual volume indices of gross output 1896 - 1948 by industry.
1929=100.

Year	37 GLA	38 MMA	39 SKB	40 EMA	41 GSM	42 TRA	43 FAT	44 SOP	45 GAS
1940	144.2	114.5	92.6	253.6	121.6	95.1	75.3	162.4	101.5
1941	144.3	123.3	96.4	242.8	113.0	55.3	43.2	170.6	85.7
1942	102.3	111.6	82.7	205.0	84.9	47.5	34.1	183.2	80.0
1943	111.6	109.5	77.3	164.7	107.0	30.8	38.1	180.8	85.6
1944	122.1	102.8	74.6	136.7	104.4	32.5	31.4	155.7	83.9
1945	99.9	89.4	73.9	111.2	83.0	50.4	29.3	116.2	30.6
1946	141.5	143.0	122.8	212.8	129.4	79.7	95.0	157.1	82.2
1947	152.1	167.3	142.4	321.1	190.2	118.7	141.1	197.7	91.2
1948	170.0	184.1	143.2	372.1	196.2	152.5	188.5	224.0	98.4

GLA = manufacture of glass, clay products and cement,

MMA = manufacture of metal products and machinery, SKB = building and repairing of ships

EMA = manufacture of electrical machinery and equipment,

GSM = manufacture of gold and silver products, music instruments,

TRA = manufacture of fish-oil and meal, FAT = manufacture of whale fats and vegetable oils,

SOP = manufacture of soap, GAS = manufacture of gas, coke and coal tar

Industrial production and business cycles, 1896-2021

7.C Appendix, Aggregated data for industrial production

Industrial production index 1896 - 2021.

1948 = 100

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1896	14.1	14.1	14.3	14.5	14.7	14.8	14.9	15.1	15.1	15.2	15.4	15.7	14.8
1897	15.9	16.1	16.2	16.2	16.4	16.7	16.8	17.0	17.2	17.4	17.6	17.5	16.8
1898	17.8	18.0	18.2	18.4	18.5	18.5	18.5	18.7	18.8	18.9	19.1	19.3	18.6
1899	19.5	19.7	19.8	19.9	19.9	19.9	20.1	20.2	20.3	20.3	20.3	20.3	20.0
1900	20.2	20.0	20.0	20.0	20.4	20.6	20.8	20.8	20.7	20.7	20.8	20.8	20.5
1901	20.8	20.8	20.6	20.5	20.7	20.8	20.8	20.8	20.9	21.0	20.9	20.9	20.8
1902	20.8	20.9	21.1	21.0	21.0	20.8	20.8	20.7	20.6	20.6	20.6	20.7	20.8
1903	20.6	20.7	20.6	20.7	20.8	20.9	21.1	21.0	21.1	21.2	21.4	21.3	21.0
1904	21.8	21.7	22.1	21.8	21.6	21.3	21.4	21.4	21.5	21.3	21.4	20.9	21.5
1905	21.1	21.0	21.1	21.4	22.5	22.5	22.6	22.6	22.6	23.0	23.0	23.3	22.2
1906	23.8	24.1	24.1	24.1	23.8	24.4	24.2	24.5	24.5	24.6	25.1	25.3	24.4
1907	25.2	25.3	25.7	25.7	25.3	25.2	25.0	25.7	26.4	26.4	26.6	27.0	25.8
1908	26.6	26.8	26.7	26.7	27.0	26.7	27.3	27.8	26.9	27.3	26.6	27.1	27.0
1909	26.3	26.9	27.2	27.6	27.5	28.1	27.5	27.9	27.9	27.6	27.9	28.0	27.5
1910	29.2	28.6	28.5	29.3	30.2	30.2	30.9	30.6	31.0	30.8	31.2	31.1	30.1
1911	30.9	31.4	31.6	31.2	32.0	31.0	27.8	31.0	33.5	33.3	33.4	32.6	31.6
1912	34.6	34.7	35.2	35.1	35.5	36.1	36.8	37.5	37.6	37.0	38.4	37.8	36.4
1913	38.9	38.6	39.2	39.2	39.3	39.1	38.8	39.9	39.5	40.7	39.4	39.0	39.3
1914	39.4	41.7	40.1	40.7	40.5	41.9	40.3	39.0	40.7	41.1	40.6	41.7	40.7
1915	41.1	40.6	40.9	41.4	42.3	43.4	43.6	42.8	43.1	43.6	43.9	44.5	42.6
1916	44.8	45.1	45.1	44.7	43.4	44.2	45.9	46.7	45.4	44.6	45.1	45.7	45.0
1917	43.2	41.5	42.1	42.1	41.5	41.3	40.6	40.1	38.6	37.8	37.5	37.2	40.3
1918	37.9	37.8	38.0	37.9	37.4	37.1	36.6	36.9	37.4	37.5	37.0	36.8	37.4
1919	37.2	37.0	37.0	37.1	37.8	38.3	38.7	39.2	39.7	39.7	39.7	40.9	38.5
1920	40.8	41.3	42.2	42.6	42.5	43.0	42.4	41.5	41.1	40.5	39.3	37.4	41.2
1921	35.4	34.6	34.3	33.1	27.7	22.7	27.9	27.1	27.3	28.8	31.1	32.5	30.2
1922	34.0	34.3	36.2	37.0	38.8	39.1	38.7	39.3	39.5	40.1	39.9	39.4	38.0
1923	40.1	40.5	41.7	42.5	42.5	41.5	41.2	41.3	40.9	40.8	40.1	40.8	41.2
1924	45.0	40.5	34.6	34.7	40.4	46.2	47.0	48.1	48.9	48.1	47.6	48.2	44.1
1925	47.5	48.8	48.4	50.2	49.5	48.4	47.1	47.0	46.7	45.4	44.9	44.0	47.3
1926	43.9	44.6	47.1	44.3	41.9	43.6	43.3	41.6	39.5	42.4	43.4	43.3	43.2
1927	44.8	43.1	43.3	42.0	43.1	44.3	45.2	45.3	45.7	47.0	47.0	47.6	44.9
1928	47.7	47.8	49.0	49.4	50.2	49.7	48.2	49.6	50.5	50.8	51.8	52.5	49.8
1929	52.2	53.5	54.3	56.2	56.9	62.9	61.0	61.6	58.6	58.0	57.9	56.8	57.5
1930	58.1	58.7	59.5	60.3	60.5	59.4	58.7	57.5	57.0	55.6	53.5	53.2	57.7
1931	51.1	50.8	50.6	42.2	39.1	38.9	38.8	39.2	45.0	50.8	54.0	51.6	46.0
1932	51.7	52.8	52.7	53.9	54.2	55.3	55.9	53.4	52.9	52.4	52.2	51.2	53.2
1933	52.8	52.7	53.1	53.8	54.0	53.9	53.4	53.8	53.9	54.0	54.2	54.8	53.7
1934	54.0	55.1	56.5	57.2	56.9	58.0	58.2	58.8	58.9	59.1	58.2	59.9	57.6
1935	60.3	61.1	61.7	62.0	63.1	63.0	63.1	63.9	64.5	65.7	66.2	66.5	63.4
1936	67.2	67.4	67.8	68.5	70.1	69.7	70.8	70.8	71.3	71.1	70.8	72.3	69.8
1937	73.0	73.9	75.5	78.9	75.9	77.8	79.3	77.7	75.8	76.5	76.9	75.0	76.3
1938	75.6	76.1	75.8	76.1	76.0	75.6	74.7	74.8	74.8	75.6	75.0	74.9	75.4
1939	75.5	77.0	79.6	81.0	81.7	81.2	82.6	82.6	80.8	81.4	81.6	83.3	80.7
1940	82.3	79.0	81.6	55.8	46.3	54.2	77.7	69.7	71.7	70.8	70.2	70.4	69.1
1941	67.2	66.6	69.2	70.2	70.7	71.7	60.7	63.0	64.2	63.4	63.0	62.3	66.0
1942	62.3	61.3	60.1	54.6	62.3	60.3	61.7	59.7	57.8	56.5	58.3	57.6	59.4
1943	57.6	58.6	59.0	58.7	58.6	59.0	57.1	56.1	55.0	55.7	53.9	52.9	56.9
1944	55.5	54.8	55.9	56.0	53.6	52.7	53.9	54.0	51.6	51.8	49.3	50.8	53.3
1945	46.6	46.6	44.7	44.3	38.0	42.5	42.8	44.8	48.8	51.4	54.2	55.1	46.7
1946	59.0	63.1	66.8	69.7	72.5	75.2	79.1	79.3	81.4	80.6	84.8	86.2	74.8
1947	85.3	84.2	85.1	84.7	90.9	90.6	90.2	99.0	91.8	92.6	91.9	93.7	90.0
1948	97.6	96.9	97.3	99.5	104.7	101.6	87.9	101.9	101.8	102.6	103.0	105.1	100.0
1949	103.6	100.8	102.7	106.1	110.8	103.6	102.1	102.2	107.2	108.4	110.8	109.4	105.6

7.C Appendix, Aggregated data for industrial production

Industrial production index 1896 - 2021.

1948 = 100

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
1950	105.8	108.7	111.8	113.0	120.0	110.6	107.6	113.4	112.0	115.6	115.5	120.5	112.9
1951	122.4	127.1	112.8	136.1	121.2	132.7	137.8	130.5	133.5	130.6	127.4	123.8	128.0
1952	129.7	128.2	126.8	124.8	126.1	127.1	128.6	127.9	129.0	132.1	134.6	131.1	128.8
1953	124.3	131.7	135.4	132.7	134.0	136.5	138.0	140.2	140.0	139.8	141.9	140.9	136.3
1954	141.8	147.0	145.4	146.8	148.3	145.7	147.6	151.4	151.8	151.4	151.0	154.7	148.6
1955	152.4	155.1	160.4	155.6	160.3	160.6	161.0	157.8	161.9	160.6	162.1	166.0	159.5
1956	168.3	168.0	149.0	174.3	160.9	165.3	158.2	170.4	168.1	170.3	171.2	170.7	166.2
1957	173.7	173.2	171.7	174.4	186.0	173.3	177.4	176.3	176.5	173.5	173.3	171.9	175.1
1958	171.3	170.6	176.9	174.3	173.8	179.9	173.2	175.6	174.5	178.5	179.6	178.2	175.5
1959	177.1	180.8	161.1	208.3	182.9	188.4	188.2	184.1	190.6	190.7	188.4	192.7	186.1
1960	197.6	198.3	205.3	203.4	211.6	201.7	208.2	205.4	206.2	207.3	207.3	217.5	205.8
1961	213.3	210.6	204.3	225.9	204.2	219.6	218.4	221.0	215.0	215.0	221.4	217.9	215.6
1962	216.5	216.6	217.1	219.0	219.2	219.6	210.9	225.8	225.8	234.1	230.2	223.1	221.5
1963	224.1	226.2	226.7	223.2	232.6	229.0	233.4	235.5	240.6	243.6	239.7	241.9	233.0
1964	242.2	238.5	246.1	250.7	246.6	251.6	256.7	254.4	255.6	255.2	259.4	262.9	251.7
1965	264.0	268.9	268.8	276.0	279.0	263.8	269.5	278.1	277.5	274.6	275.4	276.7	272.7
1966	276.5	280.2	287.9	271.9	282.5	291.8	286.0	284.3	294.1	291.4	291.0	297.6	286.3
1967	302.1	299.8	292.7	293.7	288.2	298.2	274.8	303.4	292.8	295.9	306.7	300.9	295.8
1968	301.5	301.0	303.8	304.7	322.5	295.1	315.5	307.3	303.0	309.8	306.7	311.2	306.9
1969	308.2	311.5	315.1	317.1	319.4	323.0	327.5	332.3	335.1	339.5	333.3	329.1	324.3
1970	317.5	332.6	345.9	337.6	338.7	338.2	339.6	342.5	343.6	342.9	344.3	346.9	339.2
1971	345.8	349.0	349.3	349.5	351.6	357.7	350.7	350.1	351.5	354.1	352.8	364.4	352.2
1972	365.6	361.7	347.0	392.0	358.7	377.6	362.5	363.5	370.1	369.4	373.0	386.2	368.9
1973	373.4	379.2	381.9	377.3	385.7	384.6	396.8	393.2	403.6	397.7	399.0	392.9	388.8
1974	401.8	400.7	405.6	405.5	415.9	408.5	412.6	417.5	402.5	410.9	411.8	398.3	407.6
1975	403.9	405.5	394.4	407.0	398.3	401.3	390.9	392.2	389.1	390.4	392.7	377.7	395.3
1976	380.0	393.6	394.9	393.8	405.5	389.4	374.0	399.1	400.7	393.7	395.7	408.7	394.1
1977	409.2	398.3	398.7	386.4	377.1	402.5	352.1	384.6	390.5	389.5	386.0	397.5	389.4
1978	392.5	380.9	386.4	384.2	363.8	397.3	349.8	386.4	386.4	391.2	392.6	388.7	383.3
1979	385.2	388.0	384.5	383.9	395.6	387.6	390.2	400.0	401.2	399.3	399.2	386.3	391.7
1980	385.5	384.1	386.3	394.3	385.5	393.3	391.9	383.0	378.3	382.7	384.4	364.5	384.5
1981	394.9	403.7	404.1	398.8	409.8	379.3	433.1	403.9	397.2	383.2	399.0	406.2	401.1
1982	396.5	407.6	406.4	399.4	390.4	405.1	398.1	389.1	391.2	385.2	383.9	388.0	395.1
1983	400.8	390.9	365.8	431.8	390.3	397.0	377.3	394.8	405.5	400.6	398.4	405.5	396.6
1984	411.6	404.6	418.1	403.4	415.4	400.4	396.3	412.3	417.1	419.6	425.9	418.3	411.9
1985	411.4	412.4	432.2	405.2	417.2	426.1	421.9	425.0	423.4	427.0	424.3	417.9	420.3
1986	419.9	426.3	390.0	437.7	427.0	431.4	443.7	427.9	423.3	423.5	431.0	424.5	425.5
1987	422.6	432.8	463.4	401.2	439.5	415.2	438.6	432.5	427.1	427.2	428.6	429.0	429.8
1988	435.7	433.5	425.8	432.2	424.3	419.6	403.8	419.6	416.8	423.8	419.3	423.1	423.1
1989	426.8	430.2	405.3	446.9	410.8	419.7	428.3	424.2	423.2	427.8	426.9	423.6	424.5
1990	426.0	425.5	417.1	431.2	418.0	424.6	420.8	424.6	429.3	426.5	425.1	430.3	424.9
1991	421.8	422.3	422.3	418.0	421.8	419.4	412.9	416.1	407.2	417.6	416.6	418.5	417.9
1992	420.8	410.0	423.7	419.4	422.7	424.6	411.4	426.0	426.5	425.1	427.9	417.6	421.3
1993	423.2	426.0	424.1	440.6	430.7	430.7	443.9	437.3	435.4	437.8	442.0	443.4	434.6
1994	448.1	450.0	434.5	464.1	458.5	455.2	456.6	457.1	468.3	467.9	470.2	470.7	458.4
1995	468.8	472.1	469.7	477.3	482.0	477.7	466.0	469.7	470.7	467.9	469.7	473.0	472.1
1996	486.2	482.9	481.5	482.4	457.1	490.9	495.1	488.6	489.5	486.7	488.6	495.1	485.4
1997	490.9	489.5	498.4	492.3	498.0	495.6	518.7	494.7	504.1	512.1	511.1	518.2	502.0
1998	507.4	509.7	511.1	524.3	511.1	510.7	519.1	523.4	516.8	513.9	514.9	510.7	514.4
1999	513.0	508.8	519.6	503.1	497.5	500.8	498.4	498.9	496.6	498.4	498.0	498.9	502.7
2000	498.0	496.6	498.0	497.0	487.1	477.7	482.0	484.8	489.5	489.0	483.4	480.6	488.6
2001	485.3	485.7	483.4	488.1	488.1	482.4	479.2	480.6	470.2	477.7	478.7	476.8	481.3
2002	481.0	477.3	479.2	482.0	493.3	488.1	470.7	476.3	474.5	470.2	468.3	464.6	477.1
2003	462.2	466.5	458.5	452.8	453.3	453.3	459.9	456.1	456.6	458.0	454.2	458.0	457.4
2004	446.2	457.5	460.8	456.1	457.1	459.4	458.9	467.9	467.4	467.4	467.9	465.0	461.0
2005	463.2	466.5	467.4	473.0	464.1	474.5	486.2	462.2	477.7	473.0	485.3	484.3	473.1
2006	488.6	490.0	489.5	489.5	500.3	500.3	508.8	492.8	498.0	509.2	508.8	525.2	500.1
2007	522.4	514.9	522.9	527.6	542.2	527.1	532.8	528.1	530.9	533.7	529.5	537.5	529.1

Industrial production and business cycles, 1896-2021

Industrial production index 1896 - 2021.

1948 = 100

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
2008	542.6	545.9	527.6	564.7	559.1	551.1	549.2	550.6	539.3	540.8	534.2	526.2	544.3
2009	520.5	517.7	511.1	507.8	499.4	498.0	499.8	505.5	513.9	511.6	514.9	515.4	509.6
2010	513.0	519.1	520.5	522.9	512.1	532.8	532.8	514.9	528.5	528.1	532.3	528.5	523.8
2011	529.5	529.9	536.5	526.2	530.9	519.1	504.5	522.9	537.0	532.8	535.1	532.8	528.1
2012	538.9	535.6	533.7	534.6	545.0	539.8	541.2	550.6	548.3	549.2	550.6	546.9	542.9
2013	555.3	558.6	550.6	566.6	561.4	569.9	572.7	566.1	565.7	565.2	562.9	568.0	563.6
2014	572.3	570.8	575.1	572.7	575.1	587.3	580.3	598.1	576.0	593.9	586.8	588.7	581.4
2015	575.5	576.5	596.2	569.9	560.0	564.7	541.2	555.3	558.2	544.0	549.2	542.2	561.1
2016	541.2	542.6	554.4	537.5	540.3	529.5	535.1	516.8	527.6	526.6	527.6	529.9	534.1
2017	537.5	536.5	536.1	537.0	537.0	537.0	538.9	519.6	536.1	537.0	538.9	545.0	536.4
2018	535.6	538.9	540.8	541.7	538.4	543.1	545.0	548.3	545.5	553.0	554.4	556.7	545.1
2019	555.3	555.3	549.7	560.5	567.6	561.0	563.3	560.0	561.4	560.5	560.0	560.0	559.6
2020	561.4	559.1	543.1	529.5	523.4	522.4	527.1	548.3	541.7	544.0	555.3	553.0	542.4
2021	566.6	564.3	569.4	552.5	563.3	566.1	554.9	561.9	560.5	553.0	558.2	547.3	559.8

Source: <https://www.ssb.no/en/statbank/table/07095> Index of production, by industry (SIC2007) and main industrial grouping, 1990M01 - 2021M12.

8

Norwegian GDP, 1816-2021

Ola Honningdal Grytten

8.1 Introduction

This chapter presents new and revised GDP series for Norway from both the production and the expenditure side of the Norwegian economy 1816-2021.¹ Existing historical GDP series for Norway do not always coincide with our historical knowledge of the economic development. This is to a large extent a result of a lack of calculations from the production side and in addition to insufficient data sets upon which these series rest. This chapter offers new knowledge of historical national accounting in Norway in several ways. Firstly, a new and novel set of annual gross domestic product series by industry are presented for the period 1816-1930. These are spliced with existing GDP series from 1930 onwards to form composite series of Norwegian historical GDP, which cover the entire period 1816-2021. Secondly, the new estimates suggest a substantial revision of the old long-run GDP series, which may impact our understanding of certain parts of Norwegian economic history.

Existing historical national accounts (HNA) for Norway start in 1830. For the period before 1930, these data have left writers on Norwegian economic growth with some puzzles, as they in several incidents report annual growth rates, which are contrary to our knowledge of movements in the economy. This also implies that they despite representing a small open economy, surprisingly often depart from developments in the gross domestic product (GDP) for important trading partners. One reason for this might be that the existing historical GDP series basically have been calculated from the expenditure side. Another reason is that the data sets of the old series are limited.

A key contribution of the present chapter is that we present new GDP series based on data from both the production side and the expenditure side. This enables us to study in more detail the historical industrial and economic developments in Norway over the past two centuries. We obtain more precise measures of the total size of the Norwegian economy and developments in its main production sectors and a more refined picture of economic growth across these, which will enable us to analyze industrial development and business cycles with greater precision.

8.2 Approach

The key parameter in national accounts is GDP, which reflects the sum of gross value added across all production units in the economy. GDP can be calculated by three major approaches (Fløttum, 2006, pp. 93-131)), notably the production approach, the expenditure approach, and the income approach. In the production approach we obtain the GDP estimate by aggregating gross value added across a set of production sectors. For each production sector, we estimate its gross value added in year t , denoted $y_{j,t}$, by subtracting its gross value of intermediate consumption $h_{j,t}$ from its gross value of output $q_{j,t}$:

$$\sum y_{j,t} = \sum (q_{j,t} - h_{j,t}) \quad (8.1)$$

¹ An academic article which presents this work has recently been published in Grytten (2022). See also Grytten (2020b) for a discussion paper version.

8.3 Previous work

Economy wide aggregates for gross value added, Q_t , and intermediate consumption, H_t , are obtained by aggregation across all production sectors:

$$Y_t^B = Q_t - H_t \quad (8.2)$$

One then reaches at GDP in base values (prices), denoted as Y_t^B . By adding net product taxes, calculated as gross product taxes, T_t^Q , net of product subsidies, S_t^Q , one reaches GDP in market values (prices), denoted as Y_t^M .

$$Y_t^M = Q_t - H_t + (T_t^Q - S_t^Q) \quad (8.3)$$

Whereas GDP from the production side focuses on the supply of goods and services, GDP from the expenditure side is focused on the uses of these, across a set of demand categories, where C_t denotes private consumption, I_t , gross investments, G_t , public expenditures, X_t exports and M_t imports in year t :

$$Y_t = C_t + I_t + G_t + (X_t - M_t) \quad (8.4)$$

Finally, the income approach reports the income distribution of GDP by compensation of employees (wages), W_t , gross operating surplus, S_t , and taxes, T_t , less subsidies, S_t , on gross production, Q_t , and imports, M_t , in period t .

$$Y_t = W_t + S_t + (T_t^Q - S_t^Q) + (T_t^M - S_t^M) \quad (8.5)$$

This chapter applies the production and the expenditure approach to GDP.

8.3 Previous work

One may claim that the history of national accounting in Norway starts with Schweigaard (1840), who made estimations of domestic production for most industries in a normal year around 1835. Services were largely excluded, as they by large were not considered production. Tvethe (1848) estimated production by industry for a normal year around 1845. He applied similar definitions and sources as Schweigaard. Both of them tried to estimate output and input, and thus, value added. However, they were neither consistent in their methodological nor in their empirical approach. A third attempt came when Kiær (1887, 193-205) published estimates of total national income. He included several services. Kiær also used richer, more valid, and reliable data. Additionally, he possessed a wider understanding of the importance of using value-added figures for output in the different production sectors when forming national aggregates.

The 1930s gave way to the idea of collecting data to produce sets of aggregated accounts for the overall economy. The idea was initiated by two of the most prominent Norwegian economists, i.e.,

Frisch and Wedervang. It resulted in the collection of relevant data by Statistics Norway from the 1930s onward, in addition to a historical archive of wages and prices, monitored by Wedervang and his staff at the Norwegian School of Economics (Grytten, 2007, 203-230).

After World War II, Statistics Norway (1965) published their first full HNA. These were calculated based on the System of National Accounts of 1958, SNA 1958. Skoglund (2009) later revised these from 1946 according to the SNA 2010. From 1994 a new generation of HNA series were constructed. Brautaset (2002) gave accounts of Norwegian exports, 1830-1865. Grytten calculated annual GDP contribution for agriculture 1830-1865 (Grytten, 2004c, 47-76). Bjørsvik (2004) established GDP series on public services for the same period. Vennesslan (2007) calculated detailed series for value added in manufacturing by 60 industries, 1896-1939. Klovland (2015) revised the output series for 45 industries 1896-1948. Hodne and Grytten (1994) published total GDP figures 1835-1865. This was concluded with historical GDP series 1830-2003 (Grytten, 2004a, 241-288). We will mark this as the *HMS I* version of GDP in this chapter. Lately, Grytten (2015) and Dean (2018) have been working on a comprehensive set of HNA accounts from the production side.

This paper presents both the production and expenditure approach to annual HNAs. It reports the gross product of 17 industries and 78 sub-industries. In principle we follow the SNA 2008 and the European System of Accounts (ESA) 2010 and calculate annual series of input and output and use double deflation technique, i.e., one deflates both the input and the output series when possible to arrive at fixed price series. This is a novel approach in historical national accounting, as data usually limits one to apply simple deflation technique, i.e., one deflates value added only. For the period until 1930, we give new estimates, for 1930-1946 revised figures, then we splice with updated series by Statistics Norway. We will mark the new GDP series presented in this chapter as *HMFS*. In 2013 the author made a preliminary revision of the historical GDP-series according to the SNA 2008 and the European System of Accounts (ESA) 2010. Norges Bank took these improvements into account in their mark *HMS II* version of the historical GDP series in 2014.

8.4 GDP from the production side

The approach depends on available sources. For the period since 1970, we are using Statistics Norway's last versions of GDP from the application and the expenditure side.² In the following section we offer a description of the historical sources.

Agriculture and forestry

The series are mostly taken from previous work (Grytten, 2004c, 47-76) constructed based on decadal agriculture censuses. We use production reports from counties, farm accounts, exports, and imports statistics to interpolate. For some years there is lack of sufficient data. Hence, demand and

² <https://www.ssb.no/statbank/table/09170/> and <https://www.ssb.no/statbank/table/09189/>

8.4 GDP from the production side

production functions are constructed in order to compute volumes. Price data are taken from Grytten and Hodne (1998) and the Wedervang Archive.

Brautaset (2002, 168-189) offers detailed series of forestry exports 1830-1865. Thereafter, it is possible to make similar calculations sitting on records from foreign trade accounts, tax records, and production records from Statistics Norway (Mork (1941, 194-278), Benterud (1978, 194-278), Grytten (1997, 143-164)). Since 1901 NOS (1949, 162-184) has reported annual series of variables regarding cultivation of private forests. To reach value series, we use price series from Brautaset (2002, 262-268) and the Wedervang Archive.

Fisheries, whaling and hunting

The contribution of fisheries to GDP is by definition limited to the values of catches. This means that the preservation of fish is considered industry. We find value of catches on the basis of volume series of exports and domestic fish consumption. Brautaset (2002, 168-189) offers detailed series of fish exports till 1865. Consumption surveys give us information on domestic fish consumption. Thus, it is possible to calculate total production figures.

From 1865 onwards, there are detailed figures on volumes and prices of fish exports and consumption in benchmark years NOS (1949, 91-104) From 1866 they report quantity and prices of fish brought on shore, and from 1908 values of catches. As for whaling and hunting our data are basically taken from Kiær (1877). To interpolate we use foreign trade statistics and records on catches and oil production. These are coupled with the 1930 values of the whaling industry in the revised historical national accounts by Dean (2018).

Mining and quarrying

This industry is basically calculated on fairly accurate records given by NOS (1949, 111-146), Schweigaard (1840) and Tvethe (1848). With the help of foreign trade statistics, it is possible to interpolate annual output and input between decadal benchmark years. The industry was under strict public regulation, and both price and volume data are available. Hence, the reported data seem both valid and reliable. From the 1930s onwards we splice the series calculated by Dean (2018) with the series by Statistics Norway (Skoglund, 2009).

Oil and gas extraction

Oil and gas extraction constitutes a new industry in Norway, and we solely use the national account-figures from Statistics Norway running from 1971, two years after the discovery of oil on the Norwegian continental shelf in 1969.³

³ <https://www.ssb.no/statbank/table/09170/>

Manufacturing

Both Schweigaard (1840) and Tvethe (1848) give reliable estimates of input and output in the manufacturing industry. In addition, we can add decadal benchmark years from Bjerke (1966, 53-56). By drawing on population and manufacturing censuses, export and import statistics and public reports from county officials, it is possible to come up with fairly valid and reliable accounts until 1896.

From then on, we use accounts for manufacturing industries calculated by Venneslan (2007, 12-48). These are established based on impressively informative data recorded by Statistics Norway. They are revised with data for 45 manufacturing industries by Klovland (2015, 51-73). We use these to refine the gross product series for manufacturing until 1939. From then on, we use the revised series from Statistics Norway according to the SNA 2008 and ESA 2010 standards. All in all, the new estimates rest on 37 sub-industries, covering different periods 1816-2021.

Electricity, gas, water, and sanitary services

This includes pre-electricity products, such as paraffin and other fuels. Industrial censuses kept by Statistics Norway, along with farm and institutional accounts kept at the Wedervang Archive provide necessary information on value added in benchmark years. These have been interpolated by data which are basically taken from industrial censuses and trade statistics and county reports (Dean, 2018). In addition, we find output figures for power supply from Minde (2015). Finally, we apply Statistics Norway's series from 1930s, revised by Dean (2018).

Construction

Input figures are taken from Hodne (1983, 298-313) on the size of Norwegian infrastructure. From 1914 we find relevant series in public budgets and accounts from both the central and local governments (NOS, 1949, 151-155). We also use estimates of construction in the work of Schweigaard (1840, 72-91) and Tvethe (1848, 93-118). In addition, we draw on benchmark year calculations by Bjerke (1966, 53-56) Thus, we establish decadal benchmark years of construction. We interpolate by using annual figures on public and private construction, before we use revised and refined accounts from 1930 onwards (Dean, 2018).

Trade and repair of motor vehicles

Despite trade not being always esteemed as value creation activity in the 1800s, Schweigaard, Tvethe and Kiær all report data for it. The same is found in population censuses and county reports. These have been compiled and summed up to aggregated trade figures in benchmark years in the historical national accounts published by the central bank (Grytten, 2004b, pp. 250-258)). Adding the work by Bjerke (1966, 53-56), we reach at decadal benchmark figures for trade 1830-1930. These report input, output and value-added figures. To obtain annual figures we interpolate between the benchmark

8.4 GDP from the production side

year figures. For the 19th century, the Wedervang Archive holds implicit records on trade activity and monthly prices.⁴

Repair of motor vehicles enters into the series in 1946 (Skoglund, 2009). Before 1946 repairs are included as an assumed repair value share of number of vehicles as of 1946-1950.

Ocean transport

Estimations of value-creation in the Norwegian merchant fleet by Kiær (1877) and Brautaset (2002, 257-261) serve as reliable sources on this industry's contribution to GDP from 1830 and towards the turn of the century. The Wedervang Archive gives us detailed information on income and cost structures, freights, and wages in the merchant fleet (Brautaset, 2004, 119-142). The data has best coverage for the fleet engaged in foreign ports. However, the data for the coastal fleet is also adequate.⁵

In addition, NOS (1978, 376-408) reports volumes of the fleet and the ships' engagements. Thus, drawing on this information and incalculating the new time series with the 1930 figures of value creation in ocean going transport, leads us to value added for this industry 1830-1930.

Transport and post services

Other transportation includes horse, railway, auto car as well as postal services. The number of horses is from the agricultural census held about every tenth year. Costs of transportation by horse are taken from the Wedervang Archive.⁶ NOS (1978, 419-445) provides information on kilometres of road, number of cars, kilometres of railways and other types of communication, public income and costs from transport and communication. With the help of these data, we have been able to interpolate between benchmark years and splice with the 1930 estimates by Statistics Norway.

Information and communication

This industry enters into the national accounts in 1970, and gradually includes an increasing number of sub-industries, i.e., telecommunication, internet, data communication, along with other information activity connected to information and communication technology.⁷

Financial and insurance activities

Due to extensive work on Norwegian banks' balance sheets (Klovland (2007b, 109-160), Klovland (2007a, 161-202)) we have reliable historical data on input, output and value added for the banking sector are available, as he compiled data for almost every savings and commercial bank in Norway

⁴ Wedervang Archive, files W139, W267, W268, W269, W271, W272, W273 and W383.

⁵ Wedervang Archive, W030, W032, W034, W035, W036, W038, W039, W043, W044, W063, W172, W173, W174, W176, W182, W184, W185, W186, W187, W188, W189, W193, W320, W327, W329, W330 and W407.

⁶ Wedervang Archive, W118, W119A, W120A and W249.

⁷ <https://www.ssb.no/statbank/table/09170/>

Norwegian GDP, 1816-2021

since 1822. Using similar data for publicly owned banks and other public and private credit institutions, compiled by Skånland (1967, 262-385), we arrive at valid and reliable series on value added in the registered finance market.

In addition, we add the volumes of unregistered finance services. This is done by using information found in bank history (Liseth (2012, 91-131), Grytten et al. (2013, 403-411)). By splicing these with the finance industries contribution to GDP in 1930 according to Statistics Norway, one arrives at value-added series for the entire Norwegian finance industry.

Dwellings, commercial buildings, and business services

It is possible to trace values of Norwegian housing and property management directly back to 1819. The series presented here reflect the value creation of providing private housing and business properties. Stocks of dwellings are calculated on the basis of censuses 1825-1930. Between the census data, we interpolate based on population records and estimated numbers of people per square meter (NOS, 1995, 77-79). Thus, we arrive at annual volume figures of the stock of buildings. These are multiplied by the prices of buildings as they are reported in the central bank's house price index (Eitrheim and Erlandsen, 2004, 349-376). Since housing in national accounts should reflect value creation and not market prices of buildings, we use smoothed series, with the help of a HP-filter, with a smoothing parameter (λ) of 10.

Public administration and defense

For the period 1816-1865 we use the Hodne (1983, 300-313) and Bjørsvik (2004, 293-310) series on public administration and defense. These are basically constructed on the basis of wages, depreciation and estimations of increase in productivity within the sector. Records from the Wedervang Archive give us relevant information on the income and cost structure of Norwegian garrisons during the nineteenth century.⁸

From 1915 we are using more recent computations of the size of public administration (Grytten, 2019, 189-202). They also provide us with information on wages, depreciations, and productivity growth. By splicing them with the series of Dean (2018) in 1914 and Statistics Norway from 1946 (Skoglund, 2009), we establish an annual gross product series for public administration and defense.

Education

For education we basically use the same sources as for public administration and defense. We have included estimations of private schooling and education, where schools, and training programs connected to the church were quite important. This is done by drawing on information on the scale of these occupations from popular censuses and county reports, reported annually in NOS (1876-1930). We assume the same value creation per employee in private and public schools.

⁸ Wedervang Archive, files W052-W078.

8.5 GDP from the expenditure side

Health services

Bjørsvik (2004, 293-310), Hodne (1983, 300-313) and Grytten (2019, 189-202) are primary sources for this series, as they report the volumes and values of public health production from the second decade of the nineteenth century until 1930 respectively. We also add a substantial contribution from private health care. According to contemporary sources, private health care made up a huge part of the sector until 1930, Schweigaard (1840); Tvethe (1848) and Statistical Yearbook (1876-1930). With churches and humanitarian bodies as main players.

Other services

This industry consists of both public sector and private sector services. The public records are found in the work by Bjørsvik (2004, 293-310) until 1865, Hodne (1983, 300-313) up to 1914, Grytten (2019, 189-202) from 1914. A challenge is to find the size of private services. However, we already have decadal benchmark year calculations (Grytten (2004a, 252-255), Bjerke (1966, 51-54). By refining these according to the SNA 2008 standard and new knowledge of other industries' contribution to GDP, presented here, we have established a point of departure for interpolating annual series. Grytten (2009, 48-87) and the Wedervang Archive give data for domestic and other private services.⁹ Thus, it is possible to construct value added series for this industry. Board and lodging were significant parts of wages and are therefore included.

8.5 GDP from the expenditure side

The original annual historical national accounts for Norway, which cover the years from 1830 onwards, were basically constructed from the expenditure side. Here, we revise and extend these series back to 1816.

Final private consumption expenditure

Consumption expenditures of households and non-profit institutions serving households (NPISHs) 1816-1865 are constructed based on detailed calculations of private consumption together with previous estimates of private consumption. Consumption is in principle found by domestic output less exports plus imports in every fifth year 1825-1865. The data are taken from agricultural censuses and the foreign trade statistics (Grytten and Minde, 1998, 42-58). Annual proxies of consumption are thereafter interpolated between the benchmark years on the basis of established consumption functions with normal consumption per capita linearly interpolated between the benchmark years, price elasticities and exports and imports as parameters. According to consumption surveys agricultural products accounted for about 50 % of total consumption 1830-1865.

In addition, we use previous series of private consumption estimated on the basis of the elasticity

⁹ Wedervang Archive, W009, W013, W014, W021, W028 and W204.

Norwegian GDP, 1816-2021

of private consumption to GDP 1865-1910 (Hodne and Grytten, 2000, 91-92). From 1865 we use the historical national account figures constructed by Statistics Norway revised to the SNA 2008 standard until they are spliced with Statistics Norway's GDP series from the expenditure side in 1970. In the years of revisions, we assume the same relative distribution of expenditures as in the existing accounts adjusted with the revised figures since 1970.¹⁰

Final consumption expenditure of general government

This series is extrapolated backward from 1865 by using data from Hodne (1983, pp. 300-313), Bjørsvik (2004, pp. 293-310) and Grytten (2019, pp. 189-202). These are mostly taken from departmental sources, basically expenditure accounts made by the administration of the central government. We also use these sources to adjust the series from 1865-1930 according to the SNA 2008. Furthermore, we do the same by resting on government consumption expenditure series from Statistics Norway (1965, pp. 364-365) from 1930 to 1970 (Skoglund, 2009). From then on, we splice with Statistics Norway's revised series.

Total exports

Export figures are provided by Brautaset (2002, pp. 251-268). Her data on volumes are basically taken from the official foreign trade statistics, which in some cases have been corrected by her. Her price data were basically selected from the very rich export price data archives in Bergen and partly calculated based on import price data from importing countries of Norwegian commodities.¹¹ She has also established reliable freight rates for the period.

Total imports

Imports are extrapolated with the help of public sources from the national statistical office and later Statistics Norway. They have published fixed price calculations of exports with traditional goods back to 1851 (NOS, 1969, p. 261). We have spliced these with the export series since 1865 (NOS, 1969, pp. 364-365). For the period before 1851 we also use the foreign trade statistics (NOS, 1969, pp. 190-192). The figures are in volumes. We have used the import price index by Klovland (2018, pp. 73-92) to inflate the figures to current import series 1816-1865. This series is spliced with a revised and refined version of the series of imports in the existing national accounts from 1865, and then with revised series by Statistics Norway in 1930, 1946 and 1970.

Gross capital formation

Gross capital formation has been found as a residual previous to 1865. In principle GDP plus total imports less consumption expenditures of households and NPISHs less consumption expenditures

¹⁰ <https://www.ssb.no/statbank/table/09189/>

¹¹ W370 and W397.

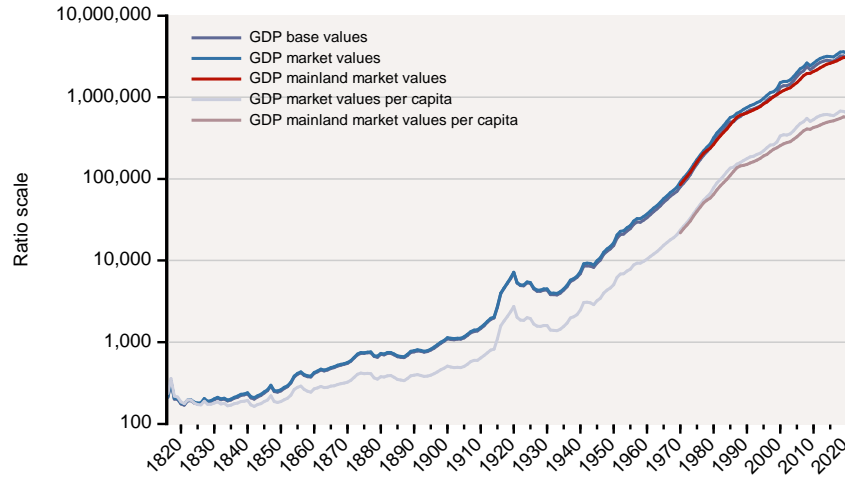
8.6 Aggregated GDP

of general government and total exports give gross fixed capital formation. Admittedly, we do not know the changes in stocks during the period. Thus, the calculations assume that stocks increased at the same pace as GDP. The indicator for 1816-1865 is thereafter connected to a revised set of the existing historical national account figures since 1865 (Statistics Norway 1865; 364-365), thereafter with revised series from 1930 (Dean, 2018) and 1946 (Skoglund, 2009).

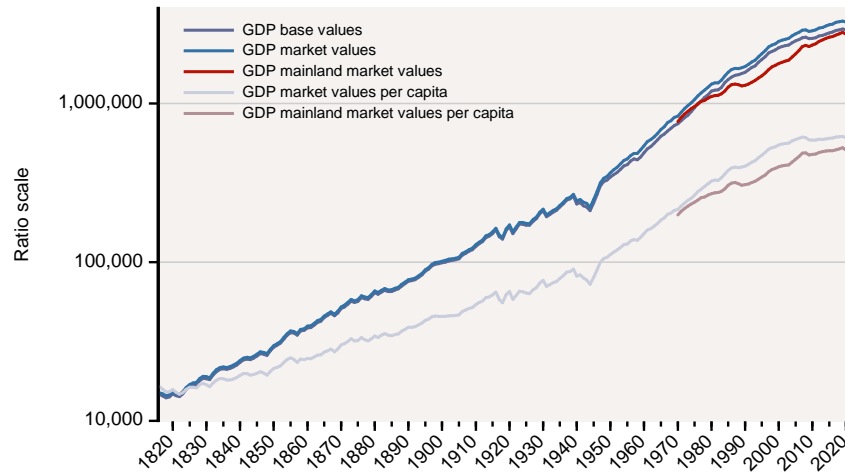
8.6 Aggregated GDP

By the value-added series for the different industries, we are able to conclude with annual GDP series for Norway 1816-2021 in current base values calculated by the production side approach, by adding net production taxes we reach GDP in current market prices as reported in Figure 8.1(a) and in fixed 2015-NOK in Figure 8.1(b).

Norwegian GDP, 1816-2021



(a) Current mill NOK.



(b) Mill fixed 2015-NOK.

Figure 8.1 GDP from the production side 1816-2021, in current mill NOK (top) and mill 2015-NOK (bottom), semi-logarithmic scale.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

8.6 Aggregated GDP

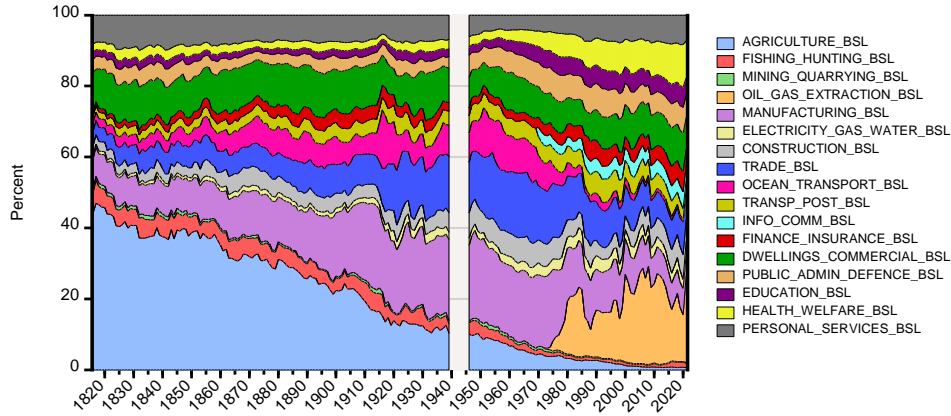


Figure 8.2 GDP from the production side 1816-2021 (disaggregated production sectors), in current mill NOK. Updated 1978-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09170/>: National accounts, production accounts and income generation, by industry.

Figure 8.2 report the shares of GDP by industry in current base values. The charts mirror industrial development as we know it. It clearly shows the decline of primary production over time, the acceleration and thereafter decline of traditional manufacturing and the steady increase of service production, along with the rapid growth of oil and gas from the 1970s. Figure 8.3 provides a more aggregated picture of production and describe the historical developments in primary, secondary, tertiary and extractive production sectors.

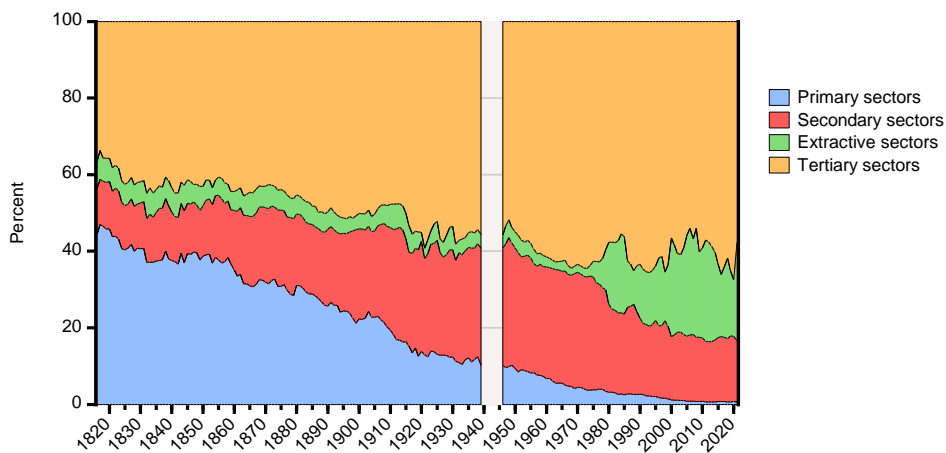


Figure 8.3 GDP from the production side 1816-2021 (primary, secondary, tertiary and extractive production sectors), in current mill NOK.

Norwegian GDP, 1816-2021

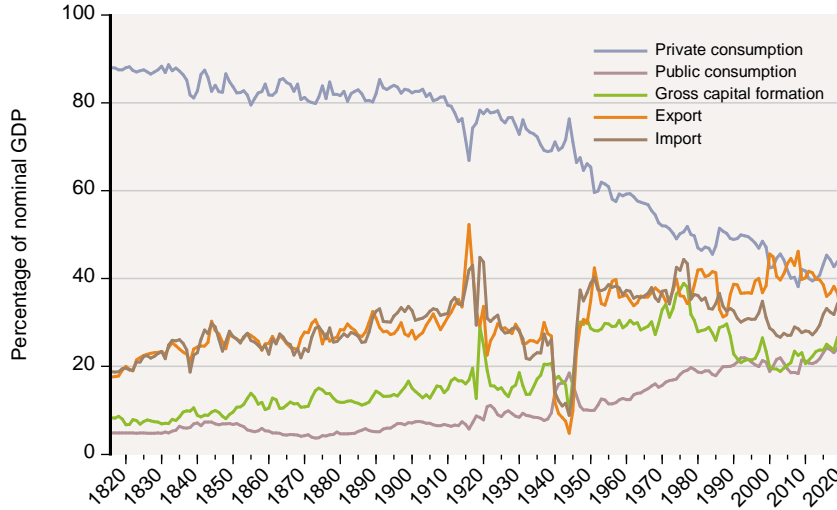


Figure 8.4 GDP and components from expenditure side, 1816-2021, in current mill NOK, percentage shares.

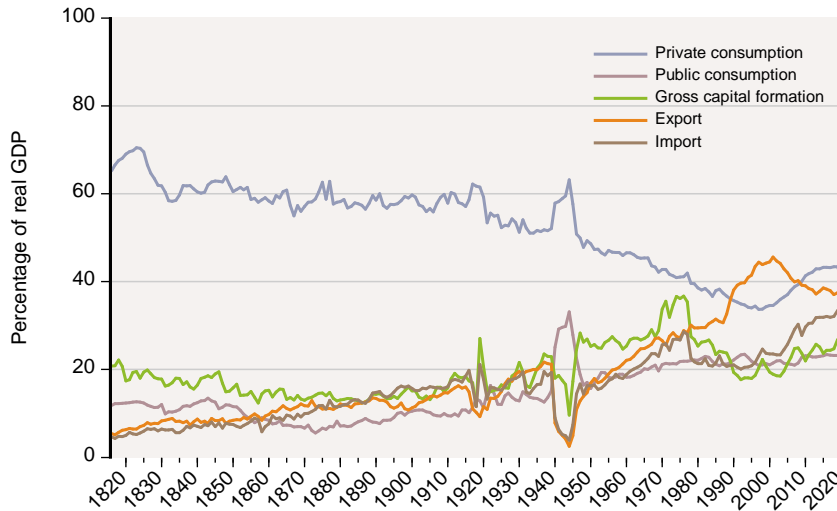


Figure 8.5 GDP and components from expenditure side, 1816-2021, in mill 2015-NOK, percentage shares.

Figure 8.4 and Figure 8.5 present GDP by expenditure as shares of GDP in market prices and fixed 2015-prices, respectively. The development to a large extent mirrors what we know from economic history research, and relative shares are in line with previous HNAs. We also see significant stability

8.6 *Aggregated GDP*

in private consumption and government consumption expenditures, when investments and foreign trade were more volatile, as is reasonable.

Norwegian GDP, 1816-2021

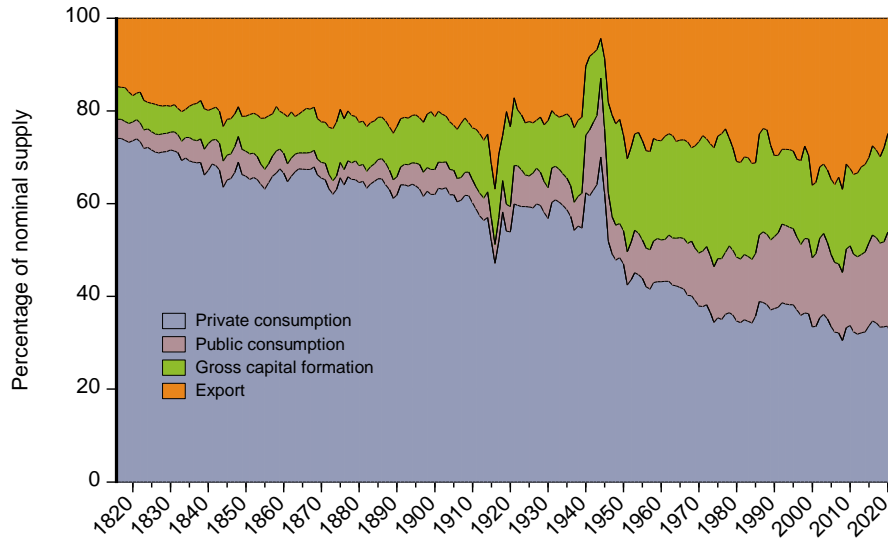


Figure 8.6 Total supply of goods and services (GDP + total imports), 1816-2021, in current mill NOK, stacked expenditure shares in percent.

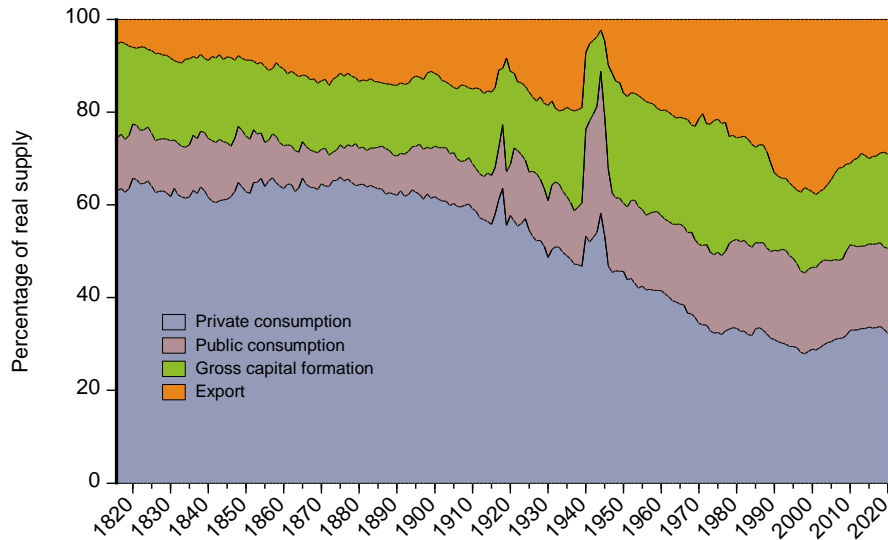


Figure 8.7 Total supply of goods and services (GDP + total imports), 1816-2021, in mill 2015-NOK, stacked expenditure shares in percent.

8.7 Fixed price calculations

8.7 Fixed price calculations

To reach gross domestic product at fixed prices we offer a set of deflators for each series from both the production and expenditure sides. By deflating the nominal figures by these, we obtain fixed price series for all the key parameters.

8.7.1 Method

We use the standard Paasche price index P_P to calculate the deflators, where p denotes price, q denotes volume, i denotes industry or sub-industry, t denotes the year for which the index is calculated and b is the base year:

$$P_P = \frac{\sum (p_{i,t}) * (q_{i,t})}{\sum (p_{i,b}) * (q_{i,t})} \quad (8.6)$$

8.7.2 Deflation from the production side

Using a double deflation technique, i.e., deflating both input and output series, gives value added y in fixed prices f for agriculture, forestry, fishing, whaling, mining, construction, manufacturing and trade:

$$y_{i,t}^f = q_{i,t} / [\sum (p_{i,t}) * (q_{i,t}) / \sum (p_{i,b}) * (q_{i,t})] - h_{i,t} / [\sum (p_{i,t}) * (q_{i,t}) / \sum (p_{i,b}) * (q_{i,t})] \quad (8.7)$$

For the rest of the service industries, we apply a single deflation technique, i.e., deflating the value-added series only:

$$y_{i,t}^f = (q_{i,t} - h_{i,t}) / [\sum (p_{i,t}) * (q_{i,t}) / \sum (p_{i,b}) * (q_{i,t})] \quad (8.8)$$

Adding the sub-industry series, we reach at value added per key industry y in fixed prices f . Adding these again, leads us to national GDP in fixed prices Y^F . By dividing GDP in nominal prices Y^N with GDP in fixed prices we find the implicit GDP deflator P_D^Y at the aggregated level:

$$P_D^Y = Y_t^N / Y_t^F \quad (8.9)$$

The same principle is used for finding implicit deflators for aggregated industries.

8.7.3 Deflation from the expenditure side

Within a fixed price period, we find GDP in fixed prices Y^F from the expenditure side by deflating each item m with their corresponding deflator P_D^m . For private consumption expenditure, we use an adjusted CPI in the historical series. This is constructed as a Laspeyres index P_L , according to the following equation (b denotes the base year):

$$P_L = \frac{\sum (p_{i,t}) * (q_{i,b})}{\sum (p_{i,b}) * (q_{i,b})} \quad (8.10)$$

Thus, one arrives at a Laspeyres deflator for private consumption expenditures P_D^C . However, for modern data one is able to operate with annual weights of quantities by adopting $t - 1$ calculations (annually spliced index). Hence, for this series until 1946 we use the following equation (8.11):

$$Y_t^F = C/P_D^C + G/P_D^G + I/P_D^I + X/P_D^X + M/P_D^M \quad (8.11)$$

8.8 Price data

Explicit deflators are calculated on basis of direct price observations. These are compiled from a wide range of sources and are well documented in the existing research literature on the establishment of HNAs for Norway. (Grytten (2000, 21-47), Grytten (2004a, 241-288), Brautaset (2002, 251-268), Bjørsvik (2004, 293-310), Vennesslan (2007, 7-138)). In addition, 19th and early 20th century price records kept in the Wedervang Archive serve as key data.¹²

Some of these are already published as price indices by the Norwegian central bank (Klovland (2018, pp. 73-92), Grytten (2020a, pp. 129-144)). In principle the fixed price series are calculated by deflating the nominal series with Paasche price indices. However, for some periods it has been difficult to find annual volumes, and Laspeyres indices have been used. Thus, fixed price periods have been set to 1816-1830 with 1825 as the base, 1830-1865 with 1850 as the base, 1865-1890 with 1880 as the base, 1890-1918 with 1910 as the base, 1918-1940 with 1938 as the base, and 1940-1945 with 1943 as the base. Thereafter, we apply the corresponding figures by Statistics Norway. We use 2015 as the reference year, meaning we present our fixed price calculations in values as of 2015 price level. Note that there is no additivity in the long-run fixed price series.

¹² Wedervang Archive, files W051, W128, W137, W138, W139, W140, W141, W142, W206, W207, W208, W209, W210, W213, W217, W218, W219, W220, W268, W269, W270, W271, W272, W273, W275, W276, W383, W386, W397 and W397.

8.9 GDP in fixed prices

8.9 GDP in fixed prices

We are now in a position to calculate GDP by the production side and the expenditure side in fixed prices. Figure 8.8 reports the development of GDP by industry, whereas Figure 8.9 and Figure 8.10 report GDP from the expenditure side in current and fixed 2015-prices, respectively.

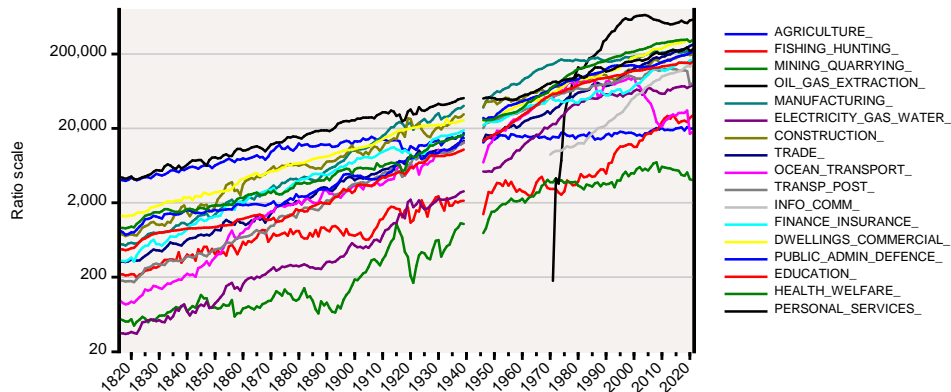


Figure 8.8 GDP by industry in mill 2015-NOK base values (semi-logarithmic scale).

Both graphs seem to show a valid and reliable picture of the development as we know it from economic history research.

8.10 Comparisons

So, do the new historical GDP series show a different picture of the macroeconomic development than assumed hitherto? To answer the question, we compare the old ($YOld_t$) series with the new ($YNew_t$) by calculating gaps ($YGAP_t$). The differences are calculated as logs in Figure 8.11 (current prices) and Figure 8.12 (fixed 2015-prices), cf. equation (8.12).

$$YGAP_t = \log \frac{YNew_t}{YOld_t} \quad (8.12)$$

The graphs in Figure 8.11 and Figure 8.12 reveal it is necessary to rewrite parts of Norwegian economic history. In the first place, the country seemed to have started on a somewhat lower level in the 1830s than shown in the existing GDP series. This is quite marginal, around 4%. However, from the 1840s onwards to the dawn of the 20th century the new series suggest significantly higher growth, in particular from 1865. During the two first decades of the 1900s the new series suggest GDP was around 17% higher than in the old. Then, in the 1920s the two series converge rapidly, suggesting considerably lower growth after World War I.

Looking more into short-term movements, one, with the exception of the crisis of 1848, finds the new series to reflect known upheavals and crises better than the old, cf. Klovland (1998b, 49-90),

Norwegian GDP, 1816-2021

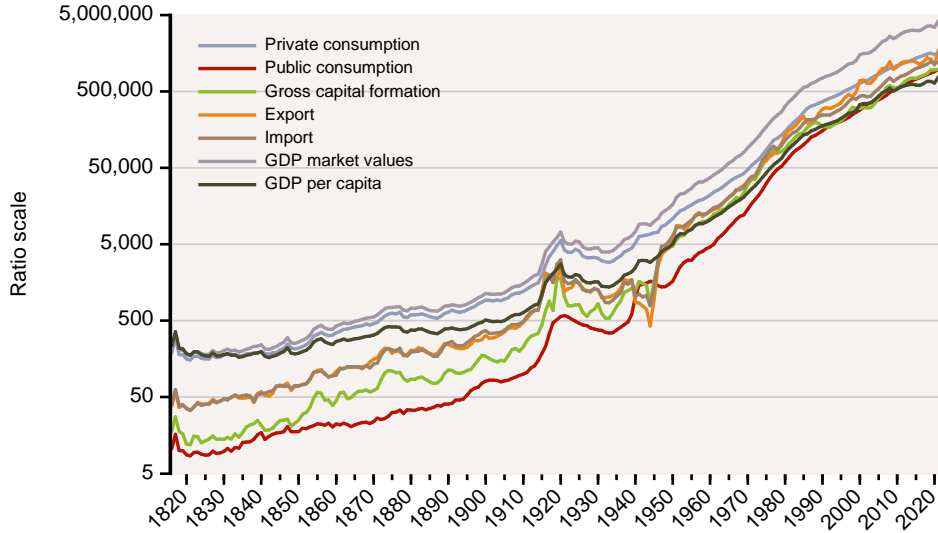


Figure 8.9 GDP and components from expenditure side 1816-2021, in current mill NOK, semi-logarithmic scale.

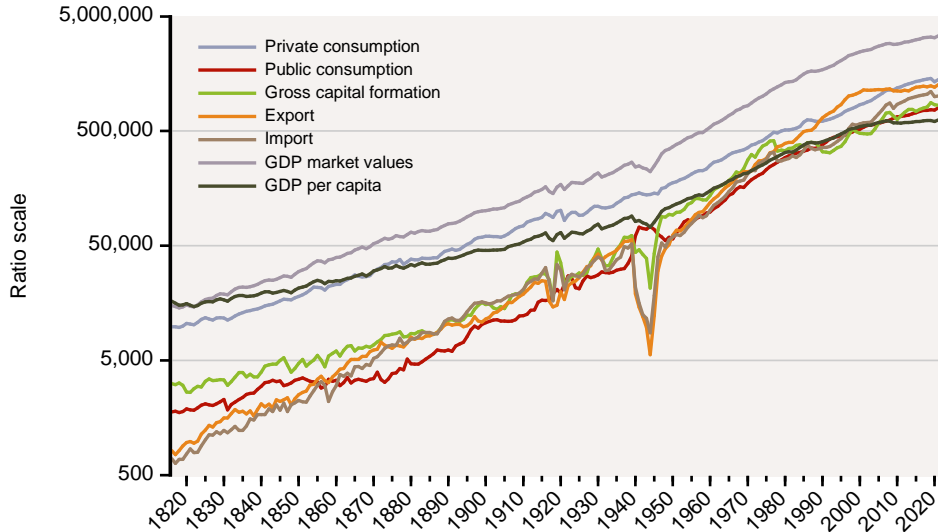


Figure 8.10 GDP and components from expenditure side 1816-2021, in mill 2015-NOK, semi-logarithmic scale.

Klovland (1998a, 309-344) and Grytten and Hunnes (2014, 25-57). The Crimean crisis towards the end of the 1850s, the start of the long depression in the mid 1870s and the Kristiania crisis 1900-1905 are better reflected in the new series. Additionally, the booms leading up to these crises have

8.10 Comparisons

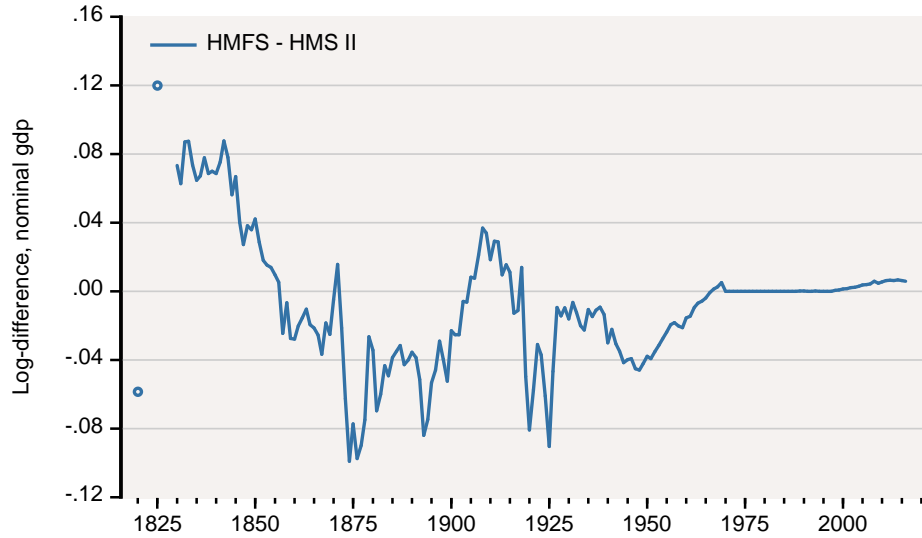


Figure 8.11 Ratios (gaps) between new (HMSF) and old GDP series (HMS II), in current mill NOK, log-differences

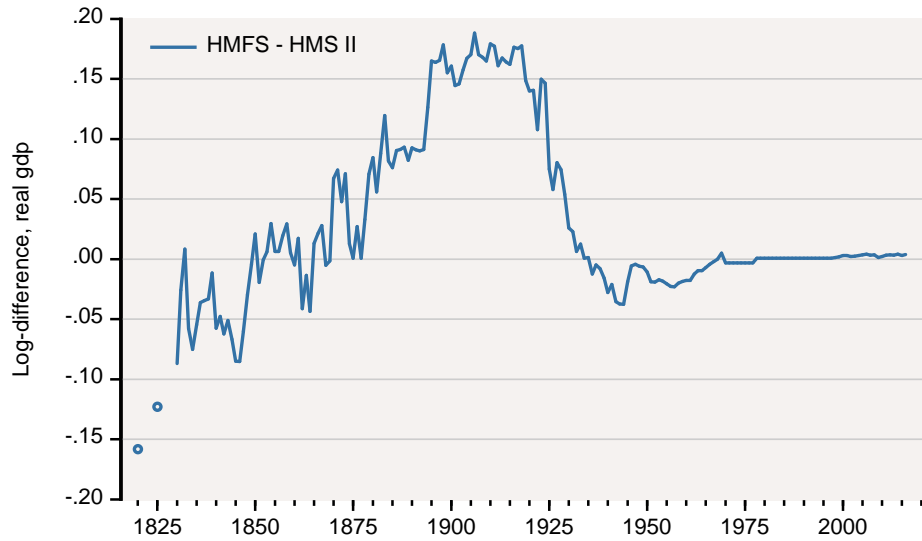


Figure 8.12 Ratios (gaps) between new (HMSF) and old GDP series (HMS II), in mill fixed 2015-NOK, log-differences

also become more significant. Lower growth in the 1920s, should better mirror the depression of the period. The same applies to the 1930s, but clearly to a lower extent.

Admittedly, the gaps between the new and the old GDP series seem quite high, in particular the

volume series in fixed prices, during the period from the 1880s until the early 1920s. Still, however, the results for the greater part of the new series are within the suggested margins of error in the old series (Bjerke, 1966, 8-14).

8.11 Conclusions

The present paper offers new calculations of Norwegian GDP from both the production and the expenditure sides 1816-2021. It sits on GDP by 17 industries and 78 sub-industries. The calculations are based on available data for input, output volumes and prices. When possible we have applied a double deflation technique for fixed price calculations. The new series rest on a significantly larger amount of data than the previous ones and are revised up to the most recent standards SNA 2008 and ESA 2010.

The new series are within the estimated errors of the old series. However, some significant differences exist. The new aggregated series show a somewhat lower level of GDP until the mid 1800s. From then on and until the turn of the century the new series show significantly higher growth rates than the old. When in the 1920s the new series shows lower growth rates than the old. This is also more in line with international trends and business cycles. Thus, the new series on GDP by industry and expenditure, presented in this paper seem fairly consistent, valid, and reliable. They surely represent improvements compared to the old series.

8.12 Sources

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8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.1: GDP for Norway by expenditure 1816-2021 in current prices (mill NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1816	190	11	18	38	41	215	234	919 242
1817	295	16	28	59	63	336	359	933 395
1818	181	10	18	37	39	206	218	945 844
1819	179	10	16	39	40	204	213	957 226
1820	158	9	12	36	35	180	186	970 050
1821	154	9	12	34	33	174	177	984 054
1822	171	9	15	37	37	195	196	997 797
1823	172	10	15	42	41	198	195	1 012 730
1824	161	9	13	41	39	185	180	1 028 142
1825	157	9	13	40	40	180	172	1 044 173
1826	158	9	14	41	41	181	171	1 061 892
1827	176	10	15	47	45	204	189	1 078 551
1828	165	9	14	44	42	189	173	1 093 287
1829	168	9	14	44	44	192	173	1 108 361
1830	179	10	14	47	47	202	180	1 123 733
1831	183	11	15	48	46	211	185	1 137 417
1832	179	10	14	49	50	202	175	1 150 463
1833	180	11	16	52	53	206	177	1 163 178
1834	172	11	15	48	51	196	167	1 174 762
1835	175	13	17	48	52	201	169	1 188 130
1836	183	13	20	49	53	212	176	1 202 404
1837	186	13	22	50	52	218	180	1 213 908
1838	187	14	22	48	43	229	187	1 224 163
1839	189	16	25	56	53	233	189	1 232 622
1840	199	17	21	59	56	241	194	1 241 140
1841	185	14	18	53	56	215	171	1 254 405
1842	182	15	19	51	59	208	164	1 270 597
1843	189	16	19	56	61	221	171	1 286 193
1844	190	17	22	70	69	231	177	1 301 772
1845	207	17	25	69	72	247	187	1 319 185
1846	217	18	25	72	69	262	196	1 336 728
1847	246	21	26	76	70	298	221	1 351 331
1848	221	18	21	61	65	256	187	1 363 384
1849	214	18	23	68	70	252	183	1 376 619
1850	218	18	25	70	70	261	187	1 391 941
1851	229	20	30	73	73	279	198	1 408 903
1852	241	19	32	75	74	293	206	1 425 472
1853	267	20	37	85	86	323	224	1 439 756
1854	313	21	49	105	105	383	263	1 457 020
1855	329	22	58	112	107	414	280	1 478 723
1856	351	22	56	115	111	433	289	1 500 611
1857	331	21	46	103	100	402	264	1 520 744
1858	319	23	46	91	92	386	250	1 543 194
1859	323	20	39	96	95	383	244	1 569 801
1860	349	22	45	108	97	427	267	1 596 089
1861	364	22	57	120	117	445	276	1 613 878
1862	385	23	58	118	117	467	287	1 626 986
1863	388	22	48	123	125	455	276	1 646 433
1864	399	21	49	123	125	467	280	1 668 254
1865	414	22	55	123	124	489	290	1 690 133
1866	421	22	59	122	125	500	293	1 707 272
1867	430	23	60	125	118	521	303	1 716 860
1868	452	24	62	128	129	536	311	1 725 088

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.1: GDP for Norway by expenditure 1816-2021 in current prices (mill NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1869	441	22	59	144	120	546	315	1 730 949
1870	457	24	61	156	135	562	324	1 736 909
1871	478	26	65	165	139	595	341	1 746 353
1872	523	25	84	195	174	653	372	1 756 929
1873	570	26	103	219	205	714	403	1 769 421
1874	606	28	112	216	216	745	417	1 786 640
1875	624	31	109	187	207	744	412	1 807 803
1876	611	32	104	207	199	756	413	1 828 856
1877	643	34	105	196	218	760	410	1 851 572
1878	559	31	87	180	174	683	364	1 876 835
1879	550	34	81	179	172	672	353	1 902 126
1880	592	34	86	206	192	726	378	1 919 075
1881	593	34	85	203	197	718	373	1 922 948
1882	599	35	90	221	200	746	389	1 919 767
1883	615	35	91	215	208	749	390	1 919 317
1884	591	34	85	202	196	716	371	1 929 058
1885	565	36	79	185	183	681	350	1 943 917
1886	550	37	75	180	171	671	343	1 958 323
1887	536	39	77	185	171	666	338	1 969 807
1888	571	38	84	213	197	709	359	1 976 615
1889	619	40	102	251	240	771	389	1 984 295
1890	644	41	113	243	256	785	393	1 996 929
1891	686	41	112	232	266	804	400	2 012 504
1892	660	46	104	220	239	791	391	2 026 016
1893	644	46	102	217	234	775	380	2 037 797
1894	660	47	105	215	238	790	384	2 056 657
1895	690	53	112	226	259	822	395	2 083 088
1896	728	61	116	247	281	871	412	2 111 676
1897	764	65	133	279	311	930	434	2 141 721
1898	830	67	153	274	325	1 000	460	2 173 807
1899	873	76	176	284	355	1 053	478	2 204 084
1900	934	81	171	321	371	1 135	509	2 230 483
1901	924	83	160	293	341	1 119	496	2 254 911
1902	913	83	150	299	340	1 105	486	2 275 485
1903	930	83	144	310	347	1 120	490	2 287 768
1904	912	79	152	329	353	1 120	487	2 297 494
1905	954	82	148	356	378	1 161	503	2 308 572
1906	1 002	84	175	398	413	1 246	537	2 319 191
1907	1 088	88	209	405	443	1 347	578	2 328 962
1908	1 142	91	217	398	444	1 405	599	2 345 564
1909	1 154	96	199	422	452	1 419	599	2 367 494
1910	1 210	100	226	476	488	1 524	639	2 383 677
1911	1 301	105	275	530	569	1 642	684	2 400 796
1912	1 401	120	312	611	642	1 802	744	2 423 184
1913	1 480	127	327	689	669	1 954	799	2 446 874
1914	1 552	150	339	680	691	2 031	821	2 472 419
1915	1 957	185	438	1 193	1 038	2 734	1 095	2 497 766
1916	2 666	230	675	2 082	1 669	3 984	1 579	2 522 178
1917	3 437	333	906	1 939	1 988	4 627	1 814	2 550 543
1918	4 019	464	677	1 741	1 567	5 336	2 070	2 577 729
1919	4 812	514	1 779	1 794	2 754	6 145	2 361	2 602 869
1920	5 586	563	1 786	2 425	3 151	7 210	2 737	2 634 664
1921	4 206	581	1 027	1 208	1 661	5 361	2 009	2 667 867
1922	3 908	561	785	1 297	1 520	5 032	1 867	2 694 840
1923	3 906	521	781	1 369	1 558	5 019	1 850	2 713 117
1924	4 275	490	809	1 627	1 733	5 468	2 004	2 728 766
1925	4 086	461	810	1 536	1 529	5 364	1 953	2 746 815

Norwegian GDP, 1816-2021

Table 8.A.1: GDP for Norway by expenditure 1816-2021 in current prices (mill NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1926	3 486	441	641	1 329	1 276	4 622	1 673	2 763 106
1927	3 335	430	573	1 226	1 209	4 356	1 570	2 774 866
1928	3 325	401	659	1 191	1 239	4 337	1 557	2 784 674
1929	3 355	389	707	1 329	1 295	4 485	1 605	2 795 105
1930	3 268	378	833	1 269	1 258	4 489	1 599	2 807 439
1931	3 028	373	621	1 002	1 045	3 979	1 409	2 823 882
1932	2 945	353	540	1 005	867	3 976	1 399	2 841 528
1933	2 896	343	540	1 023	853	3 950	1 382	2 858 343
1934	3 025	349	635	1 069	934	4 145	1 442	2 874 206
1935	3 250	378	770	1 142	1 041	4 499	1 557	2 889 211
1936	3 506	408	898	1 317	1 147	4 982	1 716	2 903 519
1937	3 980	442	1 179	1 728	1 574	5 754	1 971	2 918 742
1938	4 146	482	1 231	1 655	1 495	6 018	2 050	2 935 803
1939	4 442	604	1 331	1 731	1 678	6 430	2 176	2 954 415
1940	5 218	1 039	1 250	867	1 035	7 340	2 469	2 973 067
1941	6 323	1 456	1 620	845	1 113	9 131	3 054	2 990 234
1942	6 463	1 502	1 531	774	1 019	9 251	3 075	3 008 883
1943	6 593	1 535	1 459	698	1 071	9 214	3 039	3 032 429
1944	6 745	1 636	820	424	786	8 839	2 888	3 060 211
1945	7 044	1 578	1 721	981	1 411	9 912	3 206	3 091 177
1946	7 171	1 438	2 713	2 531	3 051	10 802	3 455	3 126 883
1947	8 534	1 381	3 804	3 650	4 729	12 641	3 994	3 165 011
1948	8 942	1 395	4 089	4 252	4 836	13 842	4 324	3 201 012
1949	9 860	1 504	4 575	4 448	5 481	14 906	4 609	3 234 227
1950	10 778	1 643	4 720	5 768	6 426	16 483	5 048	3 265 125
1951	12 220	2 054	5 767	8 698	8 240	20 500	6 220	3 295 871
1952	13 607	2 545	6 375	8 685	8 503	22 709	6 824	3 327 728
1953	14 308	2 905	6 596	7 922	8 614	23 117	6 878	3 360 888
1954	15 465	3 107	7 495	8 537	9 454	25 150	7 410	3 394 246
1955	16 351	3 080	7 966	9 820	10 368	26 849	7 832	3 428 200
1956	17 648	3 499	8 843	11 981	11 560	30 411	8 787	3 460 782
1957	18 701	3 832	9 491	12 953	12 455	32 522	9 313	3 491 938
1958	19 309	4 035	9 950	11 654	12 345	32 603	9 254	3 522 994
1959	20 386	4 398	9 973	12 463	12 583	34 638	9 749	3 552 854
1960	21 957	4 602	10 899	13 434	13 840	37 052	10 346	3 581 239
1961	23 985	5 022	12 330	14 140	15 023	40 455	11 207	3 609 800
1962	25 661	5 917	12 979	14 792	15 554	43 795	12 035	3 638 918
1963	27 154	6 530	14 121	16 242	16 923	47 123	12 852	3 666 537
1964	29 747	7 255	14 690	18 687	18 504	51 875	14 042	3 694 339
1965	32 728	8 336	16 441	20 479	20 652	57 331	15 399	3 723 168
1966	35 246	9 273	18 061	22 225	22 745	62 060	16 536	3 753 012
1967	37 714	10 588	20 494	25 034	25 792	68 039	17 978	3 784 539
1968	39 616	11 646	19 845	27 542	25 908	72 740	19 059	3 816 486
1969	41 848	12 112	23 572	29 502	27 613	79 421	20 641	3 847 707
1970	47 605	14 376	30 119	33 387	33 957	91 530	23 616	3 875 763
1971	53 440	16 938	35 136	35 780	38 394	102 897	26 363	3 903 039
1972	58 701	19 170	35 627	39 971	39 106	114 362	29 078	3 933 004
1973	65 289	22 001	43 137	48 603	49 102	129 928	32 805	3 960 613
1974	73 748	25 778	54 886	59 937	63 970	150 379	37 734	3 985 258
1975	86 271	31 165	64 351	62 041	71 979	171 849	42 884	4 007 313
1976	99 241	37 003	76 266	70 545	86 936	196 119	48 711	4 026 152
1977	114 622	42 253	84 203	75 760	95 870	220 968	54 652	4 043 205
1978	121 875	48 115	77 504	86 419	86 062	243 887	60 090	4 058 671
1979	133 808	52 033	82 030	103 570	97 907	269 067	66 069	4 072 517
1980	149 580	59 489	88 788	133 452	115 083	318 279	77 902	4 085 620
1981	169 515	67 845	102 829	153 523	128 027	365 013	89 034	4 099 702
1982	190 773	76 815	114 558	163 557	143 863	404 325	98 261	4 114 787

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.1: GDP for Norway by expenditure 1816-2021 in current prices (mill NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1983	210 806	85 228	129 938	183 253	149 129	449 657	108 917	4 128 432
1984	230 672	92 109	139 380	210 594	167 347	506 486	122 337	4 140 099
1985	266 491	100 647	146 121	232 447	192 995	562 402	135 436	4 152 516
1986	299 531	110 677	167 645	192 285	213 337	581 912	139 636	4 167 354
1987	322 145	126 832	184 881	198 266	213 615	634 874	151 633	4 186 905
1988	333 846	132 361	197 072	210 589	216 207	664 084	157 759	4 209 488
1989	348 008	141 874	190 278	258 176	235 333	708 636	167 649	4 226 901
1990	366 541	152 103	171 231	290 406	244 898	749 861	176 793	4 241 473
1991	387 866	165 965	171 843	304 892	244 928	790 087	185 391	4 261 732
1992	405 989	178 490	169 753	297 560	244 863	813 093	189 691	4 286 401
1993	425 427	187 962	182 209	313 877	261 386	855 401	198 377	4 311 991
1994	444 158	194 029	194 027	329 683	277 163	897 242	206 899	4 336 613
1995	470 912	201 899	206 488	352 689	295 496	963 138	220 945	4 359 184
1996	506 990	214 784	230 155	415 883	324 514	1 054 672	240 719	4 381 336
1997	535 342	228 017	268 797	456 947	366 572	1 141 340	259 092	4 405 157
1998	564 439	248 527	308 420	427 707	405 754	1 163 683	262 596	4 431 464
1999	597 042	266 110	297 010	486 152	394 125	1 266 463	283 839	4 461 913
2000	639 950	284 676	298 800	688 357	433 117	1 509 132	336 037	4 490 967
2001	667 510	313 842	305 493	704 786	441 391	1 566 708	347 097	4 513 751
2002	697 964	338 267	303 273	632 992	423 072	1 564 145	344 665	4 538 159
2003	740 692	356 349	306 005	644 316	432 796	1 624 095	355 782	4 564 855
2004	790 318	370 927	350 289	735 100	492 839	1 788 123	389 407	4 591 910
2005	834 554	386 895	405 383	867 554	539 747	1 997 037	431 951	4 623 291
2006	891 912	413 106	464 307	990 898	603 443	2 224 871	477 371	4 660 677
2007	951 214	440 157	554 438	1 013 873	684 084	2 360 174	501 189	4 709 153
2008	1 000 752	482 485	589 599	1 211 901	749 070	2 622 122	549 917	4 768 212
2009	1 025 885	524 514	564 867	971 253	674 682	2 439 712	505 250	4 828 726
2010	1 087 050	553 027	537 688	1 046 057	731 822	2 605 351	532 873	4 889 252
2011	1 125 089	584 196	600 817	1 170 652	785 023	2 809 929	567 309	4 953 088
2012	1 176 605	614 804	665 383	1 231 627	811 741	2 983 082	594 408	5 018 573
2013	1 234 388	648 323	724 129	1 231 848	868 739	3 090 335	608 314	5 080 166
2014	1 288 402	686 825	749 617	1 256 100	929 869	3 161 776	615 439	5 137 429
2015	1 354 268	723 005	741 527	1 207 474	997 172	3 130 183	603 130	5 189 894
2016	1 411 418	754 667	780 832	1 119 846	1 033 859	3 116 035	595 100	5 236 151
2017	1 471 657	791 090	809 386	1 220 651	1 075 905	3 323 103	629 737	5 276 968
2018	1 527 962	826 653	850 304	1 367 006	1 136 715	3 576 580	673 313	5 311 916
2019	1 579 019	866 988	957 750	1 317 951	1 232 127	3 596 937	672 589	5 347 896
2020	1 503 954	904 650	949 737	1 114 985	1 147 292	3 461 575	643 478	5 379 475
2021	1 618 054	971 877	973 971	1 753 674	1 213 298	4 209 510	778 340	5 408 320

Norwegian GDP, 1816-2021

Table 8.A.2: GDP for Norway by expenditure 1816-2021 in fixed prices (mill 2015-NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1816	9 815	1 778	3 127	818	695	15 045	16 367	919 242
1817	9 812	1 805	3 077	754	633	14 738	15 790	933 395
1818	9 691	1 753	3 179	813	683	14 342	15 163	945 844
1819	9 927	1 793	3 021	898	684	14 585	15 237	957 226
1820	10 502	1 880	2 642	962	764	15 212	15 681	970 050
1821	10 337	1 849	2 623	982	843	14 853	15 093	984 054
1822	10 219	1 839	2 833	948	784	14 643	14 675	997 797
1823	10 707	1 923	2 962	983	790	15 188	14 997	1 012 730
1824	11 391	2 032	2 918	1 138	898	16 195	15 752	1 028 142
1825	11 776	2 094	3 283	1 235	1 011	16 941	16 225	1 044 173
1826	11 484	2 045	3 432	1 359	1 123	17 251	16 246	1 061 892
1827	11 254	2 019	3 319	1 313	1 114	17 406	16 138	1 078 551
1828	11 705	2 087	3 356	1 428	1 195	18 447	16 873	1 093 287
1829	11 787	2 177	3 402	1 462	1 145	19 042	17 180	1 108 361
1830	11 700	2 281	3 378	1 572	1 222	18 935	16 850	1 123 733
1831	11 259	1 845	3 025	1 575	1 165	18 659	16 404	1 137 417
1832	11 597	2 056	3 270	1 713	1 239	19 858	17 261	1 150 463
1833	12 197	2 156	3 559	1 857	1 330	20 940	18 002	1 163 178
1834	12 662	2 273	3 903	1 764	1 224	21 666	18 443	1 174 762
1835	13 039	2 372	3 924	1 794	1 223	21 823	18 367	1 188 130
1836	13 401	2 518	3 595	1 703	1 340	21 673	18 025	1 202 404
1837	13 569	2 579	3 777	1 816	1 544	21 963	18 093	1 213 908
1838	13 839	2 594	3 593	1 642	1 506	22 385	18 286	1 224 163
1839	14 053	2 792	3 574	1 861	1 684	23 015	18 671	1 232 622
1840	14 448	2 970	3 928	2 082	1 685	23 912	19 266	1 241 140
1841	14 925	3 194	4 447	1 969	1 685	24 812	19 780	1 254 405
1842	15 183	3 248	4 584	2 077	1 889	25 152	19 795	1 270 597
1843	15 425	3 350	4 628	1 930	1 791	24 876	19 341	1 286 193
1844	15 960	3 272	4 631	2 262	2 052	25 458	19 556	1 301 772
1845	16 505	3 307	4 989	2 192	1 842	26 251	19 899	1 319 185
1846	17 064	2 998	5 279	2 271	2 118	27 157	20 316	1 336 728
1847	16 913	3 068	4 546	2 364	1 786	26 981	19 966	1 351 331
1848	16 882	3 171	3 952	2 045	2 046	26 445	19 396	1 363 384
1849	17 486	3 341	4 232	2 318	2 128	28 162	20 457	1 376 619
1850	17 970	3 428	4 702	2 505	2 228	29 706	21 342	1 391 941
1851	18 703	3 510	5 102	2 625	2 170	30 669	21 768	1 408 903
1852	19 422	3 391	4 446	2 692	2 154	31 620	22 182	1 425 472
1853	20 428	3 294	4 754	3 041	2 431	33 542	23 297	1 439 756
1854	21 758	3 243	5 037	3 080	2 716	35 411	24 304	1 457 020
1855	21 600	3 220	5 507	3 426	3 026	36 789	24 879	1 478 723
1856	21 546	2 876	5 010	3 622	3 270	36 543	24 352	1 500 611
1857	20 554	2 943	4 389	3 317	3 025	35 396	23 275	1 520 744
1858	22 091	3 411	5 432	3 188	2 193	37 677	24 415	1 543 194
1859	22 487	3 278	5 748	3 590	2 668	38 032	24 227	1 569 801
1860	23 019	3 339	6 024	3 847	3 005	39 475	24 732	1 596 089
1861	22 914	3 010	5 439	4 181	3 756	39 651	24 569	1 613 878
1862	24 480	3 192	6 096	4 258	3 621	41 089	25 255	1 626 986
1863	25 201	3 531	6 632	4 720	3 854	42 690	25 929	1 646 433
1864	26 288	3 169	6 723	5 105	3 666	43 462	26 052	1 668 254
1865	27 840	3 347	6 043	5 103	4 395	45 763	27 077	1 690 133
1866	26 958	3 415	6 417	5 090	4 411	47 045	27 556	1 707 272
1867	26 688	3 355	6 360	5 424	4 251	48 574	28 292	1 716 860
1868	26 896	3 290	6 628	5 417	4 610	46 917	27 197	1 725 088
1869	27 390	3 416	6 499	5 953	4 498	48 908	28 255	1 730 949
1870	29 805	3 463	6 791	6 136	5 194	52 185	30 045	1 736 909
1871	31 080	3 943	7 221	6 257	5 372	53 504	30 638	1 746 353
1872	32 307	3 397	7 580	7 177	5 813	55 545	31 615	1 756 929

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.2: GDP for Norway by expenditure 1816-2021 in fixed prices (mill 2015-NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1873	34 137	3 224	8 232	6 754	6 359	58 066	32 816	1 769 421
1874	34 404	3 442	8 295	6 575	6 674	56 947	31 874	1 786 640
1875	36 213	3 827	8 478	6 370	6 829	57 845	31 997	1 807 803
1876	35 963	3 893	8 579	6 765	6 748	61 222	33 475	1 828 856
1877	37 776	4 250	8 886	6 682	7 809	60 110	32 465	1 851 572
1878	34 393	4 122	7 995	6 540	6 919	59 690	31 804	1 876 835
1879	36 237	5 140	8 039	7 101	7 166	62 402	32 806	1 902 126
1880	38 215	4 679	8 552	7 963	7 627	65 630	34 199	1 919 075
1881	37 723	4 646	8 497	7 621	7 736	64 273	33 424	1 922 948
1882	37 670	4 650	8 876	7 824	8 017	66 352	34 563	1 919 767
1883	38 829	4 857	9 046	7 721	8 749	67 994	35 426	1 919 317
1884	38 662	5 116	8 711	8 119	8 767	66 709	34 581	1 929 058
1885	38 562	5 421	8 573	8 184	8 743	66 824	34 376	1 943 917
1886	39 176	5 705	8 427	8 445	8 521	68 279	34 866	1 958 323
1887	39 157	6 153	8 757	8 732	8 533	69 367	35 215	1 969 807
1888	41 836	6 084	9 574	9 331	9 546	72 426	36 642	1 976 615
1889	44 589	6 024	10 761	10 152	10 965	74 839	37 715	1 984 295
1890	45 368	6 174	11 157	10 391	11 436	77 526	38 823	1 996 929
1891	46 844	5 999	11 321	10 171	11 714	78 091	38 803	2 012 504
1892	45 405	6 675	11 041	10 286	11 122	79 228	39 105	2 026 016
1893	46 388	6 933	10 937	10 313	11 172	81 835	40 158	2 037 797
1894	48 967	7 210	11 396	9 840	11 979	85 005	41 332	2 056 657
1895	51 416	8 087	12 423	9 998	13 256	89 421	42 927	2 083 088
1896	53 250	9 217	12 383	10 638	14 497	92 217	43 670	2 111 676
1897	56 659	9 913	13 964	11 989	15 735	97 015	45 298	2 141 721
1898	58 959	9 572	15 101	10 988	15 831	99 254	45 659	2 173 807
1899	59 057	10 313	15 996	10 788	16 203	100 010	45 375	2 204 084
1900	60 478	10 635	15 306	11 424	15 892	101 292	45 413	2 230 483
1901	60 589	10 962	15 497	11 880	15 578	102 329	45 381	2 254 911
1902	59 813	11 258	14 278	12 956	15 809	104 144	45 768	2 275 485
1903	59 833	11 310	13 971	13 252	16 474	104 748	45 786	2 287 768
1904	59 126	10 998	14 736	13 917	16 511	105 751	46 029	2 297 494
1905	60 654	10 996	14 096	14 774	17 261	107 174	46 424	2 308 572
1906	63 260	10 966	15 974	15 916	18 097	113 294	48 851	2 319 191
1907	67 081	11 038	18 522	15 970	18 366	116 093	49 847	2 328 962
1908	70 753	11 285	19 072	16 911	18 818	119 553	50 970	2 345 564
1909	73 083	12 190	18 204	17 973	19 220	122 089	51 569	2 367 494
1910	74 464	12 237	20 358	18 849	20 744	128 675	53 982	2 383 677
1911	80 436	12 568	23 903	20 335	23 222	133 414	55 571	2 400 796
1912	82 557	13 651	26 358	21 787	24 501	137 800	56 867	2 423 184
1913	84 792	13 800	26 757	23 862	25 688	146 178	59 741	2 446 874
1914	86 065	16 073	27 022	23 486	25 524	149 137	60 320	2 472 419
1915	88 408	16 709	28 593	24 801	28 686	154 842	61 992	2 497 766
1916	95 634	16 597	28 385	24 384	32 324	163 197	64 705	2 522 178
1917	92 238	16 863	25 196	16 451	23 715	148 363	58 169	2 550 543
1918	88 001	18 979	16 732	14 638	16 491	142 653	55 340	2 577 729
1919	99 815	20 828	43 881	15 090	34 285	162 305	62 356	2 602 869
1920	101 572	19 269	35 348	19 748	30 484	171 496	65 092	2 634 664
1921	82 785	22 942	23 644	16 988	20 569	155 028	58 109	2 667 867
1922	92 346	27 130	24 737	22 414	26 475	166 090	61 633	2 694 840
1923	97 611	25 775	27 116	23 820	28 197	177 918	65 577	2 713 117
1924	97 666	21 487	27 360	24 667	27 398	177 355	64 995	2 728 766
1925	91 664	21 017	28 942	26 329	26 742	175 259	63 805	2 746 815
1926	92 342	24 534	27 644	29 354	28 281	174 882	63 292	2 763 106
1927	97 700	27 127	29 139	32 963	32 090	185 338	66 792	2 774 866
1928	104 493	26 304	35 581	33 372	34 227	192 590	69 161	2 784 674
1929	110 299	26 925	39 559	39 089	37 125	206 452	73 862	2 795 105

Norwegian GDP, 1816-2021

Table 8.A.2: GDP for Norway by expenditure 1816-2021 in fixed prices (mill 2015-NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1930	110 518	27 793	46 622	42 147	39 837	215 796	76 866	2 807 439
1931	107 187	29 570	38 566	37 461	38 524	198 150	70 169	2 823 882
1932	106 732	29 215	33 419	39 964	30 330	204 555	71 988	2 841 528
1933	107 855	28 902	33 545	41 815	30 736	211 452	73 977	2 858 343
1934	110 595	29 238	39 146	43 430	33 930	216 611	75 364	2 874 206
1935	117 436	30 480	46 116	45 384	37 724	227 355	78 691	2 889 211
1936	122 675	31 071	50 971	49 516	39 797	238 917	82 285	2 903 519
1937	130 266	31 596	59 205	54 479	49 127	251 607	86 204	2 918 742
1938	132 163	34 909	58 882	54 666	47 561	256 239	87 281	2 935 803
1939	139 054	40 466	61 181	56 635	51 618	267 009	90 376	2 954 415
1940	140 269	60 744	43 618	18 964	21 762	242 339	81 511	2 973 067
1941	144 451	72 481	46 239	14 565	15 776	248 214	83 008	2 990 234
1942	140 527	70 574	41 910	12 000	12 476	238 569	79 288	3 008 883
1943	139 130	69 736	38 678	9 690	11 601	233 811	77 103	3 032 429
1944	139 907	73 440	21 330	5 617	8 676	221 601	72 414	3 060 211
1945	143 183	69 162	42 927	12 255	18 364	248 284	80 320	3 091 177
1946	141 512	62 872	68 131	30 204	40 136	278 396	89 033	3 126 883
1947	157 918	59 511	89 472	40 646	52 765	316 151	99 889	3 165 011
1948	161 312	55 374	88 627	46 907	48 819	337 587	105 463	3 201 012
1949	171 275	59 222	93 436	51 179	56 513	347 229	107 361	3 234 227
1950	177 340	57 102	92 203	61 708	59 510	364 638	111 677	3 265 125
1951	180 362	64 817	97 838	68 357	62 552	381 082	115 624	3 295 871
1952	187 423	71 339	98 588	67 128	61 125	395 544	118 863	3 327 728
1953	193 576	80 541	103 471	71 767	65 508	416 019	123 783	3 360 888
1954	201 621	84 263	114 513	78 860	72 275	437 459	128 882	3 394 246
1955	210 238	81 485	118 716	84 576	77 885	446 246	130 169	3 428 200
1956	219 271	84 568	128 775	93 378	83 889	469 266	135 596	3 460 782
1957	225 905	88 639	128 719	97 479	91 818	484 732	138 815	3 491 938
1958	225 203	91 370	125 544	99 070	87 723	483 172	137 148	3 522 994
1959	234 179	96 262	125 521	108 264	91 410	509 587	143 430	3 552 854
1960	251 039	98 302	136 722	118 984	101 851	539 474	150 639	3 581 239
1961	266 717	104 894	153 666	127 645	112 334	573 285	158 813	3 609 800
1962	273 369	110 436	160 571	136 348	118 908	592 612	162 854	3 638 918
1963	280 675	118 075	167 215	147 948	126 476	616 903	168 252	3 666 537
1964	293 763	125 749	172 882	159 995	135 408	648 043	175 415	3 694 339
1965	310 119	137 840	184 908	169 265	148 051	683 633	183 616	3 723 168
1966	322 923	142 556	196 453	179 287	160 055	711 901	189 688	3 753 012
1967	330 378	156 087	220 081	194 883	179 078	757 729	200 217	3 784 539
1968	336 618	162 912	213 561	210 040	183 305	776 666	203 503	3 816 486
1969	343 596	160 642	235 358	221 767	187 124	815 050	211 827	3 847 707
1970	356 164	175 977	281 044	221 001	213 013	832 345	214 756	3 875 763
1971	375 833	188 181	312 248	224 444	227 428	879 559	225 352	3 903 039
1972	386 066	196 792	295 158	254 917	225 551	926 445	235 557	3 933 004
1973	399 837	206 688	336 284	274 656	259 776	968 440	244 518	3 960 613
1974	411 737	214 119	368 410	276 871	271 151	1 006 432	252 539	3 985 258
1975	433 521	230 233	381 901	287 255	282 396	1 056 272	263 586	4 007 313
1976	459 335	244 358	409 919	322 333	319 020	1 117 804	277 636	4 026 152
1977	488 152	254 514	412 359	330 507	325 798	1 164 313	287 968	4 043 205
1978	480 383	267 037	333 394	365 453	273 844	1 214 132	299 145	4 058 671
1979	500 560	280 618	339 808	373 264	275 361	1 267 220	311 164	4 072 517
1980	510 922	292 866	335 731	390 155	282 702	1 325 059	324 323	4 085 620
1981	512 466	302 795	352 653	397 187	287 079	1 346 238	328 375	4 099 702
1982	518 213	310 267	355 454	398 956	303 083	1 349 406	327 941	4 114 787
1983	528 475	319 625	375 018	427 247	293 775	1 403 018	339 843	4 128 432
1984	545 342	324 478	379 878	459 938	309 529	1 487 934	359 396	4 140 099
1985	595 651	333 169	367 859	493 583	337 414	1 570 565	378 220	4 152 516
1986	625 727	340 541	395 078	504 552	377 861	1 634 049	392 107	4 167 354

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.2: GDP for Norway by expenditure 1816-2021 in fixed prices (mill 2015-NOK). GDP per capita is reported in NOK.

Updated 1970-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09189/>: National accounts, Final expenditure and gross domestic product.

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP (mill NOK)	GDP per capita (NOK)	Middle population
1987	621 865	355 048	398 120	509 344	353 043	1 662 703	397 120	4 186 905
1988	608 734	351 549	394 100	540 942	343 500	1 658 460	393 981	4 209 488
1989	605 014	362 529	367 517	601 376	350 888	1 675 679	396 432	4 226 901
1990	609 204	378 786	329 617	650 104	359 312	1 708 058	402 704	4 241 473
1991	621 902	400 877	328 309	690 369	360 710	1 760 742	413 152	4 261 732
1992	636 605	425 179	321 834	722 862	366 913	1 823 679	425 457	4 286 401
1993	651 061	440 596	338 749	745 353	385 114	1 875 566	434 965	4 311 991
1994	673 163	446 944	356 543	807 251	405 839	1 970 381	454 359	4 336 613
1995	697 479	448 462	368 050	850 735	428 516	2 052 263	470 791	4 359 184
1996	741 582	461 107	402 500	936 443	466 397	2 155 449	491 962	4 381 336
1997	764 725	474 531	461 910	1 008 686	525 253	2 269 356	515 159	4 405 157
1998	786 357	491 353	518 774	1 021 911	573 628	2 329 918	525 767	4 431 464
1999	815 721	506 831	493 206	1 052 014	563 100	2 378 195	532 999	4 461 913
2000	849 742	517 501	476 980	1 093 081	578 896	2 457 126	547 126	4 490 967
2001	867 271	538 215	474 057	1 143 154	590 327	2 507 918	555 617	4 513 751
2002	894 468	557 681	472 381	1 136 499	593 515	2 542 466	560 242	4 538 159
2003	923 025	564 461	474 691	1 132 716	598 422	2 566 490	562 228	4 564 855
2004	973 324	571 318	522 858	1 145 826	653 164	2 669 525	581 354	4 591 910
2005	1 016 177	582 457	584 997	1 152 218	704 822	2 741 204	592 912	4 623 291
2006	1 066 583	595 300	638 035	1 145 639	767 034	2 808 679	602 633	4 660 677
2007	1 123 186	607 298	716 207	1 154 570	841 659	2 890 524	613 810	4 709 153
2008	1 142 028	622 860	724 299	1 167 364	879 360	2 904 454	609 129	4 768 212
2009	1 142 374	649 279	673 484	1 116 776	789 314	2 848 097	589 824	4 828 726
2010	1 185 895	663 520	630 238	1 120 581	852 338	2 870 513	587 107	4 889 252
2011	1 213 937	670 771	677 197	1 114 822	885 881	2 902 251	585 948	4 953 088
2012	1 256 458	680 995	728 275	1 137 744	911 879	2 981 133	594 020	5 018 573
2013	1 291 779	687 576	774 406	1 118 957	957 867	3 011 427	592 781	5 080 166
2014	1 318 537	706 074	772 455	1 161 857	978 744	3 073 105	598 180	5 137 429
2015	1 354 268	723 005	741 527	1 207 474	997 172	3 130 183	603 130	5 189 894
2016	1 369 481	739 858	770 766	1 212 156	1 016 443	3 166 641	604 765	5 236 151
2017	1 400 140	753 814	791 074	1 231 496	1 035 154	3 244 659	614 872	5 276 968
2018	1 420 208	758 299	808 670	1 212 563	1 049 546	3 271 555	615 890	5 311 916
2019	1 434 730	766 790	885 602	1 238 217	1 105 551	3 308 319	618 621	5 347 896
2020	1 345 475	762 817	849 270	1 209 383	996 602	3 266 033	607 129	5 379 475
2021	1 406 261	800 554	839 364	1 275 526	1 013 692	3 391 793	627 144	5 408 320

Norwegian GDP, 1816-2021

Table 8.A.3: Implicit price deflators (2015=100).

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP	Terms of trade
1816	1.93	0.59	0.57	4.63	5.82	1.43	79.57
1817	3.01	0.91	0.90	7.87	9.91	2.28	79.41
1818	1.86	0.57	0.56	4.52	5.68	1.44	79.52
1819	1.80	0.55	0.54	4.34	5.82	1.40	74.61
1820	1.51	0.47	0.46	3.74	4.62	1.18	80.96
1821	1.49	0.46	0.45	3.42	3.97	1.17	86.30
1822	1.67	0.51	0.54	3.91	4.76	1.33	82.32
1823	1.61	0.50	0.51	4.32	5.25	1.30	82.27
1824	1.42	0.44	0.43	3.57	4.32	1.14	82.66
1825	1.33	0.42	0.41	3.27	3.96	1.06	82.58
1826	1.37	0.43	0.41	3.03	3.61	1.05	83.90
1827	1.57	0.48	0.47	3.57	4.00	1.17	89.14
1828	1.41	0.44	0.42	3.06	3.53	1.03	86.69
1829	1.42	0.43	0.41	3.04	3.83	1.01	79.34
1830	1.53	0.42	0.41	3.01	3.87	1.07	77.73
1831	1.63	0.58	0.49	3.04	3.93	1.13	77.40
1832	1.54	0.48	0.43	2.87	4.05	1.02	70.77
1833	1.48	0.51	0.46	2.82	4.02	0.98	70.20
1834	1.36	0.47	0.39	2.74	4.13	0.90	66.40
1835	1.34	0.54	0.43	2.68	4.27	0.92	62.61
1836	1.36	0.51	0.57	2.89	3.99	0.98	72.39
1837	1.37	0.50	0.57	2.74	3.36	0.99	81.48
1838	1.35	0.54	0.63	2.93	2.84	1.02	103.19
1839	1.34	0.58	0.69	3.00	3.12	1.01	96.04
1840	1.38	0.58	0.55	2.83	3.31	1.01	85.59
1841	1.24	0.44	0.41	2.68	3.33	0.86	80.65
1842	1.20	0.47	0.40	2.47	3.12	0.83	79.14
1843	1.23	0.48	0.42	2.91	3.38	0.89	86.15
1844	1.19	0.52	0.48	3.09	3.35	0.91	92.13
1845	1.26	0.52	0.49	3.17	3.89	0.94	81.52
1846	1.27	0.59	0.47	3.16	3.24	0.97	97.53
1847	1.45	0.67	0.57	3.22	3.91	1.10	82.22
1848	1.31	0.56	0.53	3.00	3.20	0.97	93.70
1849	1.22	0.53	0.54	2.95	3.31	0.89	89.10
1850	1.21	0.52	0.53	2.79	3.14	0.88	88.95
1851	1.23	0.56	0.58	2.78	3.37	0.91	82.67
1852	1.24	0.57	0.71	2.80	3.45	0.93	81.10
1853	1.31	0.62	0.77	2.81	3.55	0.96	79.01
1854	1.44	0.66	0.97	3.42	3.88	1.08	88.19
1855	1.52	0.69	1.04	3.27	3.54	1.13	92.51
1856	1.63	0.77	1.12	3.16	3.38	1.19	93.56
1857	1.61	0.73	1.04	3.12	3.29	1.14	94.77
1858	1.44	0.67	0.84	2.87	4.21	1.03	68.05
1859	1.44	0.62	0.68	2.68	3.57	1.01	75.09
1860	1.52	0.67	0.74	2.81	3.24	1.08	86.70
1861	1.59	0.72	1.04	2.86	3.10	1.12	92.10
1862	1.57	0.71	0.95	2.77	3.24	1.14	85.77
1863	1.54	0.62	0.72	2.60	3.24	1.07	80.36
1864	1.52	0.65	0.73	2.40	3.40	1.07	70.69
1865	1.49	0.64	0.91	2.42	2.83	1.07	85.44
1866	1.56	0.66	0.93	2.39	2.83	1.06	84.63
1867	1.61	0.69	0.94	2.31	2.77	1.07	83.50
1868	1.68	0.72	0.93	2.36	2.79	1.14	84.44
1869	1.61	0.66	0.90	2.42	2.67	1.12	90.91
1870	1.53	0.69	0.89	2.55	2.61	1.08	97.73
1871	1.54	0.67	0.90	2.63	2.59	1.11	101.53
1872	1.62	0.75	1.11	2.71	3.00	1.18	90.54
1873	1.67	0.82	1.26	3.24	3.22	1.23	100.62
1874	1.76	0.82	1.35	3.28	3.24	1.31	101.08
1875	1.72	0.82	1.29	2.93	3.04	1.29	96.68

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.3: Implicit price deflators (2015=100).

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP	Terms of trade
1876	1.70	0.82	1.22	3.06	2.94	1.23	103.85
1877	1.70	0.80	1.18	2.93	2.80	1.26	104.64
1878	1.63	0.74	1.09	2.75	2.52	1.14	109.18
1879	1.52	0.66	1.01	2.52	2.41	1.08	104.90
1880	1.55	0.72	1.01	2.58	2.52	1.11	102.52
1881	1.57	0.72	1.00	2.67	2.54	1.12	104.89
1882	1.59	0.75	1.02	2.83	2.49	1.12	113.58
1883	1.58	0.73	1.01	2.79	2.37	1.10	117.49
1884	1.53	0.67	0.97	2.49	2.24	1.07	111.12
1885	1.46	0.66	0.92	2.26	2.09	1.02	107.95
1886	1.40	0.64	0.89	2.13	2.01	0.98	106.04
1887	1.37	0.63	0.87	2.12	2.00	0.96	106.05
1888	1.36	0.63	0.88	2.28	2.07	0.98	110.25
1889	1.39	0.67	0.95	2.47	2.19	1.03	112.76
1890	1.42	0.66	1.01	2.34	2.24	1.01	104.66
1891	1.46	0.69	0.99	2.28	2.27	1.03	100.20
1892	1.45	0.68	0.95	2.14	2.15	1.00	99.55
1893	1.39	0.66	0.93	2.10	2.09	0.95	100.65
1894	1.35	0.66	0.92	2.19	1.98	0.93	110.33
1895	1.34	0.66	0.90	2.26	1.95	0.92	115.59
1896	1.37	0.66	0.93	2.33	1.94	0.94	120.06
1897	1.35	0.66	0.95	2.33	1.98	0.96	117.71
1898	1.41	0.70	1.01	2.49	2.05	1.01	121.48
1899	1.48	0.74	1.10	2.63	2.19	1.05	120.07
1900	1.54	0.76	1.12	2.81	2.34	1.12	120.08
1901	1.53	0.76	1.03	2.47	2.19	1.09	112.77
1902	1.53	0.74	1.05	2.31	2.15	1.06	107.34
1903	1.56	0.73	1.03	2.34	2.11	1.07	111.14
1904	1.54	0.72	1.03	2.36	2.14	1.06	110.62
1905	1.57	0.74	1.05	2.41	2.19	1.08	109.98
1906	1.58	0.76	1.10	2.50	2.28	1.10	109.55
1907	1.62	0.80	1.13	2.54	2.41	1.16	105.20
1908	1.61	0.81	1.14	2.36	2.36	1.17	99.84
1909	1.58	0.79	1.09	2.35	2.35	1.16	99.84
1910	1.62	0.82	1.11	2.52	2.35	1.18	107.30
1911	1.62	0.84	1.15	2.61	2.45	1.23	106.35
1912	1.70	0.88	1.18	2.81	2.62	1.31	107.05
1913	1.75	0.92	1.22	2.89	2.61	1.34	110.90
1914	1.80	0.94	1.26	2.90	2.71	1.36	107.08
1915	2.21	1.11	1.53	4.81	3.62	1.77	132.90
1916	2.79	1.39	2.38	8.54	5.16	2.44	165.33
1917	3.73	1.98	3.59	11.79	8.38	3.12	140.57
1918	4.57	2.45	4.05	11.89	9.50	3.74	125.20
1919	4.82	2.47	4.05	11.89	8.03	3.79	147.99
1920	5.50	2.92	5.05	12.28	10.34	4.20	118.81
1921	5.08	2.53	4.34	7.11	8.08	3.46	88.06
1922	4.23	2.07	3.17	5.79	5.74	3.03	100.79
1923	4.00	2.02	2.88	5.75	5.53	2.82	104.03
1924	4.38	2.28	2.96	6.59	6.33	3.08	104.26
1925	4.46	2.19	2.80	5.83	5.72	3.06	101.99
1926	3.78	1.80	2.32	4.53	4.51	2.64	100.38
1927	3.41	1.58	1.96	3.72	3.77	2.35	98.79
1928	3.18	1.53	1.85	3.57	3.62	2.25	98.56
1929	3.04	1.45	1.79	3.40	3.49	2.17	97.45
1930	2.96	1.36	1.79	3.01	3.16	2.08	95.33
1931	2.83	1.26	1.61	2.68	2.71	2.01	98.63
1932	2.76	1.21	1.62	2.52	2.86	1.94	88.00
1933	2.69	1.19	1.61	2.45	2.77	1.87	88.20
1934	2.73	1.19	1.62	2.46	2.75	1.91	89.50
1935	2.77	1.24	1.67	2.52	2.76	1.98	91.18

Norwegian GDP, 1816-2021

Table 8.A.3: Implicit price deflators (2015=100).

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP	Terms of trade
1936	2.86	1.31	1.76	2.66	2.88	2.09	92.32
1937	3.06	1.40	1.99	3.17	3.20	2.29	98.96
1938	3.14	1.38	2.09	3.03	3.14	2.35	96.28
1939	3.19	1.49	2.18	3.06	3.25	2.41	94.03
1940	3.72	1.71	2.87	4.57	4.76	3.03	96.15
1941	4.38	2.01	3.50	5.80	7.06	3.68	82.24
1942	4.60	2.13	3.65	6.45	8.17	3.88	78.94
1943	4.74	2.20	3.77	7.20	9.23	3.94	78.05
1944	4.82	2.23	3.84	7.55	9.05	3.99	83.35
1945	4.92	2.28	4.01	8.00	7.69	3.99	104.15
1946	5.07	2.29	3.98	8.38	7.60	3.88	110.23
1947	5.40	2.32	4.25	8.98	8.96	4.00	100.22
1948	5.54	2.52	4.61	9.06	9.91	4.10	91.50
1949	5.76	2.54	4.90	8.69	9.70	4.29	89.60
1950	6.08	2.88	5.12	9.35	10.80	4.52	86.56
1951	6.78	3.17	5.89	12.72	13.17	5.38	96.59
1952	7.26	3.57	6.47	12.94	13.91	5.74	93.00
1953	7.39	3.61	6.37	11.04	13.15	5.56	83.95
1954	7.67	3.69	6.55	10.83	13.08	5.75	82.76
1955	7.78	3.78	6.71	11.61	13.31	6.02	87.22
1956	8.05	4.14	6.87	12.83	13.78	6.48	93.11
1957	8.28	4.32	7.37	13.29	13.57	6.71	97.96
1958	8.57	4.42	7.93	11.76	14.07	6.75	83.59
1959	8.71	4.57	7.95	11.51	13.77	6.80	83.63
1960	8.75	4.68	7.97	11.29	13.59	6.87	83.09
1961	8.99	4.79	8.02	11.08	13.37	7.06	82.83
1962	9.39	5.36	8.08	10.85	13.08	7.39	82.93
1963	9.67	5.53	8.44	10.98	13.38	7.64	82.04
1964	10.13	5.77	8.50	11.68	13.67	8.00	85.47
1965	10.55	6.05	8.89	12.10	13.95	8.39	86.73
1966	10.91	6.51	9.19	12.40	14.21	8.72	87.23
1967	11.42	6.78	9.31	12.85	14.40	8.98	89.19
1968	11.77	7.15	9.29	13.11	14.13	9.37	92.77
1969	12.18	7.54	10.02	13.30	14.76	9.74	90.15
1970	13.37	8.17	10.72	15.11	15.94	11.00	94.77
1971	14.22	9.00	11.25	15.94	16.88	11.70	94.43
1972	15.20	9.74	12.07	15.68	17.34	12.34	90.44
1973	16.33	10.64	12.83	17.70	18.90	13.42	93.62
1974	17.91	12.04	14.90	21.65	23.59	14.94	91.76
1975	19.90	13.54	16.85	21.60	25.49	16.27	84.74
1976	21.61	15.14	18.61	21.89	27.25	17.55	80.31
1977	23.48	16.60	20.42	22.92	29.43	18.98	77.90
1978	25.37	18.02	23.25	23.65	31.43	20.09	75.24
1979	26.73	18.54	24.14	27.75	35.56	21.23	78.04
1980	29.28	20.31	26.45	34.20	40.71	24.02	84.02
1981	33.08	22.41	29.16	38.65	44.60	27.11	86.67
1982	36.81	24.76	32.23	41.00	47.47	29.96	86.37
1983	39.89	26.66	34.65	42.89	50.76	32.05	84.49
1984	42.30	28.39	36.69	45.79	54.07	34.04	84.69
1985	44.74	30.21	39.72	47.09	57.20	35.81	82.33
1986	47.87	32.50	42.43	38.11	56.46	35.61	67.50
1987	51.80	35.72	46.44	38.93	60.51	38.18	64.33
1988	54.84	37.65	50.01	38.93	62.94	40.04	61.85
1989	57.52	39.13	51.77	42.93	67.07	42.29	64.01
1990	60.17	40.16	51.95	44.67	68.16	43.90	65.54
1991	62.37	41.40	52.34	44.16	67.90	44.87	65.04
1992	63.77	41.98	52.75	41.16	66.74	44.59	61.68
1993	65.34	42.66	53.79	42.11	67.87	45.61	62.04
1994	65.98	43.41	54.42	40.84	68.29	45.54	59.80
1995	67.52	45.02	56.10	41.46	68.96	46.93	60.12

8.A Appendix, GDP for Norway by expenditure 1816-2021

Table 8.A.3: Implicit price deflators (2015=100).

	Private consumption expenditures	Government consumption	Gross investments	Total exports	Total imports	GDP	Terms of trade
1996	68.37	46.58	57.18	44.41	69.58	48.93	63.83
1997	70.00	48.05	58.19	45.30	69.79	50.29	64.91
1998	71.78	50.58	59.45	41.85	70.73	49.95	59.17
1999	73.19	52.50	60.22	46.21	69.99	53.25	66.02
2000	75.31	55.01	62.64	62.97	74.82	61.42	84.17
2001	76.97	58.31	64.44	61.65	74.77	62.47	82.46
2002	78.03	60.66	64.20	55.70	71.28	61.52	78.14
2003	80.25	63.13	64.46	56.88	72.32	63.28	78.65
2004	81.20	64.92	67.00	64.15	75.45	66.98	85.02
2005	82.13	66.42	69.30	75.29	76.58	72.85	98.32
2006	83.62	69.39	72.77	86.49	78.67	79.21	109.94
2007	84.69	72.48	77.41	87.81	81.28	81.65	108.04
2008	87.63	77.46	81.40	103.82	85.18	90.28	121.87
2009	89.80	80.78	83.87	86.97	85.48	85.66	101.75
2010	91.66	83.35	85.32	93.35	85.86	90.76	108.72
2011	92.68	87.09	88.72	105.01	88.61	96.82	118.50
2012	93.64	90.28	91.36	108.25	89.02	100.07	121.61
2013	95.56	94.29	93.51	110.09	90.70	102.62	121.38
2014	97.71	97.27	97.04	108.11	95.01	102.89	113.79
2015	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2016	103.06	102.00	101.31	92.38	101.71	98.40	90.83
2017	105.11	104.95	102.31	99.12	103.94	102.42	95.37
2018	107.59	109.01	105.15	112.74	108.31	109.32	104.09
2019	110.06	113.07	108.15	106.44	111.45	108.72	95.50
2020	111.78	118.59	111.83	92.19	115.12	105.99	80.09
2021	115.06	121.40	116.04	137.49	119.69	124.11	114.87

Norwegian GDP, 1816-2021

8.B Appendix, GDP for Norway by production sector 1816-2021

Table 8.A.4: GDP by production sector 1816-2021. Million 2015-kroner.
 Updated 1978-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09170/>; National accounts, production accounts and income generation, by industry.

	Agri- culture	Fishing Hunting	Mining Quarrying	Oil & Gas extraction	Manu- facturing	Electricity Gas & water	Constr.	Trade	Ocean transp.	Transp. & Post	Info. & Comm.	Finance & Insurance	Dwellings & Commercial	Public admin & defense	Education	Health & Welfare	Personal Services
1816	4 078	221	55		555	35	768	325	97	182		335	1 351	848	474	928	4 396
1817	4 020	217	53		551	35	741	324	90	179		331	1 338	800	469	920	4 309
1818	3 953	210	51		536	34	713	319	87	174		329	1 313	745	460	903	4 176
1819	4 075	214	51		568	35	739	326	88	178		340	1 334	763	473	926	4 313
1820	4 317	221	54		579	37	756	344	94	177		365	1 353	802	494	954	4 529
1821	4 193	217	45		570	36	738	337	91	172		324	1 360	797	494	940	4 152
1822	4 015	199	50		567	35	731	333	99	188		397	1 463	872	541	1 037	4 090
1823	4 138	217	54		601	41	819	337	108	208		450	1 484	961	596	1 116	4 225
1824	4 309	225	59		660	50	923	361	116	225		495	1 481	1 034	642	1 215	4 404
1825	4 418	246	56		689	50	961	387	137	263		527	1 518	1 198	666	1 328	4 527
1826	4 415	251	50		758	53	1 005	412	132	268		535	1 581	1 209	696	1 373	4 698
1827	4 291	254	55		775	53	1 085	444	137	277		602	1 734	1 250	739	1 399	4 872
1828	4 572	270	52		793	54	1 104	470	153	299		635	1 744	1 339	760	1 474	5 227
1829	4 876	269	55		783	51	1 033	459	149	304		559	1 805	1 311	775	1 489	5 522
1830	4 772	283	61		796	53	1 012	454	143	299		555	1 838	1 263	793	1 487	5 463
1831	4 630	311	61		792	50	1 026	447	139	296		533	1 897	1 234	799	1 536	5 383
1832	4 775	341	61		807	50	983	479	151	293		577	2 000	1 404	810	1 643	6 174
1833	5 053	342	67		829	60	1 109	528	164	326		632	2 082	1 425	821	1 637	6 528
1834	5 378	350	69		834	54	1 082	586	163	342		709	2 072	1 431	832	1 599	6 369
1835	5 500	346	74		902	59	1 242	569	174	330		697	2 094	1 406	842	1 543	5 880
1836	5 333	337	79		985	74	1 504	565	180	335		702	2 141	1 387	848	1 503	5 744
1837	5 170	432	77		993	71	1 497	546	187	332		760	2 157	1 405	860	1 509	6 271
1838	5 610	315	81		1 070	82	1 743	533	184	335		761	2 122	1 456	871	1 492	5 762
1839	5 495	351	84		1 067	86	1 847	586	206	347		809	2 388	1 548	887	1 557	6 057
1840	5 773	403	69		1 005	70	1 500	639	223	381		879	2 324	1 592	901	1 646	6 489
1841	6 033	381	76		1 044	61	1 323	665	214	380		982	2 381	1 569	904	1 662	6 950
1842	6 113	404	82		1 132	69	1 500	670	217	365		1 022	2 185	1 506	911	1 633	7 406
1843	5 991	333	78		1 217	66	1 443	682	204	382		1 043	2 457	1 462	906	1 574	7 321
1844	5 725	474	95		1 325	80	1 757	726	267	418		1 170	2 431	1 472	913	1 681	7 508
1845	6 113	420	115		1 364	86	1 899	746	274	414		1 208	2 411	1 452	917	1 707	7 475
1846	6 376	514	104		1 377	82	1 840	730	294	396		1 140	2 749	1 459	925	1 683	6 832
1847	6 321	510	104		1 433	94	1 890	745	328	384		1 166	2 650	1 557	929	1 627	6 347
1848	6 293	417	79		1 269	77	1 512	727	290	419		1 247	2 572	1 565	929	1 783	7 501
1849	5 854	480	78		1 273	80	1 566	773	336	450		1 270	2 691	1 547	940	1 827	8 053
1850	6 378	407	79		1 395	89	1 793	873	371	471		1 317	2 758	1 615	945	1 837	8 170
1851	6 616	463	76		1 516	97	2 211	858	409	482		1 326	2 793	1 560	955	1 840	7 880
1852	6 936	410	77		1 641	108	2 454	852	411	487		1 342	2 841	1 596	988	1 840	8 025
1853	7 138	434	86		1 760	121	2 747	1 089	502	524		1 627	2 840	1 603	989	1 891	8 686
1854	7 526	392	83		1 992	152	3 450	1 175	586	586		1 834	2 907	1 627	999	1 889	8 956
1855	7 860	518	84		2 077	160	3 640	1 123	719	580		1 864	2 938	1 637	1 006	1 905	8 488
1856	7 400	547	98		2 204	169	3 788	1 072	843	576		1 952	3 082	1 633	1 012	1 885	8 468
1857	7 083	481	59		1 971	141	2 883	1 014	696	622		1 614	3 422	1 798	1 110	2 055	9 768
1858	7 700	406	66		2 053	147	2 972	1 182	655	675		2 000	3 571	1 925	1 178	2 250	10 567
1859	7 625	493	66		2 003	133	2 552	1 080	769	680		2 092	4 053	1 873	1 200	2 332	10 554
1860	7 920	600	76		2 104	161	3 494	1 067	804	693		1 989	4 132	1 853	1 216	2 317	10 057
1861	7 655	544	78		2 342	181	3 925	1 006	887	702		2 077	4 322	1 890	1 256	2 467	10 115
1862	7 814	608	81		2 361	192	4 093	1 066	907	711		2 297	4 487	1 861	1 285	2 570	10 495
1863	8 096	590	77		2 305	199	4 343	1 149	1 058	745		2 573	4 672	1 904	1 323	2 606	11 018
1864	8 339	634	74		2 220	187	4 150	1 126	1 208	806		2 635	4 906	1 928	1 342	2 676	11 312
1865	8 672	688	81		2 514	202	4 500	1 350	1 231	860		2 744	4 928	1 920	1 364	2 737	11 563
1866	8 140	823	78		2 441	198	4 400	1 192	1 248	799		2 689	4 587	1 872	1 397	2 563	11 004
1867	8 280	863	87		2 655	212	4 693	1 230	1 346	800		2 767	4 662	1 870	1 338	2 554	10 553
1868	7 577	852	90		2 781	217	4 840	1 083	1 325	771		2 846	4 936	1 831	1 192	2 603	9 887
1869	8 303	601	95		2 949	236	5 319	1 269	1 438	895		2 940	5 105	1 897	1 177	2 821	10 959
1870	9 602	672	97		3 155	251	5 712	1 438	1 535	976		3 012	5 330	1 968	1 193	2 714	12 126
1871	10 125	772	110		3 409	270	6 144	1 564	1 516	990		3 150	5 333	2 090	1 247	2 897	12 342

Table 8.A.4: GDP by production sector 1816-2021. Million 2015-kroner.
 Updated 1978-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09170/>: National accounts, production accounts and income generation, by industry.

	Agri- culture	Fishing Hunting	Mining Quarrying	Oil & Gas extraction	Manu- facturing	Electricity Gas & water	Constr.	Trade	Ocean transp.	Transp. & Post	Info. & Comm.	Finance & Insurance	Dwellings & Commercial	Public admin & defense	Education	Health & Welfare	Personal Services
1872	11 186	725	130		3 123	244	5 549	1 753	1 828	1 117		2 692	5 389	1 858	1 105	2 659	12 839
1873	11 953	740	121		3 341	259	5 893	1 816	1 819	1 293		2 596	5 583	1 816	1 130	2 598	12 907
1874	10 683	772	113		3 681	277	6 301	1 820	1 817	1 340		2 608	5 920	1 903	1 139	2 616	13 092
1875	10 584	793	137		3 703	273	6 219	1 857	1 760	1 308		2 855	6 053	2 048	1 248	2 789	13 889
1876	11 434	721	122		3 977	283	6 446	1 987	1 855	1 351		3 106	6 610	2 152	1 295	2 895	15 301
1877	10 522	881	117		4 209	291	6 632	1 886	1 860	1 384		3 304	6 314	2 293	1 353	3 105	15 135
1878	10 053	761	101		4 152	282	6 414	1 908	1 928	1 369		3 535	6 680	2 204	1 427	3 172	15 608
1879	11 036	837	96		4 171	287	6 494	2 102	1 942	1 260		3 808	6 692	2 590	1 638	3 657	15 416
1880	12 461	837	102		4 008	281	6 314	2 085	2 136	1 530		3 922	6 793	2 388	1 577	3 613	14 858
1881	11 791	701	120		4 281	290	6 486	1 919	1 895	1 593		4 148	6 870	2 443	1 591	3 617	14 678
1882	11 981	667	142		4 457	299	6 699	2 120	2 159	1 720		4 154	6 930	2 427	1 535	3 742	15 798
1883	12 304	664	107		4 370	286	6 338	2 363	2 299	1 710		4 278	7 172	2 462	1 537	3 613	16 811
1884	11 534	784	111		4 144	273	6 020	2 314	2 144	1 678		4 516	7 450	2 635	1 725	3 665	17 155
1885	11 342	708	97		4 073	270	5 952	2 450	2 033	1 653		4 850	7 731	2 749	1 799	3 831	17 669
1886	11 523	859	74		3 943	260	5 736	2 644	1 981	1 611		4 911	7 951	2 877	1 862	3 917	18 333
1887	11 750	704	65		4 115	264	5 850	3 023	2 005	1 591		4 830	8 051	2 977	1 947	3 974	18 454
1888	12 184	924	94		4 520	257	5 699	3 157	2 389	1 739		4 901	8 137	3 027	2 013	3 996	18 769
1889	11 968	927	84		5 122	291	6 466	3 242	2 991	1 972		4 735	8 243	2 990	1 958	4 022	18 711
1890	12 022	863	91		5 436	321	7 137	3 153	2 920	2 150		4 665	8 407	3 082	1 969	4 364	18 704
1891	12 129	831	77		5 714	323	7 239	2 956	2 656	2 133		4 874	8 476	3 006	1 941	4 011	18 329
1892	11 254	955	69		5 950	318	7 167	2 880	2 661	2 263		5 127	8 893	3 221	2 177	4 523	19 108
1893	11 380	973	67		6 142	324	7 325	3 122	2 494	2 566		5 470	9 238	3 447	2 392	4 838	20 649
1894	11 611	917	83		6 708	349	7 944	3 554	2 454	2 633		5 698	9 489	3 674	2 426	5 244	23 093
1895	12 765	823	76		7 020	375	8 298	3 925	2 338	2 703		6 084	9 661	4 116	2 697	5 392	23 765
1896	13 157	732	100		7 359	383	8 324	3 879	2 634	2 835		6 116	10 033	4 749	3 071	5 526	24 757
1897	13 607	893	115		8 134	424	9 032	4 288	2 861	2 867		6 426	10 189	4 866	2 927	5 704	25 038
1898	13 259	756	127		9 141	505	10 539	4 467	2 897	3 237		6 935	10 217	4 864	3 001	5 657	24 759
1899	12 253	738	155		10 061	577	11 803	4 387	3 268	3 479		6 787	10 286	4 771	2 719	4 889	25 724
1900	13 465	725	187		10 085	534	10 364	4 039	3 388	3 570		7 106	10 635	4 539	2 872	5 635	25 716
1901	13 293	755	183		10 355	508	9 653	4 233	3 455	3 619		7 920	10 857	4 600	3 448	5 835	26 894
1902	13 435	790	203		10 531	512	9 348	4 317	3 331	3 751		7 816	10 993	4 595	3 522	5 904	27 077
1903	14 555	674	225		10 543	492	8 766	4 254	3 027	3 795		8 159	11 210	4 407	3 462	5 810	28 011
1904	13 950	639	235		10 853	516	9 636	4 353	3 665	3 672		8 248	11 333	4 216	3 453	5 843	27 833
1905	14 273	644	274		11 281	496	9 002	4 532	3 422	3 859		8 143	11 643	4 207	3 396	5 769	27 790
1906	15 319	711	337		12 275	557	10 448	4 869	3 333	4 117		8 027	11 864	4 145	3 388	5 713	28 042
1907	14 785	857	348		13 005	629	11 392	4 834	3 605	4 250		8 230	12 352	4 131	3 490	5 620	27 421
1908	13 962	949	322		13 977	638	11 162	5 000	3 749	4 472		8 646	13 120	4 146	3 845	6 777	29 943
1909	13 998	1 175	289		14 571	598	9 948	5 253	3 432	4 523		9 386	13 555	4 455	4 139	6 151	31 359
1910	14 212	1 209	345		15 967	719	11 113	5 538	3 549	4 939		9 661	14 296	4 509	4 427	6 172	32 761
1911	14 056	1 397	390		16 739	854	12 823	5 693	3 832	5 154		10 011	14 906	4 598	4 341	6 547	32 822
1912	13 312	1 645	494		18 793	887	12 931	5 730	4 042	5 075		10 516	15 778	5 043	4 601	6 717	31 846
1913	13 771	1 759	600		20 589	985	13 931	6 052	4 117	5 739		10 888	16 214	5 166	4 689	6 915	34 703
1914	13 920	1 743	661		20 924	1 061	14 561	6 208	4 194	5 677		11 133	17 172	5 596	4 858	6 856	33 604
1915	13 894	1 662	1 042		23 054	1 072	14 330	6 362	5 497	5 281		10 480	18 044	6 877	4 996	6 595	29 449
1916	13 387	1 651	831		24 356	1 412	18 375	7 265	6 464	5 265		10 119	18 829	7 043	5 206	6 412	30 639
1917	10 693	1 273	687		23 288	1 388	17 647	7 023	5 304	4 454		9 433	18 785	7 122	5 051	5 275	24 812
1918	10 461	1 579	440		21 123	1 237	15 366	6 641	4 628	4 731		10 214	19 177	7 173	4 833	5 538	25 893
1919	9 705	1 725	373		22 777	2 040	27 218	7 979	5 315	6 327		9 565	19 613	7 685	5 405	7 370	33 481
1920	11 511	1 086	210		23 922	2 189	26 710	8 448	6 856	6 543		8 980	20 049	7 940	5 977	8 663	35 883
1921	10 967	1 166	168		19 097	1 749	20 464	7 831	5 796	8 063		7 749	20 485	7 965	5 971	8 289	30 835
1922	10 222	1 584	282		21 928	1 899	21 452	8 905	6 556	7 679		8 637	20 703	8 748	6 471	8 294	31 263
1923	11 770	1 531	394		23 571	2 143	23 629	10 020	4 775	8 159		8 909	21 052	9 120	6 875	9 176	38 316
1924	11 880	2 146	433		25 192	1 798	19 339	9 021	6 122	7 761		9 085	21 400	7 786	6 885	9 366	34 899
1925	11 628	1 790	420		26 598	1 639	17 200	8 264	6 652	7 515		9 157	21 575	8 056	6 977	9 992	34 475
1926	11 956	1 306	365		24 016	1 684	15 740	9 108	6 566	8 116		10 588	21 662	8 931	7 648	10 438	36 059
1927	13 027	1 823	347		24 458	1 804	15 247	9 603	7 119	8 563		12 639	21 798	9 514	8 591	11 806	38 359

Table 8.A.4: GDP by production sector 1816-2021. Million 2015-kroner.
 Updated 1978-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09170/>; National accounts, production accounts and income generation, by industry.

	Agri- culture	Fishing Hunting	Mining Quarrying	Oil & Gas extraction	Manu- facturing	Electricity Gas & water	Constr.	Trade	Ocean transp.	Transp. & Post	Info. & Comm.	Finance & Insurance	Dwellings & Commercial	Public admin & defense	Education	Health & Welfare	Personal Services
1928	13 241	2 026	470		26 372	1 936	17 687	9 755	7 378	8 432		14 202	21 841	9 052	8 651	11 698	39 431
1929	13 603	2 370	618		30 062	2 090	19 810	10 016	8 930	8 735		14 638	21 923	9 220	8 518	12 321	41 015
1930	13 765	2 445	627		31 938	2 263	20 896	10 309	10 166	9 671		15 120	22 055	9 359	8 522	13 029	42 903
1931	11 928	1 933	377		26 521	2 206	19 282	9 850	9 463	9 299		15 814	22 184	10 112	8 509	13 200	41 570
1932	13 226	1 578	463		28 410	2 206	21 883	9 878	9 595	9 217		15 953	22 434	10 320	8 540	13 482	41 345
1933	14 427	2 310	524		28 539	2 225	21 793	10 017	9 881	9 341		15 953	26 984	10 185	8 769	13 693	42 099
1934	14 843	1 827	552		29 735	2 263	22 869	10 351	10 276	9 630		16 230	23 286	10 348	8 813	14 295	43 344
1935	15 088	1 838	684		32 473	2 339	26 098	10 991	10 517	9 919		16 508	23 819	10 840	8 950	14 626	44 315
1936	14 524	2 097	857		35 434	2 415	29 147	11 714	11 154	10 746		16 924	23 906	11 173	9 225	14 945	46 101
1937	15 578	2 032	930		37 485	2 605	27 802	12 507	12 164	11 820		17 340	24 558	12 078	9 656	15 462	48 813
1938	15 896	2 116	1 064		37 132	2 757	28 430	12 618	12 537	12 068		18 034	25 018	13 549	9 962	15 699	49 929
1939	14 696	2 127	1 039		40 040	2 852	30 941	13 578	12 757	12 854		18 727	25 532	17 306	10 355	16 397	50 858
1940																	
1941																	
1942																	
1943																	
1944																	
1945																	
1946	12 959	1 399	789		37 996	5 249	39 012	13 685	6 958	20 170		22 068	25 219	27 482	13 642	26 019	50 300
1947	14 295	1 971	906		45 716	5 222	45 560	16 457	8 981	23 275		23 182	25 985	26 253	14 521	25 684	51 378
1948	14 959	2 802	1 203		51 332	5 332	45 665	16 136	11 782	23 983		24 474	26 954	27 774	15 130	25 824	51 948
1949	14 848	2 709	1 508		54 104	5 207	45 724	16 022	13 030	24 620		24 594	27 521	28 187	15 851	25 970	51 240
1950	14 164	3 159	1 533		59 067	5 772	46 734	16 176	15 408	25 196		24 397	28 952	27 855	16 522	26 869	50 782
1951	14 863	3 717	1 632		62 521	5 882	42 373	16 387	18 616	26 120		24 619	28 968	31 297	17 241	28 072	48 791
1952	16 214	3 635	1 797		61 417	6 025	44 801	17 812	18 453	27 317		25 232	29 364	33 350	18 016	29 403	48 970
1953	16 122	3 361	1 929		65 878	6 717	48 153	19 169	18 937	28 297		26 485	31 371	35 674	18 998	30 368	49 271
1954	15 906	3 982	1 920		68 836	7 259	51 438	20 824	18 698	29 505		27 981	33 733	38 055	20 287	31 007	49 707
1955	14 421	3 400	2 067		71 100	7 696	50 841	20 451	21 617	31 138		29 478	35 411	40 431	21 509	31 169	48 709
1956	16 678	3 815	2 272		77 414	7 913	45 745	21 220	24 330	31 064		30 732	36 246	41 107	23 420	31 830	48 387
1957	16 400	3 274	2 098		79 234	9 138	49 624	22 132	26 139	31 148		32 058	38 254	42 406	24 656	32 709	47 769
1958	15 718	2 817	2 081		77 113	10 080	48 114	20 457	25 688	31 538		32 192	39 616	43 341	26 498	33 179	49 178
1959	15 510	3 051	2 124		80 294	10 192	47 634	21 395	26 776	33 266		33 976	40 988	44 945	28 189	35 571	52 600
1960	15 279	2 847	2 269		87 923	11 253	47 852	23 498	29 457	34 445		36 440	42 364	45 780	29 883	37 124	54 017
1961	16 092	2 769	2 024		94 371	12 395	52 908	25 130	30 473	35 663		38 733	44 202	47 658	31 622	39 955	56 298
1962	15 445	2 534	2 257		96 700	13 337	56 011	25 892	32 268	37 144		38 740	46 258	48 634	33 640	44 857	57 453
1963	15 253	2 441	2 444		102 985	14 276	60 137	27 403	35 135	38 253		41 017	46 842	50 243	35 971	45 609	59 702
1964	15 522	2 863	2 448		112 962	14 838	60 832	27 748	37 835	40 057		39 826	47 372	52 123	38 274	48 396	61 152
1965	16 125	3 725	2 732		120 286	16 308	60 158	28 364	41 070	40 740		42 034	48 087	53 638	41 033	52 051	64 070
1966	14 921	4 183	2 774		124 887	16 466	64 997	29 189	42 262	41 735		45 098	48 050	54 335	43 490	53 867	66 847
1967	15 171	4 447	3 377		125 875	17 914	66 333	30 125	47 558	44 419		43 121	49 537	59 390	47 397	56 078	70 528
1968	15 447	3 704	3 604		132 777	20 350	63 093	31 169	51 614	45 936		43 281	50 431	60 299	49 892	57 778	74 046
1969	14 686	3 151	4 047		141 763	20 075	60 028	34 007	51 957	48 573		48 009	50 223	62 984	52 367	60 397	78 787
1970	14 340	3 054	3 763	0	143 048	21 533	66 655	31 574	52 604	53 369	8 831	53 788	57 850	66 592	55 615	68 694	79 918
1971	15 330	3 060	3 763	178	146 397	22 800	71 932	34 834	51 228	54 987	9 540	48 926	60 305	70 141	58 391	72 987	84 215
1972	15 299	3 069	4 252	4 253	153 202	22 856	72 833	37 757	56 308	55 587	9 957	47 055	63 051	73 978	58 324	77 429	84 602
1973	15 063	2 729	3 910	3 637	162 241	26 267	71 705	38 702	61 832	56 292	9 916	47 923	66 053	76 781	60 000	81 013	82 650
1974	17 420	2 583	4 030	7 442	168 554	28 681	74 012	43 329	65 535	58 858	10 025	45 520	69 449	77 655	60 730	86 733	86 977
1975	17 111	2 865	3 692	30 209	164 232	30 846	79 970	46 552	64 535	59 687	10 712	45 170	74 430	81 332	63 285	94 245	89 111
1976	16 036	3 967	3 798	45 260	163 421	35 041	81 441	50 323	78 167	62 059	11 558	46 671	79 343	85 635	66 508	100 894	90 409
1977	15 793	3 774	3 758	52 313	163 451	37 674	84 222	53 553	82 846	62 930	11 094	48 079	85 567	86 379	68 051	106 269	92 627
1978	15 982	3 443	3 795	87 650	160 473	41 071	93 541	52 693	80 553	64 264	11 253	47 522	87 886	88 182	70 013	110 771	92 981
1979	14 646	3 475	3 803	105 394	167 542	42 234	84 130	57 114	75 689	69 026	11 889	44 555	91 673	89 312	73 007	119 826	95 746
1980	15 724	3 873	3 395	131 306	165 593	41 365	86 744	60 498	84 648	69 140	12 605	44 235	91 618	91 712	75 848	125 127	105 007
1981	16 216	4 840	3 281	127 870	162 596	45 391	83 760	61 345	99 690	67 644	12 665	48 909	91 329	96 666	78 810	129 146	100 017
1982	16 353	4 438	3 023	129 833	162 744	46 041	86 394	62 774	88 343	66 754	12 566	49 420	92 318	98 340	81 756	131 130	95 211
1983	15 654	4 477	3 498	150 505	159 086	49 359	89 511	64 003	85 758	66 553	14 233	48 964	92 158	101 927	83 102	134 641	98 950

Table 8.A.4: GDP by production sector 1816-2021. Million 2015-kroner.
 Updated 1978-2021 from Statistics Norway, <https://www.ssb.no/en/statbank/table/09170/>; National accounts, production accounts and income generation, by industry.

	Agri- culture	Fishing Hunting	Mining Quarrying	Oil & Gas extraction	Manu- facturing	Electricity Gas & water	Constr.	Trade	Ocean transp.	Transp. & Post	Info. & Comm.	Finance & Insurance	Dwellings & Commercial	Public admin & defense	Education	Health & Welfare	Personal Services
1984	17 483	4 764	3 435	174 190	168 364	50 497	90 977	66 397	102 062	68 531	15 371	50 999	95 905	104 495	84 198	137 603	112 152
1985	15 733	4 444	3 290	181 627	175 583	51 178	95 563	75 902	98 712	73 941	17 193	54 694	96 861	107 212	86 578	140 774	121 450
1986	14 215	4 543	3 654	193 130	174 968	49 718	103 453	81 119	82 590	75 298	18 211	61 133	95 127	108 622	88 776	145 060	130 804
1987	14 545	5 112	3 729	212 026	178 417	50 666	107 710	81 654	54 567	75 676	19 885	63 440	95 504	111 275	91 912	151 796	131 492
1988	14 245	5 603	3 328	227 213	169 604	53 229	108 156	77 726	55 698	77 262	20 580	63 188	104 042	114 137	92 851	155 972	131 432
1989	14 937	5 634	3 661	292 300	162 769	57 496	106 047	74 145	69 431	76 434	21 140	58 551	113 666	116 950	94 418	157 701	124 253
1990	16 334	4 942	3 564	310 268	160 852	57 251	103 569	74 266	84 471	79 085	22 260	55 474	117 138	124 532	95 574	163 222	115 803
1991	16 964	6 735	3 591	353 749	156 727	56 346	93 179	75 935	87 067	79 784	24 627	55 533	119 018	131 397	96 900	170 372	118 252
1992	15 644	6 992	3 792	395 014	158 287	57 573	94 078	78 281	79 760	80 227	25 950	62 490	118 663	136 371	99 698	176 157	122 725
1993	17 314	9 013	3 244	410 525	161 109	56 069	89 664	80 226	78 420	84 582	27 528	63 036	122 552	138 892	101 354	181 111	127 211
1994	17 127	10 299	3 973	470 401	165 583	54 505	93 482	87 732	82 280	85 872	30 283	65 933	126 233	139 940	103 835	184 521	133 788
1995	17 956	11 406	3 991	512 800	166 078	58 020	99 511	92 837	85 242	90 509	31 532	66 583	131 810	137 842	103 994	187 028	138 323
1996	17 855	11 405	4 735	570 604	173 408	53 428	103 929	101 813	86 794	95 055	33 707	58 353	138 948	138 893	107 014	196 139	145 559
1997	17 291	11 724	5 222	603 200	181 886	57 045	114 773	108 146	89 596	99 660	37 549	60 822	146 147	139 117	109 545	207 113	154 549
1998	17 390	12 248	4 545	576 299	180 530	59 233	122 382	118 036	93 857	102 722	42 442	63 688	158 436	139 789	114 041	206 832	156 875
1999	17 510	12 104	5 022	577 158	181 433	58 487	122 326	117 733	90 182	99 853	48 193	67 324	176 252	141 602	116 907	211 988	157 590
2000	16 919	11 255	4 974	627 246	183 327	63 380	123 331	127 552	97 331	96 055	51 456	73 488	179 975	139 323	118 755	215 511	162 418
2001	16 117	11 233	5 696	645 842	181 792	65 974	121 454	133 881	77 411	92 852	56 238	79 426	185 459	137 134	119 698	220 153	164 815
2002	16 367	13 529	6 045	654 301	180 567	65 056	123 639	135 828	72 430	93 347	58 285	80 534	188 218	132 593	119 150	227 623	167 304
2003	15 651	13 922	5 423	657 540	186 160	56 728	128 657	143 440	62 748	93 507	61 020	89 666	187 192	132 962	121 457	230 465	162 375
2004	17 169	16 171	5 722	668 133	194 298	60 072	133 241	148 193	52 586	105 640	69 304	96 920	195 295	134 226	122 996	235 378	166 439
2005	17 204	17 099	5 460	644 136	201 618	70 728	138 952	152 487	46 840	110 897	74 213	104 842	204 260	133 977	126 195	245 614	173 128
2006	18 470	16 945	6 003	610 805	206 544	68 554	149 625	163 393	42 882	121 038	77 258	115 232	218 510	134 873	126 894	250 812	187 194
2007	19 076	18 800	6 782	584 005	214 505	63 995	165 095	174 019	34 261	126 656	84 365	124 991	231 218	138 973	129 521	264 036	199 552
2008	20 251	18 969	6 999	569 261	220 785	63 126	167 408	179 294	24 230	122 188	88 624	124 966	233 384	143 842	129 927	274 403	209 049
2009	19 459	20 778	5 228	557 626	204 367	59 342	155 298	173 771	22 189	118 134	90 729	127 901	232 958	149 626	130 980	275 760	201 974
2010	20 208	24 330	6 070	533 372	207 201	58 153	151 803	182 627	21 091	122 638	99 697	122 530	236 330	155 585	135 143	280 222	200 653
2011	18 919	27 382	5 988	517 477	210 764	58 121	155 682	185 983	24 809	125 172	102 514	118 938	248 413	160 568	136 496	282 417	201 168
2012	19 219	29 359	5 847	512 309	215 071	66 097	166 666	195 495	26 745	124 187	105 688	123 407	258 935	163 688	137 966	290 223	211 762
2013	18 904	26 952	5 810	498 890	221 673	64 832	169 678	198 044	29 372	127 686	108 974	128 662	267 267	163 777	142 080	292 736	219 658
2014	19 037	30 255	5 556	502 140	228 123	68 998	172 877	208 699	30 545	124 276	110 487	134 312	271 798	172 882	142 366	294 864	224 762
2015	19 897	26 487	5 519	518 406	217 910	71 030	176 230	216 602	29 604	124 978	114 160	143 370	275 155	180 578	143 673	301 614	222 648
2016	20 088	23 514	5 354	527 844	208 953	71 579	183 070	222 946	32 273	118 462	116 634	151 367	277 029	184 466	151 339	305 497	216 363
2017	20 554	24 794	4 759	558 148	209 365	73 288	189 102	228 165	32 350	118 195	119 994	155 560	283 199	188 581	151 921	309 796	220 210
2018	18 783	25 362	4 594	531 578	213 044	73 344	191 659	233 847	32 269	121 324	129 813	150 824	293 222	193 775	151 515	309 590	231 466
2019	20 855	24 467	5 131	518 754	216 927	69 839	199 388	241 198	34 555	117 723	137 211	150 481	303 578	197 485	152 184	311 373	246 406
2020	19 806	27 632	4 153	567 360	205 448	73 448	192 926	255 816	16 825	77 013	136 227	163 137	297 256	206 717	149 373	290 045	219 858
2021	20 023	30 082	4 018	577 941	213 639	75 927	196 945	266 856	17 973	80 631	145 379	165 485	305 342	213 545	156 730	307 285	231 162

Monthly wholesale price indices, 1767-1920

Jan Tore Klovland

9.1 Introduction

The first historical price indices created were often motivated by the task of measuring business cycles.¹ This implied that the sample was restricted to a limited number of price series that were sensitive to demand disturbances, thus being suitable to form a barometer of business fluctuations. Later the focus was mostly shifted to measuring the general price level on a broader basis. According to Gayer et al. (1953, p. 465) ‘[t]he primary characteristic of a general commodity price index should be its inclusiveness.’

The latter approach, which is followed here, is far more demanding with respect to sources. Although much price information is available, many compromises must be made as to validity, reliability and frequency of price observations in order to construct a price index with a reasonably comprehensive coverage of goods. Much space is therefore devoted to a discussion of the sources and characteristics of individual price series, which will highlight the strengths and weaknesses of the data material underlying the price indices.

An overview of data sources is presented in Section 9.2, with a detailed list of commodity descriptions to be found in the appendix. Section 9.3 reviews issues related to data measurement and statistical methods. Aggregate price indices are presented in Section 9.4, import and export price indices in Section 9.5. A comparison with existing consumer price indices is found in Section 9.6, while in Section 9.7 the new Norwegian indices are compared with Scandinavian, German and British price indices 1767 onwards. Finally, Section 9.8 explains how the new indices are linked to the existing wholesale price indices for the interwar period.²

9.2 Data sources

The price observations that would be most ideal for the construction of the families of price indices considered here are those determined on commodity exchanges. Market prices originating from actual transactions undertaken by commodity brokers are also highly useful. Price currents of wholesale prices, giving a fair and well informed statement as to the actual level of commodity prices, are also within the desired range of sources.

A well known example of the latter source is the *Economist's* weekly price current, which stated that ‘[t]he prices in the following list are revised on Friday with the assistance of an eminent firm in each department.’ Examples of such sources may be found for Norway in the period covered here, 1767-1920, but they only exist for part of the period and mostly for a limited range of commodities. The weekly price current published in the Norwegian weekly *Farmand*, beginning in February 1891, is the closest we get to the *Economist's* price current. In the early part of the sample the semi-official *Bergen Price Current* is of great importance.

There is also very useful price information from commodity brokers or grocers that was published

¹ Persons and Coyle (1921); Silberling (1923).

² A review of price indices for a number of individual commodities and a detailed list of sources can be found in Klovland (2013). An article version of this work appeared in Klovland (2014).

9.2 Data sources

in Christiania from 1825 and in Bergen from 1861. The publication of the Christiania source petered out towards the end of the 1840s but the Bergen price currents continued to be published until 1916.

Price data from many of the sources listed below were transcribed and stored in the Wedervang Archive, which is now located at the Norwegian School of Economics.³ This is an extremely useful collection of data for this purpose, which has been extensively drawn upon. Most of the material from the archive utilized here originates from newspaper sources. Whenever it was feasible to go to the original sources this was done, because extracts made from the sources were often less than complete as to price series included. The accuracy of the transcribed material is admirable, but ambiguities sometimes occur, which makes it desirable to go to the original sources.

Bergen Price Current and market reports from Bergen commodity brokers

The monthly *Bergen Price Current*, known as '*meglerpriskuranten*', was published by Bergen commodity brokers.⁴ It originally appeared in German language as '*Preis-Courant vor Bergen in Norwegen*', from 1829 it was published as '*Bergen Priis-Courant*', now in domestic language. It contained monthly price quotations for export and import goods traded by merchants in Bergen. The city brokers (*stadsmeglerne*) obtained certain privileges from the king in 1759, but by then they were well established. Coldevin (1938, p. 146) maintained that the Bergen Price Current dated at least back to the 1740s.⁵

A page of the Bergen Price Current from June 1777 is shown in Figure 9.1.⁶ When our sample starts in October 1767 it was a rich source of price information on 'incoming' (import) goods such as wheat, rye, barley, oats, malt, salt, spirits, tobacco, iron, hemp, flax, linen cloth and canvas; there was also an extremely well specified price list of 'outgoing' (export) goods such as herring, stockfish, *klippfisk* (dried and salted cod), fish oil, roe, tar, hides and skins. The price current gradually deteriorated as to coverage of actively quoted goods in the ensuing years, however, so that by 1812 it was basically only grain and salt left of the import goods and fish from the export price list. It is likely that the reduction in the range of goods actively quoted is in large measure attributable to the effects of the Napoleonic Wars and the British blockade of Norwegian waters starting in 1807, which severely interrupted the free flow of goods across the borders of Europe.

It has not been feasible to locate the original issues of this price current after 1812. However, there exists a complete run of records containing weekly reports which were sent from the city brokers to the magistrate in Bergen giving information on the prices of selected commodities.⁷ These always included precise information on the stipulated market prices of rye, barley, wheat and malt,

³ See Grytten (2007) for a description of the Wedervang Archive.

⁴ Information on the Bergen Price Current can be found in Coldevin (1938) and Solhaug (1983).

⁵ There are in fact traces of the Bergen Price Current as early as 1739, see Brautaset (2002, p. 51). Original issues of this source covering the period from May 1777 to December 1812 are at present located at the Regional State Archives in Bergen.

⁶ The left hand side showing export goods refers to the previous month.

⁷ The minute books of the city brokers are available from 1774 at the Regional State Archives in Bergen (*Stadens Previlgerede Mæglernes Protocoll Anlagd i Bergen Anno 1774*). From 1793 these books contain some weekly price quotations which are basically the same as those published in the Bergen Price Current.

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sometimes also prices of salt, fish and a few other commodities. In addition, part of the material from the Bergen Price Current for selected years, in particular with respect to fish prices, was recovered from the Wallem and Grip papers stored at the University of Bergen.⁸

Figure 9.1 The Bergen Price Current May-June 1777.

Beginning January 1830 extracts from the Bergen Price Current and the underlying brokers' minute books are preserved in the Wedervang Archive, which represents a considerable extension of the material. From November 1825 price quotations of selected goods from the monthly Bergen Price Current can also be found, although not on a regular basis in the early years, in *Norsk Handels Tidende*. This was a national newspaper established in 1825, which contained economic news and market reports from several towns, in particular Christiania and Bergen.

From the 1840s the Bergen Price Current appeared with greater regularity in Bergen newspapers.⁹ The published lists then regularly comprised the basic import goods (rye, barley, wheat, malt, peas and salt) but also, occasionally, such goods as iron, hemp and barrel staves. Among export goods a fully specified list of fish, roe and fish oil prices reflecting actual market transactions were always included, less frequently also skins and tar.¹⁰

From the late 1840s contemporary Bergen newspapers began to report weekly on the trade in

⁸ Fredrik Meltzer Wallem's papers (Ms 1589) and Jørgen Grip's business archive (Ms 1294) University of Bergen Library.
⁹ The Bergen Price Current can be found in *Bergens Stiftstidende* from 1840, in *Bergenske Blade* 1848-1854 and thereafter in *Bergensposten*.
¹⁰ The fish trade was highly seasonal, which is why there inevitably are gaps in the monthly fish prices series. June to October/November was the main season for stockfish and *klippfisk*, which in many cases leaves no price data for the remaining part of the year.

9.2 Data sources

grain, salt and the various fish products, including estimates of the going market price or actual prices at which transactions had taken place. This is a useful supplement to the Bergen Price Current and the minute books of the brokers. In his monumental study of Norwegian fisheries and fish trade 1815-1880 Solhaug (1983) relied mostly on price information from the Bergen Price Current, claiming that detailed information on price movements in the years 1848-1860 was missing because the city brokers' original minute books and price currents apparently had been lost.¹¹ It appears that Solhaug overlooked the fact that the Price Current was regularly published in the local newspapers in this period. In addition, the market reports in newspapers provide rich material for the study of the fish trade in this period.

The Nordland Price Current

In the summer months fishermen from the north of Norway came to Bergen to sell their stocks of dried and salted fish, fish oil, roe and, on a smaller scale, skins. In exchange the Nordland fishermen bought grain, salt and textiles. This activity peaked in May and August, when the Nordland fairs (*Nordlandsstevne*) were taking place. The merchants of Bergen prepared in advance a comprehensive price list of goods sold to the Nordland fishermen and of fish products bought from them. Prices were stipulated with a view to give maximum prices for goods sold and minimum prices for goods bought from the fishermen, which is a quite remarkable principle. Coldevin (1938) made a thorough study of the relationships between prices from the Nordland Price Current, the actual prices paid according to archived invoices and the quoted market prices in Bergen. His main conclusions were that the first two set of prices were in general highly correlated, but that the prices actually obtained by the fishermen were somewhat more favourable than stipulated in the Nordland Price Current. There is also some evidence that the prices stipulated in the Nordland Price Current basically reflected going market prices, with a reasonable markup. Some further evidence on this issue will be explored below.

We have access to the original printed sheets of the Nordland Price Current from 1815-1865, with some lacunae before 1824.¹² Before 1815 the original material is no longer available, but the main fish price series can be found in the Wallem Papers referred to above. After the 1860s fish products were increasingly sent to Bergen by steam ships and the importance of the Nordland Fairs was greatly diminished. We make use of this data source from 1800 to 1865.

Early wholesale prices in Christiania and other towns

A royal assent was required in order to work as a broker in Christiania, as was the case in Bergen. In 1827 there were two authorized commodity brokers in Christiania and two ship brokers, but all four might also serve as bill brokers.¹³ Beginning with the first issue of the twice-weekly newspaper *Norsk Handels Tidende* in October 1825, price quotations of the most frequently traded goods in Christiania

¹¹ Solhaug (1983, p. 582 and pp. 716-722). See also Brautaset (2002, p. 65).

¹² The available copies can be found in the Grip papers at the University of Bergen referred to above and at Bergen City Archives, which has a complete run from 1842.

¹³ *Norsk Handels Tidende*, 13 January 1827.

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were published in this newspaper, from about 1834 also in *Morgenbladet*. The price information appeared somewhat irregularly, but usually at least once a month. The range of commodities covered varied quite much, but prices of grain were always included. In addition there were fairly regular price quotations of spirits and colonial goods, in particular coffee and sugar, sometimes also tea, spices, raisins, tobacco, iron, flax and cotton. Prices of bacon, salted beef and butter did also figure occasionally; these were nearly all ex ship prices from Danish vessels that were lying at berth in Christiania in order to sell their goods. The bulk of the grain supply to Christiania also seemed to come from Denmark and were sold either on an ex ship or ex warehouse basis.

Grain was always sold by the barrel (about 139 litres), which was a universal unit until well into the 1870s both in Bergen and Christiania. Provisions in Christiania were sold by the *skippund* (159.277 kilos), *bismerpund* (5.977 kilos) or by the *quarter* in the case of butter (one quarter of a barrel, about 34.7 litres). The fairly large units of measurement indicate clearly that these Christiania prices applied to wholesale transactions, which was often explicitly stated as well. Colonial goods were luxuries and prices applied to a *pund* (0.498 kilo). Heavy goods, such as iron and flax, were mostly quoted by the *skippund*.

From 1825 to about 1848 this is a highly valuable source that covers a wide range of commodities. After this year, however, the information from this source peters out. With the exception of grain prices, which still can be found, although not on a regular basis, there is virtually no sources at all for Christiania commodity prices from 1850 until the 1880s except for those traded in smaller quantities on the regular city markets.

Less comprehensive reports on market prices from some other towns also found their way to the contemporary newspapers referred to above, but mostly at long and varying intervals. Here we have only used some of the prices reported from Stavanger beginning 1825; for Fredrikshald and Arendal for the period 1825-1830 only. These sources are of particular interest with respect to the information on prices of such goods as iron, tar, hemp, wool, tallow and provisions, for which the coverage in Bergen and Christiania is rather patchy at times. The units quoted seem to imply that these prices in principle applied to fairly large transaction volumes. It is not stated who compiled these market reports, but the setup and range of commodities were somewhat similar to the quarterly prices supplied by the magistrates beginning 1832, which are discussed in Section 9.2 below.

The Bergen Wholesale Price Current

In October 1861 the Bergen newspaper *Bergensposten* launched a new wholesale price current, supplementing the official Bergen Price Current. It was referred to as current prices of *mellombudsvarer*, which was the label used for goods ordinarily not dealt with by the official city brokers (*stadsmeglere*), such as colonial goods, flour, hemp and wooden barrels. Early in the century prices of some of these commodities could occasionally be found in the Bergen Price Current, but by the 1850s this practice had largely been abandoned.

As noted by *Bergensposten* (1 October 1861) it was a curious fact that the activity of those wholesale merchants who traded in these goods (*mellombud*) actually was illegal according to the Broker

9.2 Data sources

Law, which gave the authorized brokers all privileges regarding the trade in commodities. But the newspaper also noted that it had long been tolerated by the Bergen Bourse Committee, the magistrate as well as the city council.

The new price current comprised about 30 commodity descriptions, providing an extremely useful source of prices of such goods as coffee, sugar, flour, tobacco, spirits, hemp, wooden barrels and petroleum. After the Christiania brokers' quotations for groceries faded away in the late 1840s we have no regular source of price information on most of these goods until the Bergen Wholesale Price Current appeared in October 1861. It was typically published twice a month until 1875, when weekly quotations began. The regularity was maintained through 1912; it then started to appear more irregularly and was discontinued in January 1916.¹⁴

Town markets in Christiania, Bergen, Trondhjem and Stavanger

Domestically produced agricultural products that were not consumed by the farmers themselves were chiefly brought to local town markets and sold there. The distribution of such goods via grocers and village shopkeepers only acquired some importance after the turn of the century.¹⁵ We are therefore obliged to use town market prices to obtain information on the prices of domestic meat, grain, potatoes, butter, eggs, game and poultry, tallow, hay, hides and firewood.

The first systematic recording of town market prices is from Christiania in January 1830. After being temporarily discontinued after December 1830, we find such price information fairly often quoted in the newspapers from January 1834.¹⁶ In the second half of the nineteenth century the main series of market prices from Christiania were collected by the city registrar (*stadsveieren*). This series is supplemented by prices quoted at the various market places (*Youngstorvet, Ankertorvet*), as well as those recorded by the city meat inspection (*kjøttkontrollen*), and published in *Farmand* and other contemporary newspapers.

We have town market prices from Bergen from January 1840, but with gaps in 1847 and 1849 - 1860 (with the exception of 1855). As from the autumn of 1860 the regularity of this series is quite good. Town market prices from Trondhjem and Stavanger have been used to supplement the prices from Christiania and Bergen when required, notably for such goods as meat, potatoes, tallow, coal, wool, hides and skins.

Quarterly prices collected by town magistrates

This data base covers the period 1832 - 1871, giving quarterly market prices of 15 commodities from 40 towns as collected by the town magistrates.¹⁷ There are many gaps in these time series, but in general it is possible to compute useful aggregates for most goods over this period. However, the

¹⁴ This information is from the Wedervang archive, file W(264).

¹⁵ Hodne (1989).

¹⁶ There are data for the first three months of 1833. Until February 1853 there are quite often gaps in our monthly series, most visible in 1852, when only January and April are available.

¹⁷ This source was extensively used in the construction of the consumer price index reported in Grytten (2004b), where a more detailed overview of this source can be found.

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reliability of individual series is highly variable, in some cases prices are reported as unchanged for many successive years, and there are sometimes unreasonably large price changes that must be due to changes in product quality or units of measurement. Using this data source consequently requires a careful inspection of each series, which implies that the nationwide averages should be computed only from a subset of the towns, also excluding periods when the reported prices from a particular town were judged to be less reliable. The data are only used for commodities for which other market price data are somewhat defective. This applies to hemp, flax, wool, iron, tar and spirits. The market price data for various grain and fish products taken directly from brokers' and market reports are considered to be more accurate and consistent over time, hence the information on these goods from the magistrates' reports was neglected here.

Agricultural prices collected by Christiania Landmandskontor

The prices of agricultural produce recorded in the city markets primarily applied to transactions involving small quantities. In 1877 Christiania Landmandskontor started to publish market prices of such goods at the wholesale level. It was explicitly stated that the price current applied to prices 'in wholesale transactions or for whole lots.'¹⁸ From 1877 onwards these price currents were published in Christiania newspapers, to begin with quite irregularly, and only a few lists have been located for the years 1879-1881, but beginning 1882 we have a complete run of these price currents from the weekly *Norsk Landmandsblad*, supplemented by newspapers.

The price current published by Christiania Landmandskontor covered much the same products as the town market reports. A comparison of prices from the two sources may therefore shed some light on the behaviour of our town market prices, which is the only source available for domestically produced agricultural products prior to 1877.¹⁹

Price data from the financial weekly newspaper *Farmand*

The first issue of *Farmand* appeared on 14 February 1891. The editor, Einar Sundt, explicitly announced in the first issue that he viewed as his model the English weekly trade journals, in practice this meant in particular adopting the format of *The Economist*, although on a smaller scale. A weekly wholesale price current was therefore a prominent regular feature of *Farmand*. This represents an important addition to our data sources, in particular giving detailed information on flour, coffee, sugar, provisions, metals, oils, spirits and leather. In addition, there were market reports from Bergen and Trondhjem containing current export prices of fish and a few other products.

¹⁸ The headline of the price current (in Norwegian) was "Christiania Markedspriser - i Partier eller hele Kolli meddelt af Christiania Landmandskontor."

¹⁹ Figure 5.3 in Klovland (2013) shows that there is a very close correlation between prices from the two sources; hence, it may be warranted to assume that the town market prices to a large extent reflected the fluctuations in bulk transactions as well.

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Price information from foreign trade statistics

For the period 1895 - 1912 Statistics Norway published *monthly* data on the volume and value of selected export and import items, from which unit prices can be derived. These prices were stipulated by Statistics Norway on the basis of current market prices each month. Some of this information may have been obtained directly from merchants involved in foreign trade. In this regard these data may contain price information that no longer can be retrieved from published sources. The price series derived from this source is therefore a useful supplement to our data set in cases where directly observed market prices are missing or incomplete.

The main argument against using implicit prices from trade statistics is that the commodity item may in some cases be too broadly defined to give an accurate estimate of price movements. If the composition or product qualities are changing over time the computed prices may be rather misleading. The use of these data should therefore be confined to homogenous commodities where quality differences and relative price changes are not contaminating the data.

Monthly trade prices series were computed for three main commodity groups: (1) manufactures of wood (deals and boards, mechanical pulp, chemical pulp, wrapping paper, printing paper, matches), (2) textiles (cotton, hemp and woollen plain goods), (3) minerals (coal, pyrites and natural ice). In these cases it was found that the commodity specification was sufficiently well defined to warrant their inclusion; moreover, directly observed market prices were hard to find.²⁰

After having scrutinized all conceivable data sources there were some important commodities for which price data were missing for some periods. As a last resort prices from the *annual* trade statistics were used, subject to the same criteria as outlined above. This applied in particular to several textile goods, metals and minerals. In these cases, which are described in detail in the appendix of Klovland (2013), the tradeoff between data quality and importance spoke in favour of using trade return data. Although this procedure is not ideal, these commodities were too important to exclude from the price index.

Annual volume *and* value estimates of exports and imports begin in 1866. For some goods the commodity classifications changed over time, particularly in the early years, which implied that the computed price series were not useful and had to be excluded. In general, however, we believe that the annual trade return prices give a reasonably representative view of the price movements.

The fact that these price data are annual averages presents a genuine problem given that our price index is constructed with a view to show monthly price fluctuations. Simply inserting the annual averages for each month is not an acceptable solution because it would create discontinuities in the computed monthly price series at year-ends. To overcome this problem a smoothing algorithm that produces monthly data but preserves the annual averages is applied to the annual prices. This method is explained in Section 9.3.

²⁰ Even in the cases of these seemingly homogenous commodities there are some inherent problems. One example is the case of hemp, in which case a comparison of the monthly and the more detailed annual trade statistics revealed that the monthly hemp series was increasingly influenced by lower priced jute qualities over time. Consequently, we only use this series until 1907.

Miscellaneous other sources

In addition to the twice-yearly Nordland fairs in Bergen we have information from two other trade fair categories. One source is represented by the annual or semi-annual trade fairs associated with timber floating in the water systems surrounding Christiania, Drammen and Kongsberg. These data cover a long time span, 1791 - 1908, but there are large gaps in the early decades. This source is particularly useful because it contains the only directly observed domestic prices of timber or wood apart from firewood in this period.

Another source of information is the Stavanger trade fairs, which yielded information on some domestically produced agricultural goods, including wool, from the late 1840s until the 1880s, covering a period in which time series from other sources are rather fragmentary.

There are two time periods which present particular problems as to data sources. The first one is some of the years of the Napoleonic Wars, in particular during the later part of the period 1806-1814 when the Continental System (Blockade) was in effect. For this period there are inevitably some large gaps in our price series. A second problematic period occurred a century later, in the second half of World War I and its aftermath, 1916-1919. Export bans on fish products, extensive price controls and the general disruption of trade flows led to the breakdown of regular transactions on most commodity markets. Consequently, market reports and price currents disappeared from contemporary newspapers to a large extent. For this reason we have had recourse to retail prices in this period in a few cases, including coal, firewood, coffee, fresh and salted fish, rye flour, barley flour as well as rolled oats. We have also incorporated information from some price index series (petroleum, pulpwood, paper and textiles) for the period 1914-1920 published by the weekly trade journal *Økonomisk Revue*. These price relatives partly reflect price information which was obtained directly from merchants at the time and which no longer can be retrieved.

9.3 Data measurement and statistical methods

Price quotations

This index reflects monthly price fluctuations. This implies that in principle we are only collecting price information that can be pinned down to a specific month within the year. The main exception is the annual trade return data, for which a special procedure is adopted, as described below. In general, prices observed at any date within the month is accepted, but if there are two or more observations the one closest to the middle of the month will be used.

In price currents prices are typically given as a range of high and low, reflecting different quality descriptions. If the quality range is reasonably invariant over time it is sufficient to use the average of the quoted range; in a few cases either the lowest or highest price is assumed to best reflect an unchanged quality.

Seasonal adjustment

Some of the price series exhibit distinct seasonal patterns. This is most typical for certain agricultural goods, in particular butter, eggs, cheese and potatoes. For the majority of commodities, however, regular seasonal fluctuations are weak or non-existent. Numerous gaps in the monthly time series present problems for seasonal adjustment procedure; hence, the data are not seasonally adjusted.

Conversion of annual averages to monthly figures

As noted above the problem of estimating the unobserved monthly movements in data series for which only annual averages are available arises in cases where annual price data from the foreign trade returns are the only alternative. The method applied here employs a procedure suggested by Litterman (1983). In this approach a related series (in this case only a time trend) and certain statistical assumptions about the error term are used in order to distribute the annual values over the twelve months of the year. In addition to smoothing the intrayear movements this method ensures that the annual average of the estimated monthly data equals the true annual average.²¹

In order to get an idea of how this method works in practice an illustration using an actual monthly time series is shown in Figure 9.2. The data series chosen is the monthly price of brown fish (cod liver) oil as quoted in Bergen from 1830 to 1913. This is a commodity with fairly wide cyclical fluctuations, occasionally subject to speculative behaviour with the inevitable subsequent collapse.

First, annual average values of the monthly data series, which only have minor gaps in some years, were computed. Then the Litterman procedure was applied to the annual time series, distributing its values over the months according to our assumptions about the related series (time trend) and the error term. The original monthly data in Figure 9.2 may then be compared to the estimated values using this procedure. It will be seen that the two time series track each other quite well. The constraint

²¹ This procedure is implemented in slightly modified form in RATS version 8.0, with a different handling of the initial periods. An ARIMA(1,0,0) specification for the error term is generally assumed, but in some cases more reasonable results were obtained with a first-order autoregressive model.

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that annual averages of the monthly series must be equal to the annual figures ensures that large and persistent discrepancies never occur.

The general features of the *intra-year* movements of the estimated series are relatively encouraging; the direction of change within the year is in most cases correctly reproduced and the timing of the peaks and troughs are not bad. What the smoothed series cannot pick up is of course the minor and irregular movements of the true series, also missing the extreme values of the more pronounced cycles by a wide margin. For example, it may be noted that the all-time high extreme value of the 1857 commercial boom, which occurred in June 1857, is grossly underestimated, but the dating of the peak is correct. The following steep decline of fish oil prices and the subsequent recovery is quite well picked up by the distribution procedure, however.

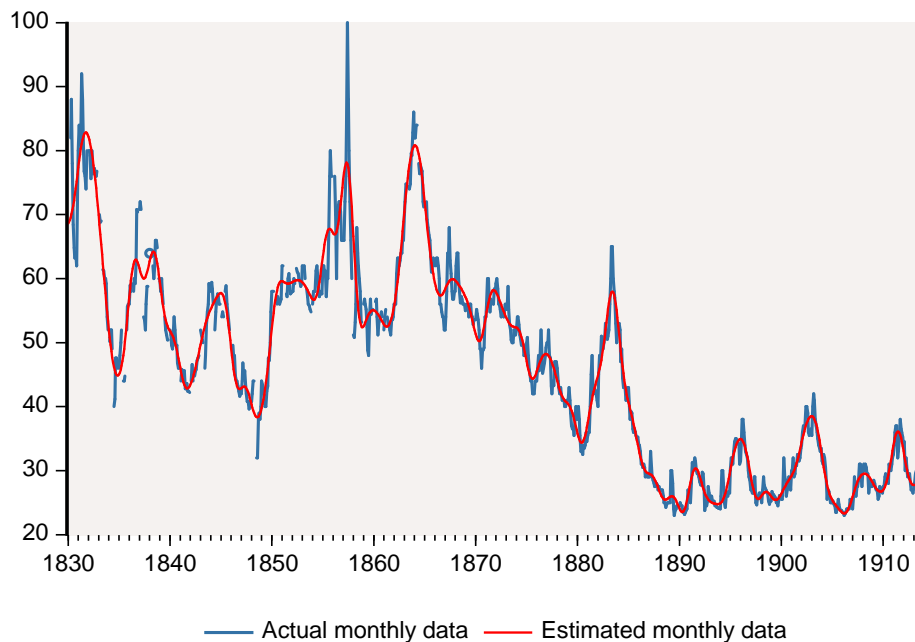


Figure 9.2 Actual and estimated time series of brown cod liver oil 1830-1913.

This illustration may be typical of the correlation between the true data and the estimated monthly values, but in practice we will of course never know exactly how close the distribution procedure can mimic the *intra-year* movements of the true price series. However, the method seems to work sufficiently well to warrant its use here. Please note again that this procedure is only applied to data series for which little or no other *intra-year* information is available.

9.3 Data measurement and statistical methods

The method of price index construction

The review of data sources for this study highlights the fact that most of the price series must be extracted from publications which are discontinued, incomplete and, in some cases, no longer accessible. This may be typical of many studies in price history. But even if sources are available on a continual basis there will inevitably be numerous cases when a particular data series is discontinued or contains substantial gaps. For many agricultural goods supply conditions may vary according to seasons and crop failures; in general, quality descriptions may be altered and publication practices may change. The problem facing the researchers then is how to put together the bits and pieces of price material at hand to form continuous time series of the commodity prices.

The traditional way of dealing with this problem is to splice the time series at a point in time when there is overlapping information.²² Applying this method necessitates great care and involves substantial work. If there are many time series and gaps to fill, as is the case with monthly data, this procedure may become virtually impossible to implement.

Given these problems we suggest using a type of index extensively employed in the construction of house price indices, where it is referred to as a *repeat sales* index.²³ When there are no gaps in the data this index is an ordinary chain index. The repeat sales index has been developed for a market where the price of each object is quoted infrequently and at irregular intervals, which typically characterizes the house market. A somewhat similar, but far less extreme situation is typical of our sample. Here, the gaps between the observed price quotations are in many cases much shorter, often of a seasonal nature. However, the problems encountered in splicing and aggregating the individual time series to an overall index are in principle the same, and the repeat sales method can easily take care of this.²⁴

The repeat sales method can handle gaps in the data series of any length, thus utilizing all information in the data set. Variables observed frequently will exert a stronger influence on the index, simply because there will be more observations in the data set originating from this variable. This is consistent with the view that more weight should be attached to commodity specifications regularly quoted in the market because these are very often the ones most frequently traded. Instead of relying on the price of one single 'representative' commodity, this method makes it feasible to use all available price information, including prices on various commodity descriptions traded in the market to establish the 'representative' price. However, it should be underlined that this procedure lends itself mostly to the lowest level of aggregation, that of a particular commodity, say rye or pig iron, for which explicit weighting of different price observations is less urgent. The relative weights

²² See for example Kennedy and Solar (2007) and Solar and Klovland (2011) for some recent studies in which this principle is systematically applied.

²³ The method was first launched by Bailey et al. (1963). One of the key house price indices in the United States, the Case-Shiller home price index, is based on this principle. The principles of this index are more fully discussed in Shiller (1993). See also Klovland (2013) for a simple numerical example that illustrates the application of this method.

²⁴ It can be argued that less weight should be attached to observations calculated from rates of change over long periods of time than on changes from adjacent periods, partly because changes in product specifications or other characteristics are more likely to have changed if there are large time intervals between the observations. Following the suggestion of Case and Shiller (1989) a weighted three-step least square procedure which takes this into account is adopted here.

of the various grains and metals should of course still be based on actual production or consumption figures.²⁵

Ideally we would like to observe an exact price for an invariant specific commodity description, but this requirement is seldom encountered in practice. Our index methodology makes it feasible to work with a very detailed commodity classification, and when the underlying price sources permit, we fully exploit all price information there is. In some cases, such as herring, for which we have 83 price series (many of which contain data for subperiods only) this procedure ensures that relative price changes from season to season of the various fish qualities are taken into account as far as possible. In some instances we also include price quotations from more than one market place, supplementing the Bergen and Christiania data with information from other towns, in particular Stavanger and Trondhjem.

In general, the main reason for including a large number of individual price series for a particular commodity is that it produces a price index with fewer gaps. For example, in the case of rye there are 47 market price series, but none of them covers the whole period without gaps. The final price index for rye is nearly complete on a monthly basis for the whole span of 154 years, only during the first decade of the sample and the period 1800-1814 are there a few missing observations in some years.

Producer price indices versus wholesale price indices

A price index can be defined as a weighted average of the price change in a group of products between one time period and another.²⁶ In practice there are several issues that have to be clarified before the construction of the index can begin. These issues comprise among others: which products, which prices and which weights.

The indices constructed here utilize commodity prices only, thus neglecting services. The products may originate from agriculture, fisheries, dairying, manufacturing or mining. In principle we want to observe prices at one stage prior to final demand, which traditionally has been referred to as wholesale prices. The material does not lend itself particularly well to measuring consumer or cost-of-living price indices.

In deriving weights for the construction of the indices we distinguish between domestically produced goods sold in the home market, exported goods and imported goods. This distinction concerns the weighting of the indices – it might have been desirable to single out prices of the three types of goods in separate groups, but the underlying price material does in general not allow for this.

By combining these product categories and price level definitions a whole family of indices can be derived.²⁷ Traditionally *wholesale price indices (WPI)* included both domestic goods (sold at

²⁵ This principle is in line with the view advocated by Flux (1921, p. 178) in his perceptive discussion of price index construction. He drew an analogy between using individual price observations to measure the price level and shots from a rifle against a target: 'When a commodity is of great importance in our economic life, its price-position should have an influence on the index-number such as many shots from the same rifle might have in the case of the target.'

²⁶ IMF (2004, p. 66).

²⁷ See IMF (2004, pp. 61 - 72) for a useful discussion of these issues.

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home) and imported goods, while sometimes ignoring exported goods. The first (non CPI) price index launched by Statistics Norway in 1924 was explicitly constructed in this way.²⁸

Producer price indices (PPI), on the other hand, focus on prices obtained by domestic producers, thus including domestic, and, as an option, also exported goods, excluding imported goods altogether. It is also feasible to construct an index for the total supply of goods (*TPI*): domestic, exported and imported goods.²⁹

The following types of indices will be considered here, using the abbreviations *DOM* for domestic goods (sold in the home market), *EXP* for exported goods and *IMP* for imported goods :

- **PPI:** producer price index (*DOM, EXP*)
- **WPI:** wholesale price index (*DOM, IMP*)
- **TPI:** total supply price index (*DOM, EXP, IMP*)

We use these labels extensively for reference here, acknowledging that they may differ somewhat from the present use of these terms. The concept of wholesale price (*WPI*) indices, which has a long tradition in the literature on historical price indices, has a modern counterpart in price indices of first-hand sales. The present producer price (*PPI*) indices usually measure prices net of sales taxes. In our case the information required to distinguish between output prices net of taxes and final market prices may be difficult to obtain; hence, market prices are used throughout. However, it only concerns a few goods subject to excise taxes, notably alcohol. There was no uniform sales tax in this period. In the nineteenth century there was a small tax on the export of wood, which has been deducted.

Weights for the commodity groups

There are three levels of aggregation involved in constructing the indices. The first level involves aggregating all price information to indices for 110 commodities. For many commodities there are prices of several product qualities as well as quotations from different market places. This is done by using the repeat sales method described above. For example, in the case of rye, a time series regression was run over the whole sample period 1767-1920, using information from all the 47 rye descriptions in the sample. There is only an implicit weighting involved here, following from the fact that the descriptions with the greatest number of observations are the most influential ones in determining the coefficient estimates.

The next step involves aggregating the 110 individual commodities into 16 commodity groups. At this stage weights reflecting each commodity group's market shares are being used, implying different weights for the three main indices TPI, WPI and PPI defined above.

Considering the fundamental changes in industrial structure and consumption patterns over the 154 years covered by this index commodity weights ought to be changed over time. The sample

²⁸ Wedervang (1924).

²⁹ This was actually the principle underlying the weights used for the British price index constructed by Flux (1921). Earlier price index studies were typically computed as unweighted averages, only implicitly reflecting the 'importance' of each good.

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has been divided into four subperiods, with benchmark years for the index weights in 1835, 1870, 1890 and 1910. The choice of 1835 as the first year is dictated by the availability of reasonably complete foreign trade statistics. Separate indices are computed for the four overlapping subperiods 1767-1839, 1830-1879, 1870-1899 and 1890-1920. The subperiod indices are then spliced together in the years 1839, 1879, 1899 and 1913.

The estimates of import and export values are straightforward for the last three subperiods. For the year 1835, however, the foreign trade returns only give figures for quantities exported and imported. The price data collected here were then used to backcast the export and import prices from the 1870 trade return to 1835.

Estimating the market value of domestic output of the various goods is much harder, though. In a few cases, mostly for the more recent benchmark years, reasonably exact figures could be taken from output estimates published by Statistics Norway.³⁰ In many cases output estimates for 1910 or later years had to be extrapolated backwards, sometimes by using related information, such as acreage sown or the number of livestock combined with slaughter weight. In other cases little relevant information was available and figures had to be stipulated on the basis of export shares, reasonable growth rates between benchmark years as well as pure guesswork. Output values of domestic goods are not supposed to be estimated with much precision, the intention is merely to obtain a reasonable set of weights for the construction of the indices.

In principle the indices only refer to goods sold on a market. A particular problem in this connection concerns the proportion of domestic agricultural output that was marketed, for example in the case of hay and butter. It was assumed that in the early years a larger share of the output was consumed at the farms. Some corrections for this was attempted, but these calculations are also subject to great uncertainty.

Relative weights for each commodity within the group is computed as follows: The commodity with the greatest market value is given a load of 10 and the other commodities are scaled proportionately according to this, using rounded integer load values, subject to the constraint that all time series for which there are data get a load factor of at least one. For example, in the case of the WPI index for grain (group A) the load factors for the second subperiod 1830-1879 using 1870 weights are (percentage shares in parentheses): barley 10 (34), rye 9 (31), wheat 1 (3), wheat flour 1 (3), rye flour 5 (17), barley flour 3 (10), rolled oats 0 (because data for the latter commodity are missing in this subperiod). The weights are tabulated in the appendix of Klovland (2013).

Finally, we need to aggregate the commodities within each group to a group index (for example grain, fish or timber) and further to an overall index comprising all 16 commodity groups. This is done for for each of the four subperiods and indices are spliced as explained above to render continuous indices for the whole sample period.³¹ The aggregation procedure is explained next.

³⁰ The most useful publications are (NOS numbers in parentheses): Industrial production statistics of 1909 (V 50) and 1916 (VII 49); Agricultural statistics 1886-1890 (III 217) and 1906-1910 (V 196); Mining statistics 1866-1870 (1C no. 12), 1889-1890 (III 165) and 1910 (V 159). The summary estimates in *Statistiske oversikter 1948* (X 178) are also quite helpful.

³¹ A minor adjustment in the form of rebasing the weights must be made in the case of the chemicals (group O) index, data for which only exist in the final subperiod.

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Aggregation

Gaps in the monthly time series present problems for aggregating the subindices of commodity groups to total indices. Various ad hoc procedures may be applied to circumvent the problems of missing observations, all of which are likely to create some distortions as subindices are ‘walking in and out’ of the aggregates. The most satisfactory approach is probably to apply a dummy variable procedure advocated by Rao (2005).

The method involves running a standard least squares regression with a dummy variable DS_i for each of the S group indices to be aggregated and a dummy variable, DT_t , for each of the T time periods in the sample.³² These dummy variables are multiplied by the square root of the weights w_i attached to each commodity group. In order to implement the model a sample is constructed of S times T observations, minus the number of observations for which values of the subindices are missing.³³

$$\begin{aligned} \sqrt{w_i} \ln P_{it} = & \lambda_1 \sqrt{w_1} DS_1 + \lambda_2 \sqrt{w_2} DS_2 + \dots + \lambda_S \sqrt{w_S} DS_S \\ & + \psi_1 \sqrt{w_i} DT_1 + \psi_2 \sqrt{w_i} DT_2 \dots + \psi_T \sqrt{w_i} DT_T + u_{it} \\ & i = 1, \dots, S, t = 1, \dots, T \end{aligned}$$

u_{it} is a random disturbance term. The model is estimated by ordinary least squares after deleting one arbitrary dummy variable for time and group to avoid perfect multicollinearity. The aggregate index value in period t , X_t , is computed as

$$X_t = 100 \cdot \exp(\psi_t) \quad t = 1, \dots, T$$

and then normalized relative to a benchmark period.

In summary, the weighting and aggregation procedure runs as follows: At stage one indices for each of the 110 commodities (say, rye, barley, wheat etc.) are formed by the repeat sales method. This method involves piecing together the individual data series on each commodity in an efficient way to form an index series by using all available price information. In this way a consistently measured index for individual prices with a minimum of gaps is produced, but there will still be gaps in the index if there are no observations for a particular month.

These time series are then aggregated to 16 commodity groups (say, grain, meat etc.) by applying weights based on the market shares of each good in domestic production (for home use), exports and imports. These weights will differ according to the particular price index version chosen, being either the total supply price index (TPI), wholesale price index (WPI) or producer price index (PPI).

³² The dummy variables for commodity groups, DS_i , are assigned a value of 1 for the i -th group and 0 otherwise; the dummy variables for time, DT_t are equal to 1 for the t -th month of the sample and 0 otherwise.

³³ The left hand side variable P_{it} is thus a column vector where T observations (minus any missing index values) for the first commodity group index are entered, then come (at most) T observations for group number two and so on.

Exchange rates

After the relative tranquil exchange rate environment of the last quarter of the eighteenth century, the first three decades of the following century present a marked contrast. These years were a period of extreme instability in currency values in Norway. Excessive inflation and a strongly depreciating currency necessitated two major currency reforms, one in 1813 and one 1817. The value of the new *speciedaler* currency introduced in 1817 was not undermined by a reckless monetary policy, as had been the case in the previous currency regimes, but still the exchange rate against silver fluctuated wildly until the late 1820s.³⁴

The currency reforms and the inflationary periods present some problems for drawing a consistent picture of the true price movements in these years. A bird's eye view of the exchange rate development of the period 1767 - 1830 is presented in Figure 9.3, showing that monthly values of the exchange rate against the Hamburg banco, which had a fixed silver value. Annual averages of the exchange rates against Hamburg and London are shown in Table 9.1. The Hamburg exchange rate is to be read as the number of domestic currency units needed to buy 100 Hamburg banco, thus increasing values imply a depreciating Norwegian currency. The exchange rate series has been spliced according to the principles laid out below in order to obtain a consistent picture of the silver value of the currency. The primary market quotations are in *riksdaler (Danish) courant* through January 1813; thereafter in *riksbankdaler*. As from February 1817 the curve shows actual market values of the *speciedaler*; prior to this date it shows exchange rate values equal to a backcasted hypothetical *speciedaler*. The par value is equal to 100, which the *speciedaler* attained in 1842.

Between 1767 and 1813 the Danish-Norwegian currency, *riksdaler (Danish) courant*, was the legal tender in Denmark-Norway. The par value against Hamburg banco was 125, before 3 December 1794 122.5.³⁵ In January 1800 it was quoted at 138, or about 10 per cent below par.³⁶ The *riksdaler* depreciated slightly over the ensuing years, but not by more than a few per cent; it was quoted at 144.5 in January 1808. From then on the rate of depreciation increased considerably, approximately halving the currency value in terms of silver in each of the years 1811 and 1812. In January 1813, when the new currency, the *riksbankdaler* was introduced, the old *riksdaler courant* was quoted at 1750 in Bergen, possessing less than 10 per cent of its original value. The data in Table 9.1 show that a domestic merchant would have to give up about 94 times as much in nominal domestic currency in 1817 compared to 1800 in order to buy one hundred Hamburg banco. As will emerge from the presentation of the price series below, fluctuations of the same order of magnitude are reflected in the commodity price series as well.

What matters for the splicing of prices quoted in the new and the old currency is not the silver

³⁴ In fairness to the bank directors it should be borne in mind that the predecessor of Norges Bank, the Riksbank, operated under extremely difficult conditions between 1813 and 1817. Severe harvest failures, an endemic credit crunch and forceful political pressure to contribute to state finances were almost inevitably bound to result in a huge monetary expansion. See e.g. Rygg (1918, pp. 38-62). The main events of the currency history are discussed in Rygg (1918), Kristiansen (1925) and Keilhau (1952). For a recent overview of the monetary history of the period see Eitrheim, Klovland and Øksendal (2016).

³⁵ Rygg (1918, p. 21).

³⁶ Another source of actual currency movements in this period are the Bergen quotations in Coldevin (1938, pp. 106-113).

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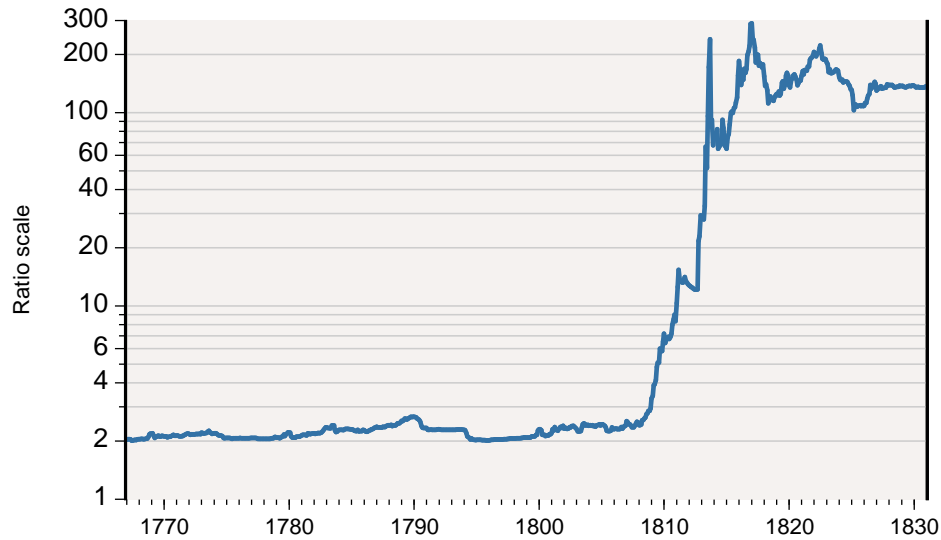


Figure 9.3 *Nominal exchange rate against Hamburg banco, 1767-1830.*

value of the currencies, however, but information on the currency in which prices were quoted and the conversion ratio between the two currencies.³⁷ In 1813 the conversion ratio between the old and the new currency was set at six riksdaler courant per riksbankdaler. Thus prices quoted in the old currency have to be multiplied by $1/6$ (0.1667) to be consistent with those quoted in the new riksbankdaler. If prices had continued to be quoted in both old and new currency units some ambiguities might have arisen in the price index calculations,³⁸ but in our Bergen sources the transition from the old currency to the new one is clear-cut once it was introduced.³⁹

³⁷ There was for a time a tradition in Norwegian economic history of converting all nominal prices to silver values in this period. This blurs the price history and significantly mars the otherwise useful price material in Solhaug (1983).

³⁸ In Sweden there are examples of competing currencies being used simultaneously, which may require separate indices for different currencies, see Edvinsson and Söderberg (2010) for an example of this approach.

³⁹ There is in fact one exception here taking place in August 1815, when prices were given in the old rigsdaler courant. For example, the price of Nakskov (Zealand) barley was 20 riksbankdaler (new currency) in July and September, but 120 rigsdaler courant (old currency) in August. This reflects exactly the conversion ratio of 6 to 1 between the old and the new currency.

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Table 9.1: Exchange rates against Hamburg and London. Annual averages 1767 - 1819.

Year	Reichstaler Hamburg banco			Pound sterling		
	Riksdaler DC	Riksbankdaler	Speciedaler	Rigsdaler DC	Riksbankdaler	Speciedaler
1767	121.7	20.29	2.029	5.32	0.89	0.089
1768	124.4	20.73	2.073	5.23	0.87	0.087
1769	127.4	21.23	2.123	5.24	0.87	0.087
1770	126.9	21.14	2.114	5.17	0.86	0.086
1771	128.3	21.39	2.139	5.22	0.87	0.087
1772	130.0	21.66	2.166	5.26	0.88	0.088
1773	132.3	22.04	2.204	5.60	0.93	0.093
1774	128.1	21.35	2.135	5.45	0.91	0.091
1775	124.0	20.66	2.066	5.21	0.87	0.087
1776	124.0	20.66	2.067	5.09	0.85	0.085
1777	123.7	20.62	2.062	4.95	0.82	0.082
1778	123.7	20.62	2.062	5.15	0.86	0.086
1779	127.2	21.20	2.120	5.49	0.91	0.091
1780	127.0	21.16	2.116	5.38	0.90	0.090
1781	129.7	21.61	2.161	5.17	0.86	0.086
1782	133.6	22.26	2.226	5.27	0.88	0.088
1783	139.3	23.22	2.322	5.48	0.91	0.091
1784	137.6	22.94	2.294	5.76	0.96	0.096
1785	135.8	22.64	2.264	5.88	0.98	0.098
1786	136.9	22.81	2.281	5.82	0.97	0.097
1787	141.9	23.64	2.364	6.04	1.01	0.101
1788	145.8	24.30	2.430	6.28	1.05	0.105
1789	156.5	26.08	2.608	6.76	1.13	0.113
1790	149.9	24.98	2.498	6.51	1.08	0.108
1791	137.4	22.89	2.289	6.03	1.00	0.100
1792	136.9	22.82	2.282	5.76	0.96	0.096
1793	137.2	22.86	2.286	6.09	1.01	0.101
1794	126.2	21.03	2.103	5.50	0.92	0.092
1795	121.1	20.19	2.019	4.88	0.81	0.081
1796	121.7	20.28	2.028	4.96	0.83	0.083
1797	122.9	20.49	2.049	5.43	0.91	0.091
1798	124.2	20.70	2.070	5.68	0.95	0.095
1799	127.1	21.19	2.119	5.45	0.91	0.091
1800	130.9	21.82	2.182	5.05	0.84	0.084
1801	138.6	23.09	2.309	5.30	0.88	0.088
1802	140.8	23.47	2.347	5.66	0.94	0.094
1803	140.9	23.49	2.349	5.81	0.97	0.097
1804	144.2	24.03	2.403	6.21	1.04	0.104
1805	139.8	23.30	2.330	5.91	0.98	0.098
1806	139.9	23.31	2.331	5.78	0.96	0.096
1807	146.5	24.41	2.441	6.17	1.03	0.103
1808	159.2	26.53	2.653	6.80	1.13	0.113
1809	289.3	48.22	4.822	10.73	1.79	0.179
1810	443.2	73.88	7.387	16.67	2.78	0.278
1811	793.8	132.31	13.231	24.72	4.12	0.412
1812	926.3	154.38	15.438	32.03	5.34	0.534
1813	4964.8	827.47	82.747	167.47	27.91	2.791
1814	4444.8	740.79	74.079	168.05	28.01	2.801
1815	6022.3	1003.72	100.372	233.45	38.91	3.891
1816	10955.7	1825.95	182.595	478.75	79.79	7.979
1817	12250.1	2041.69	204.169	517.57	86.26	8.626
1818	7506.5	1251.09	125.109	305.18	50.86	5.086
1819	8273.1	1378.85	137.885	351.95	58.66	5.866

9.3 Data measurement and statistical methods

NOTE: The primary exchange rate quotations were in *rigsdaler Danish courant (DC)* before March 1813; thereafter in Norwegian *riksbankdaler* until February 1817, when the *speciedaler* was introduced. The rates shown here have been calculated on the basis of these primary quotations according to the official conversion rates of six rigsdaler DC to one riksbankdaler, and ten riksbankdaler to one speciedaler. Sources. *Hamburg banco: January 1767 - January 1813*. Copenhagen on Hamburg, primarily short sight, from Denzel (1999), supplemented by data from Denzel et al. (2006) on the inverse rate Hamburg on Copenhagen April 1809 - April 1811. *February 1813 - April 1815*. Norwegian riksbankdaler as quoted in Bergen from Coldevin (1938, pp. 112-113) supplemented by data in Rygg (1918, pp. 376-377), which are taken from various domestic sources. *May 1815 - March 1819*. Computed indirectly from Norwegian riksbankdaler quoted in Copenhagen and the short exchange rate on Hamburg in Copenhagen, averages of one to eight observations per month. These quotations are from market reports published in *Den Norske Rigstidende. April 1819 - December 1819*. Direct quotations on Hamburg (short) on Christiania Bourse, from Klovland (2004). *Pound sterling: January 1767 - August 1808*. Copenhagen on London, 2 months' sight, from Denzel (1999). *September 1809 - January 1813*. Copenhagen on London indirectly via Hamburg. The underlying data are from Denzel et al. (2006). *February 1813 - April 1815*. Norwegian riksbankdaler indirectly on London via Hamburg. The rate on Hamburg as calculated above, London on Hamburg from Denzel et al. (2006). *May 1815 - March 1819*. Computed indirectly from Norwegian riksbankdaler quoted in Copenhagen and the exchange rate (2 months' sight) on London in Copenhagen, averages of one to eight observations per month. The underlying data are from market reports published in *Den Norske Rigstidende. April 1819 - December 1819*. Direct quotations on London (short) on Christiania Bourse, from Klovland (2004).

The city brokers in Bergen began quoting prices in riksbankdaler in March 1813.⁴⁰ The figures below show the prices of various grains quoted in the old currency on 27 February, the implied price in the new currency using the conversion ratio of six to one, and, finally, the prices actually quoted in riksbankdaler on 6 March.

	27 February rigsdaler courant	27 February converted price	6 March riksbankdaler
Rye	130	21.7	25.0
Barley Zealand	100	16.7	15.0
Barley Jutland	90	15.0	14.2
Oats	80	13.3	13.3
Peas	120	20.0	20.0

The price quotations for 6 March show that one of the prices (rye) is higher than the conversion ratio implies, two are lower (both barley prices) and two match exactly. Allowing for the fact that prices may have changed during the week, this comparison presents fairly strong evidence that there is no discontinuity in price quotations using the six to one conversion ratio.

The riksbankdaler introduced in 1813 depreciated even faster than the currency it replaced. By the

⁴⁰ The following data are taken from the minutes of the city brokers (*stadsmeglerne*) in Bergen covering the years 1812-1828. The February price of peas is as of 13 February, which was the last quotation of the month; the March price of Jutland barley is dated 13 March.

Monthly wholesale price indices, 1767-1920

winter of 1817 it had been reduced to about ten per cent of the silver value it contained in January 1813. The Norwegian Parliament had taken a decision in June 1816 to establish a new currency, the *speciedaler*, which was to be introduced in conjunction with the central bank, Norges Bank, beginning its operations. The official conversion ratio was fixed at ten to one.

We find the first price quotations in *speciedaler* in the minutes of the Bergen brokers on 7 February 1817. It is quite evident that prices in the new currency were roughly fixed at the official conversion ratio. Prussian wheat was quoted at 200 riksbankdaler on 24 January and 21 *speciedaler* on 7 February. The corresponding quotations for rye were 145 and 15, respectively.

9.4 The aggregate indices 1767 - 1920

After having reviewed individual prices and subgroups of commodity prices it is now time to look at the aggregate indices.⁴¹ In conformance with the discussion in Section 9.3 three sets of indices are presented: producer price index (PPI), wholesale price index (WPI) and total supply price index (TPI). It will be recalled that the PPI index reflects the weighting of domestically produced goods sold at home and abroad; the WPI index differs from the PPI by including import goods while excluding export goods. The TPI index is constructed by using the combined weights of domestic goods, exports and imports.

The indices for four subperiods are shown in Figure 9.4 to Figure 9.6. Two graphs covering the 1767 - 1830 period are presented in order to obtain a more detailed view of the years before 1800. The discussion here is only intended to give a descriptive summary of the main features of the new indices. We refrain from trying to systematically relate the price movements to monetary and political events, as this is beyond the scope of this study, although a few incidents are touched upon.

As a guide to identify the major cyclical movements in the price indices Table 9.2 contains the dating of the turning points. The basis for this tabulation is the graphs shown here. The dating of the cycles is tentative only, as it is merely based on visual inspection of the series. Strict criteria for identifying cycles as in the Bry and Boschan (1971) tradition were not applied, but we do have in mind a notion of cycles not being too short and too weak.

It will be seen from Figure 9.4 that the price level was in general rather stationary from the start of the sample in 1767 until the first years of the 1780s, but with a fairly marked cycle peak in 1773. The price level shifted upwards to a higher level in the early 1780s and was relatively stable at this level until the final year of the decade. There are minor peaks in the autumn of 1789 and in September 1795, with periods of slightly lower prices in the middle of 1792 and in 1796 or 1797.

A much stronger price cycle starts in 1799, peaking in the spring of 1801, when the price level is estimated to have increased by 54 per cent relative to January 1799 according to the PPI and by 94 per cent according to the WPI index. This difference is related to the fact that import prices rose much faster than export prices over the same period. The inflationary episode around the turn of the

⁴¹ A more detailed discussion of price groups can be found in Klovland (2013).

9.4 The aggregate indices 1767 - 1920

century coincides with years of a depreciating exchange rate (Table 9.1) and a great expansion in the money supply after a decade of relatively constant volumes of the circulation of *kurantsedler*.⁴²

Table 9.2: Cyclical turning points of price indices 1767 - 1920.

Cylce	Troughs			Peaks		
	PPI	WPI	TPI	PPI	WPI	TPI
1	1770 MAY	1769 AUG	1769 AUG	1773 JUL	1773 MAY	1773 MAY
2	1774 JUL	1774 JUL	1774 JUL	1789 JUL	1789 JUL	1789 JUL
3	1792 SEP	1792 SEP	1792 SEP	1795 APR	1795 SEP	1795 SEP
4	1796 OCT	1797 SEP	1796 SEP	1801 JUN	1801 APR	1801 APR
5	1802 APR	1802 APR	1802 APR	1813 SEP	1813 SEP	1813 SEP
6	1815 FEB	1815 FEB	1815 FEB	1817 FEB	1817 FEB	1817 FEB
7	1818 JUL	1818 JUL	1818 JUL	1819 MAR	1819 JAN	1819 MAR
8	1821 FEB	1821 JUN	1821 JUN	1822 NOV	1822 AUG	1822 JUL
9	1825 OCT	1825 SEP	1825 SEP	1827 FEB	1826 NOV	1826 NOV
10	1828 JUL	1828 JUL	1828 JUL	1831 APR	1831 MAY	1831 APR
11	1834 JUN	1834 JUN	1834 JUN	1838 AUG	1838 MAY	1838 AUG
12	1841 SEP	1841 JUL	1841 SEP	1843 AUG	1843 AUG	1843 AUG
13	1844 DEC	1844 NOV	1844 DEC	1847 MAY	1847 MAY	1847 MAY
14	1850 NOV	1850 NOV	1850 NOV	1856 MAY	1855 DEC	1856 JUL
15	1859 SEP	1859 OCT	1859 OCT	1861 MAY	1861 FEB	1861 FEB
16	1865 MAR	1865 MAR	1865 MAR	1868 MAR	1868 MAR	1868 MAR
17	1870 OCT	1870 OCT	1870 OCT	1874 JUL	1874 JUL	1874 JUL
18	1875 SEP	1875 SEP	1875 SEP	1877 MAY	1877 MAY	1877 MAY
19	1878 DEC	1879 APR	1878 DEC	1882 MAY	1881 JUN	1881 SEP
20	1888 JAN	1887 NOV	1887 NOV	1891 AUG	1891 SEP	1891 AUG
21	1894 OCT	1894 OCT	1894 OCT	1900 JUL	1900 JUL	1900 JUL
22	1901 OCT	1901 OCT	1901 OCT	1907 JUL	1907 JUL	1907 JUL
23	1908 NOV	1908 OCT	1908 NOV	1913 AUG	1912 MAY	1913 AUG
24	1914 APR	1914 APR	1914 APR	1919 FEB	1918 AUG	1918 AUG
25	1919 AUG	1919 JUN	1919 JUN	1920 OCT	1920 OCT	1920 OCT

Considering the first three decades of the nineteenth century as portrayed in Figure 9.5 we get an overall view of the course of prices that is quite similar to the one left by looking at the exchange rate graph, see Figure 9.3. A striking feature of Figure 9.5 is the strong similarity of price movements between the indices. The general picture is independent of the choice of index, only during some brief periods are there any discernible discrepancies between them.

Prices showed cyclical fluctuations but no inclination towards a permanent rise in the first five years of the century. The great inflation period started in the final months of 1807. In this period there are huge changes in the indices from one month to the next and large discrepancies between the movements of the various price indices. This may to some extent be a reflection of the abnormal economic and political circumstances of the time, which worked through extreme fluctuations in the exchange rate, but it should also be borne in mind that the underlying price material is scanty, particularly in the years 1813 to 1814. Month-to-month changes in the indices in these years must be interpreted with much caution.

The surge in the WPI price index did not come to a halt until the autumn of 1813. In September

⁴² According to Svendsen (1968), the Danish-Norwegian currency circulation increased by 15 per cent in 1799, by 32 per cent in 1800 and by 24 per cent in 1801.

Monthly wholesale price indices, 1767-1920

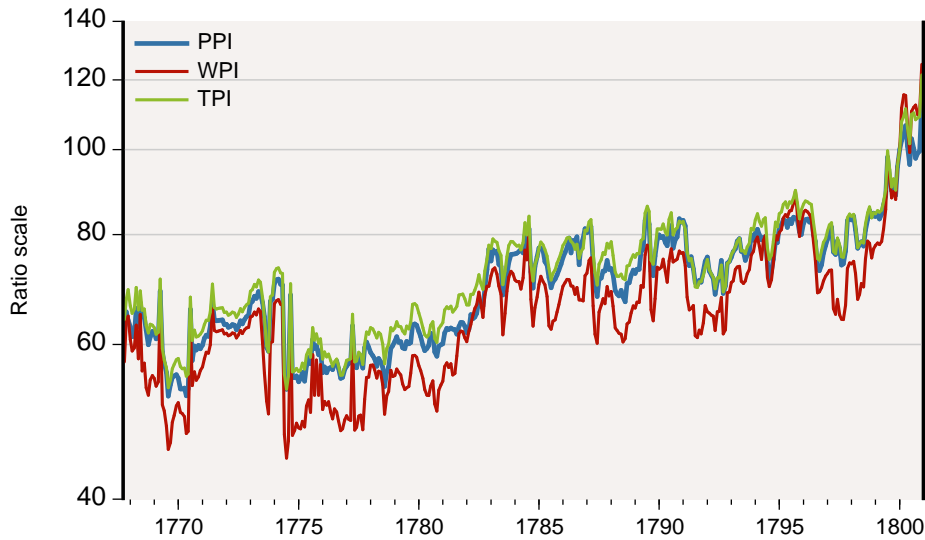


Figure 9.4 *Aggregate price indices 1767-1800. January 1800=100.*

1813 the WPI index had increased by a factor of 66 relative to the level of January 1800. The peak of the price cycle in September 1813 coincides with the collapse in the exchange rate. During 1814 there was a period of deflationary pressure as a reaction to the surge in prices in the preceding year. After February 1815 another period of sharply rising prices set in, which culminated in the winter of 1817. At its peak in March 1817 the WPI was about 141 times higher than it was in the first month of the century.

The violent price fluctuations in these years largely mirror the exchange rate behaviour. The characteristic bimodality of the silver value of the currency, as reflected in exchange rate against Hamburg banco, applies to commodity prices as well. There are two distinct peaks in the price of banco, in September 1813 and January 1817 (Figure 9.3). The twin peaks of prices occur in September 1813 and February 1817. The winter of 1817 represents an all-time low for the international value of the currency and an all-time high for prices. In the case of the WPI price index it took one hundred years (and 3 months) until this threshold was surpassed.

From the peak in 1817 the long-run movement of prices was downward over next decade. It is possible to identify several shorter cycle within this period, most notably a short period of severe deflation reaching a trough in September-October 1825. This episode coincides with the dramatic appreciation of the exchange rate on Hamburg, which went from 216.5 in July 1822 to 101.5 in August 1825.

Figure 9.6 gives a bird's-eye view of the price indices over the period 1830 - 1913. The general picture is of one of strong cycles around distinct long-run price trends. In broad terms the new Norwegian indices follow the trend pattern of prices seen in many other European countries. The

9.4 The aggregate indices 1767 - 1920

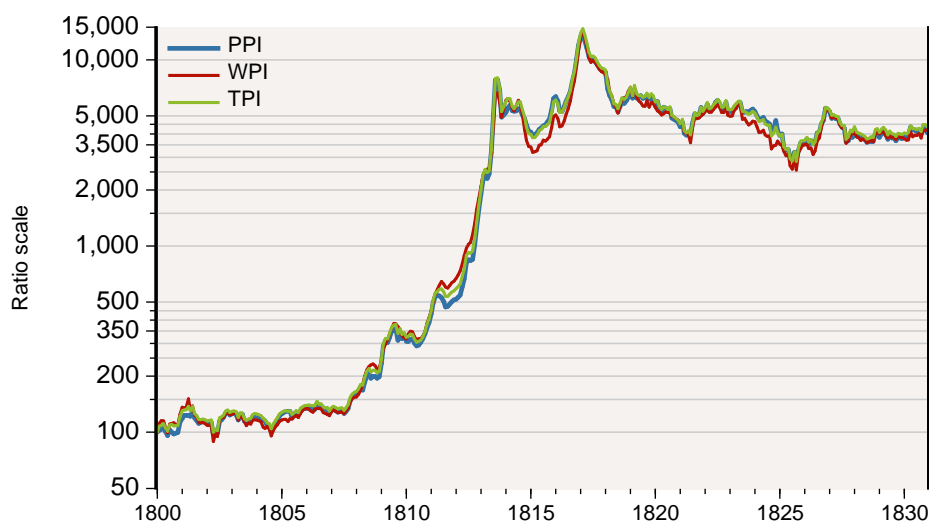


Figure 9.5 Aggregate price indices 1800-1830. January 1800=100.

common features include the 25 years of generally rising prices from about 1850 to 1875, then a period of falling prices until the middle of the 1890s, often referred to as the great deflation, followed once again by an increasing price level towards WWI.⁴³ Upon these long-run trends is superimposed a picture of distinct price cycles, mostly of a five to ten years duration. The similarity with business cycles is not only with respect to amplitude and duration, but also with respect to timing. Many of the peak months of prices identified in Table 9.2 correspond to the business cycle peaks in chronologies for the major countries.⁴⁴ This is in particular the case for the decades beginning in the 1880s. All the peak years of prices in Norway – 1881, 1891, 1900, 1907, 1912/13, 1918, 1920 – fall in the same or within one year of the business cycle peaks in Britain. This might support a conjecture that prices were procyclical in this period, for which there is much international evidence, but the issue must await a more detailed econometric investigation.⁴⁵

The final graph, Figure 9.7, shows the price indices in the 1910 - 1920 period. There was a peak in WPI in May 1912 and weak trough in April 1914. For PPI the cyclical movements around these dates are so small that they barely qualify as a genuine cycle. In contrast to the great inflation of the WWI years the prewar period stands out as one of stationary or slowly rising prices. The wartime evidence was a period of uninterrupted inflation rates hovering around 40 per cent per year. In 1915 and 1916 PPI was the most buoyant price index, while WPI was rising faster in 1917. The wartime inflation episode peaked just as the war was about to end, in October 1918 in the case of PPI and

⁴³ Church (1975).

⁴⁴ Zarnowitz and Moore (1986).

⁴⁵ In a study including Norway in the sample Smith (1992) concludes that the international evidence supports hypothesis that prices were procyclical prior to WWI. Somewhat different results are obtained by Grytten and Hunnes (2012) in their study based on correlations between annual GDP output gaps and consumer price indices for Norway.

Monthly wholesale price indices, 1767-1920

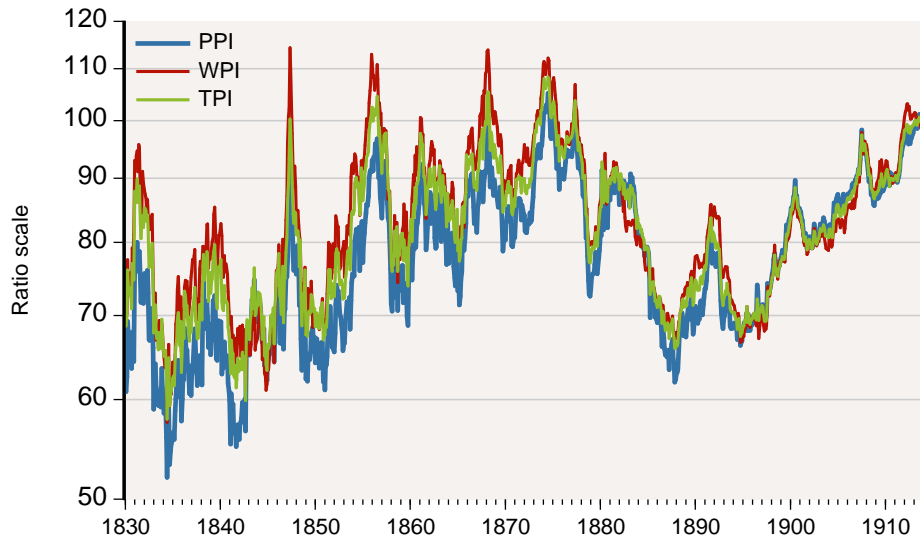


Figure 9.6 *Aggregate price indices 1830-1913. June 1913=100.*

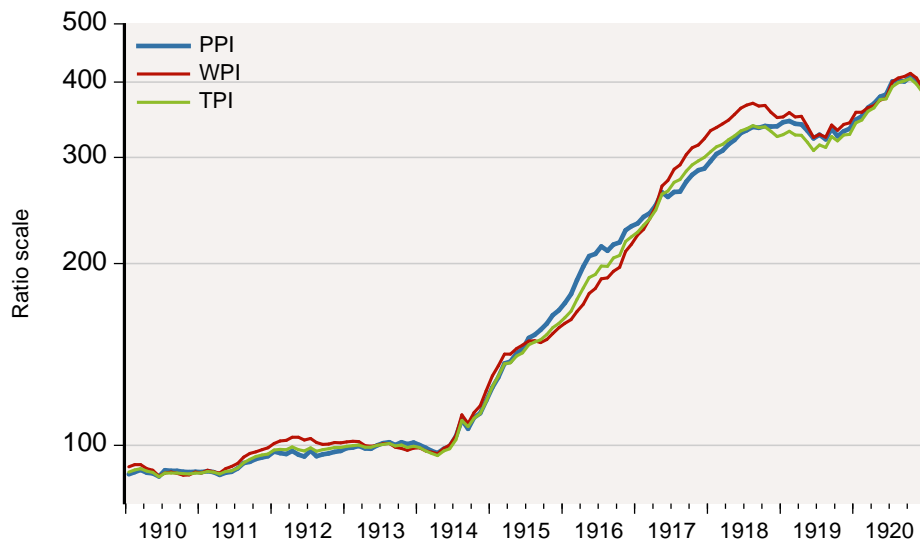


Figure 9.7 *Aggregate price indices 1910-1920. June 1913=100.*

in August 1918 in the case of WPI. Then followed some months of falling prices until the postwar restocking boom began to take effect in the summer of 1919. The sharp inflation episode ended in October 1920.

9.5 Export and import prices, terms of trade

Using export and import revenue shares in the benchmark years 1835, 1870, 1890 and 1910 we are able to derive monthly price indices of exports and imports for the whole period 1767-1920. We also compute time series for the ratio between export prices and import prices, referring to this for short as the terms of trade. It should be carefully noted however that this series deviates somewhat from the usual definition of the terms of trade. One source of difference emanates from the fact that our import price index is based on market prices in Norway rather than being on a cif basis, thus comprising tariffs and excise taxes. A further difference derives from the fact that the price indices presented here refer solely to prices of commodities, excluding services. Because of the very important role played by the shipping industry in Norway a conventional and more comprehensive terms of trade may deviate considerably from the time series shown here. The terms of trade, as defined here, is accordingly a somewhat defective, although still perhaps indicative, measure of the purchasing power of the nation's goods, excluding services.

The new data series for the period 1767 - 1830 are shown in Figure 9.8. The export series is largely dominated by wood and fish products, including fish oil, which accounted for 43.6 and 50.1 per cent of the export price index, respectively, on the basis of 1835 weights.⁴⁶ Other goods entering the export index in this period (weights in parentheses) are copper (2.6), iron (2.1) and tar (0.7). The most important components of the import price index are grain (44.6), textiles (14.0), alcohol and tobacco (8.0) and minerals (i.e salt and coal) (5.9), but the effective weights of these goods are higher, because price data for colonial goods (17.5) are missing prior to 1825.

These caveats imply caution in interpreting the curves shown in Figure 9.8, but the graph nevertheless invites to some tentative conclusions. There were relatively large swings in the ratio of export prices to import prices, particularly from the middle of the 1790s. Prices of imports were on a slightly rising trend but exhibited some distinct short cycles peaking in September 1795 and in April 1801. Import prices started to rise somewhat in 1805, and more strongly from 1807. Export prices rose in line with import prices as from the first years of the new century, but showed less cyclical movements than import prices.⁴⁷

It is only in the second half of 1808 that we see any persistent upward movement in the prices of export goods. During the whole blockade and wartime period until 1813 import prices were more buoyant than export prices. This result is in accordance with the contemporary view of the industrialist Jacob Aall, who by 1813 maintained that prices of goods produced at home still had not risen as much the fall in the currency value implied.⁴⁸

The discrepancies between price fluctuations in exported and imported goods yield substantial movements in the terms of trade (as measured here). The export/import price ratio rises somewhat towards the year 1804, when a setback occurs. As discussed above, it is tempting to associate this

⁴⁶ See table of weights in the appendix in Klovland (2013).

⁴⁷ This may partly be a statistical artifact because of the smoothing procedures applied to wood and copper prices in this period

⁴⁸ Quoted in Rygg (1918, p. 26). This feature emerges clearly from a comparison of domestic and import price indices.

Monthly wholesale price indices, 1767-1920

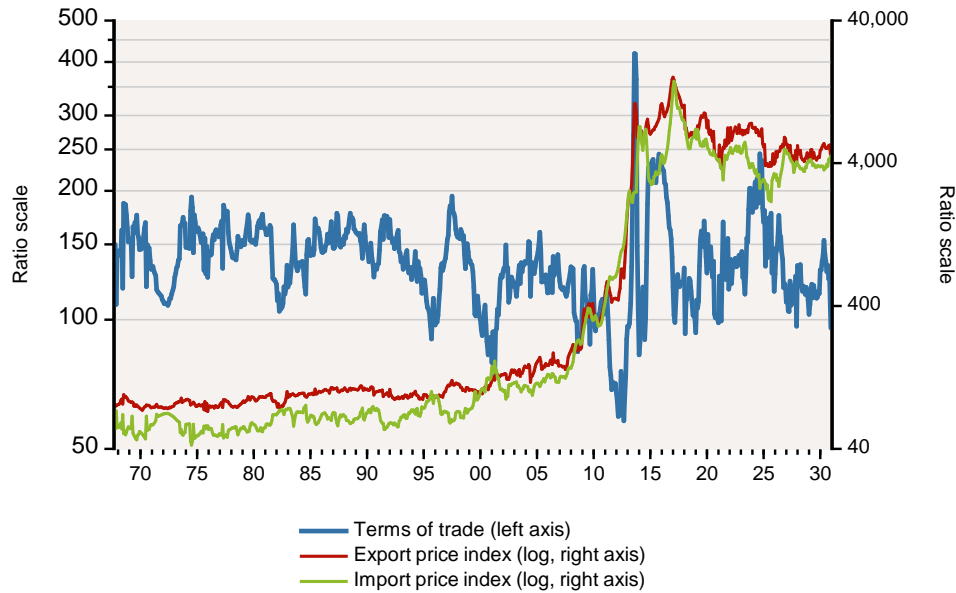


Figure 9.8 *Export and import prices, commodity terms of trade, 1767-1830. January 1800=100.*

with the effects of the political turmoil, from 1807 in particular with the naval blockade. In 1809 and 1810 the terms of trade are temporarily improving again, but a further decline sets in during the following year. The nadir is reached in 1812. After some violent swings, mostly due to wood prices, the terms of trade measure reverted to a level closer to the pre-blockade relationship after 1818.⁴⁹

Much has been written on the economic hardships facing Norway during the Napoleonic Wars and the final years before the secession from Denmark in 1814, but it has been difficult to underpin the text with figures because of the almost complete lack of aggregate data on production and trade. Figure 9.8 may be one of the first pieces of hard evidence in this respect, although the uncertainty regarding the wood price index should be born in mind when interpreting this graph, in particular short-run movements. The opening created by the trade in wood with Britain under the licence agreement starting in 1809 increased wood prices considerably, which is reflected in the terms of trade improvement at that time. But by 1810 wood prices were falling in Britain and freight costs and tariff rates increased, so that the wood trade was hardly very profitable any more. Thereafter wood exports dwindled and ceased altogether in 1813 and 1814.⁵⁰ The wood price movements in

⁴⁹ The wood prices were converted from pound sterling to Norwegian currency using the monthly sterling exchange rate, which causes extreme short-run fluctuations in this period.

⁵⁰ Worm-Müller (1922, p. 78).

9.5 Export and import prices, terms of trade

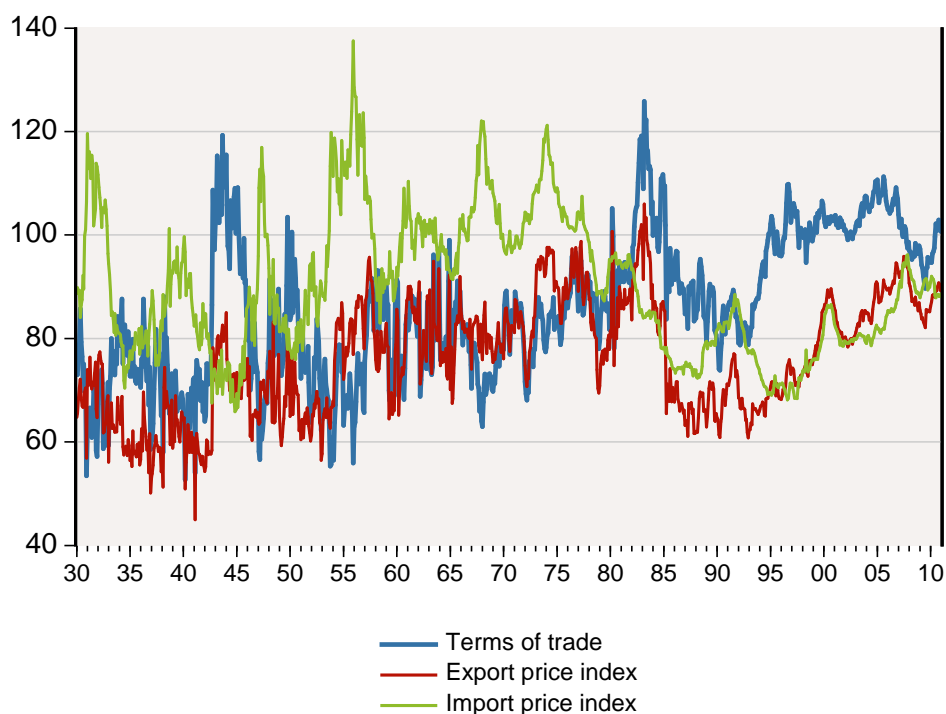


Figure 9.9 *Export and import prices, commodity terms of trade, 1830-1910. June 1913=100.*

these years may therefore be rather void of much significance for the wood export trade - prices were fair, but only a limited number of timber cargoes could be shipped to Britain.⁵¹

As from 1817 export and import prices were both on a falling trend, which continued during the first half of the 1820s, but prices tended to converge toward a more stable level in the second half of the decade. The differential behaviour of the two indices are most marked around 1824, when the wood trade benefited from a boom on export markets while import prices declined steadily. Thereafter there was a quite marked decrease in the terms of trade towards the end of the decade.

Figure 9.9 portrays the same data series for the period 1830 - 1910. The main feature of the terms of trade measure is the sharp rise in two steps during the years 1838-1843. The first step, occurring in 1838 is due to a combination of falling import prices and rising prices of exports, in particular fish. The second step is clearly attributable to the greatly improved net sales prices of Norwegian wood on the English market following the substantial import tariff reductions in 1842-1843. It seems fairly safe to conclude that there was an upward shift in the ratio of export to import prices at this

⁵¹ According to Warburton (1835, p. 384) the volume of Norway deals imported into the United Kingdom in 1814 was only 18.6 per cent of the level during the height of the licence trade period in 1810 and 1811, which corresponded roughly to the normal level during prewar years.

Monthly wholesale price indices, 1767-1920

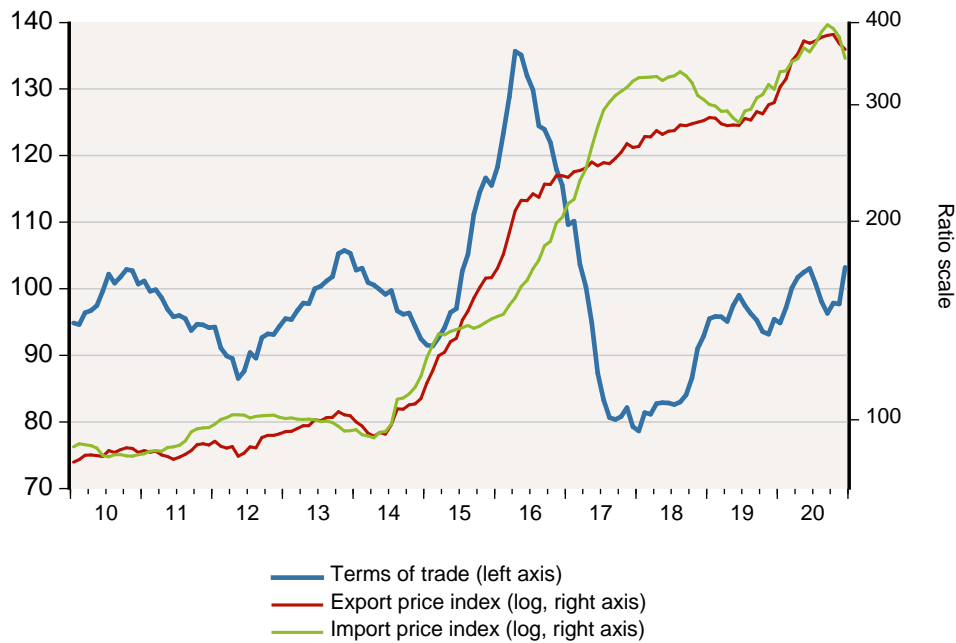


Figure 9.10 *Export and import prices, commodity terms of trade, 1910-1920. June 1913=100.*

time, but the exact magnitude is difficult to measure. The temporary setback in 1846-1847 is largely due to the increased prices of grain on international markets.

A second major feature of this period is the strong cycle in the terms of trade during the 1880s. The upward movement in the years 1881-1883 is once again a combination of falling prices of imported goods and rising prices of exports, with a surge in fish prices playing a leading role. The subsequent fall in export prices relative to import prices during the second half of the 1880s is of considerable magnitude. This decade is known as a period of general depression in Norway, characterized by sluggish growth, the first round of bank failures and some years of net migration. This was also the decade of a large-scale transition from sail to steam in international shipping, which depressed ocean freight rates to a considerable degree. The fluctuations in our terms of trade variable are greater than in existing estimates of the the terms of trade as traditionally defined (including shipping).⁵² This is an issue which may warrant further investigation.

The period comprising the WWI period is shown in Figure 9.10. The graph highlights the booming export prices during the first part of the war, being subsequently overtaken by the more strongly rising import prices in 1917. This resulted in a forceful positive terms-of-trade shock in 1916, which collapsed completely in 1917. A revival took place in 1918, which brought relative foreign trade prices back to prewar levels. In spite of the shocks from international commodity markets and the

⁵² See Grytten (2004b) and Statistics Norway (1968).

9.6 A comparison with the existing consumer price index, 1767 onwards

impediments to trade due to the war, as well as the draconian domestic price control measures, the terms of trade series ends up very close to the prewar level in 1920. Note again that these data only refer to commodity prices. If an index of ocean freight rates were to be added to give a more complete picture, the positive terms of trade shock experienced by Norway in 1916 will most certainly be magnified, also improving the record for 1917.

9.6 A comparison with the existing consumer price index, 1767 onwards

Grytten (2004a) has published an annual consumer price index which covers the impressive time span 1516 - 1871, with links to previous work that extends the index right up to our time. The underlying price material for this index is different from the one used in the present study, and there are many differences between the two types of indices in terms of composition, weighting and construction, which may lead to dissimilar movements in the two indices. After 1871 Grytten linked his index to a consumer price index constructed by Minde and Ramstad (1986), and from 1901 to 1916, to a price index from Christiania, thereafter to the Statistics Norway's consumer price index. In spite of all these differences, it is of some interest to compare the two indices in order to see whether they give basically the same picture of the trends and cycles in the price level in Norway.

First we look at the early years, including the great inflation period after 1807. The two indices are shown in Figure 9.11. Grytten's consumer price index is referred to as CPI. Our index is the WPI aggregated to annual levels from the underlying monthly data.⁵³ In Figure 9.11 the levels of the indices in 1800 are set equal to 100.

The similarity between the two indices is quite good during the *kurantdaler* regime before 1813. There are some short-run deviations, but the long run development is nearly identical. However, it is seen by a glance that there is a distinct break between the two series after 1812. This is almost certainly due to a different treatment of the transition from *rigsdaler Danish courant* to *riksbankdaler*. Our procedure for handling this problem is discussed in detail in section 4. There is also a large discrepancy between the two series in the years from 1815 to 1817, at the time of the transition from *riksbankdaler* to *speciedaler*. Between 1815 and 1817 CPI only increases by 10 per cent, whereas the new WPI index exhibits nearly a 3-fold increase. The overall effect on the long-term price level is that, according to CPI, prices were about 3.5 times higher in 1820 than in 1800. This is very different from the WPI, which yields a corresponding ratio of about 46. Regarding the period between 1812 and 1818 it is clear that the two indices are incompatible, even taking into account a margin for a possible unsynchronized behaviour of consumer and wholesale prices.

The comparison for the long period 1830 - 1910 shown in Figure 9.12 presents a rather different picture. Here the covariation between the two indices is as good as can be expected given the differences in the construction of the two indices. The short cycles are basically the same, but more pronounced for the WPI, which is normal when compared to the less volatile consumer price index.

⁵³ It is evident from the discussion in Section 9.4 that the results would not have been much changed if the PPI or the TPI had been used instead.

Monthly wholesale price indices, 1767-1920

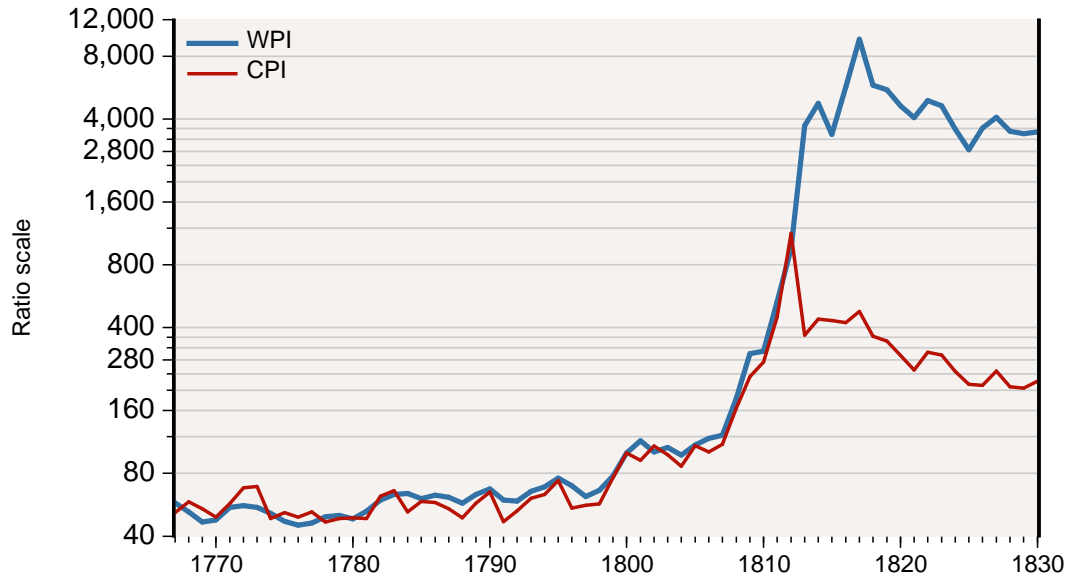


Figure 9.11 Wholesale price index and consumer price index, 1767-1830. January 1800=100.

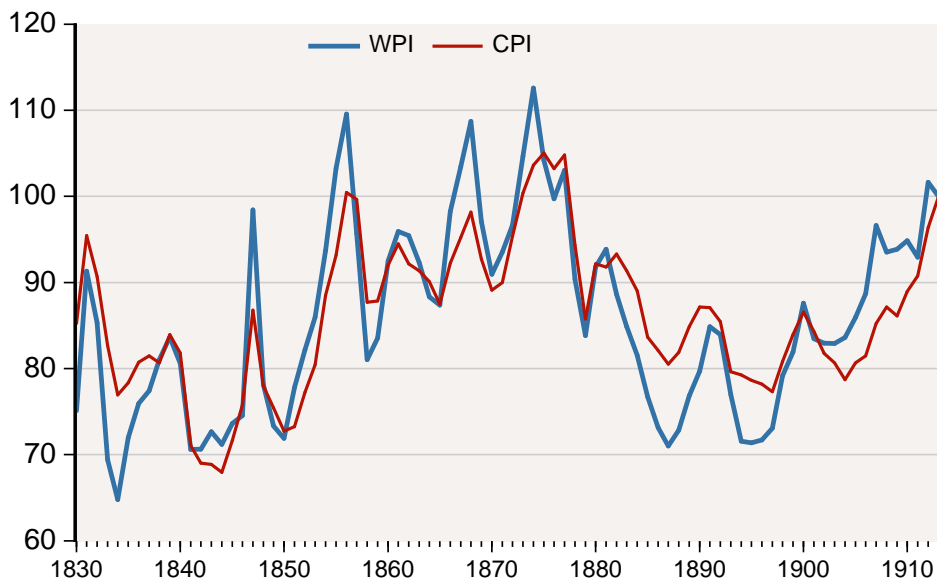


Figure 9.12 Wholesale price index and consumer price index, 1830-1913. June 1913=100.

9.7 A comparison with foreign price indices, 1767 onwards

After the 1870s the correlation is somewhat weaker. In particular it is seen that the WPI records much deeper troughs in 1887 and 1895 than does the CPI. After 1900 WPI shows more buoyancy than CPI, with a local peak in the international boom year 1907.

Finally, Figure 9.13 contains the comparative indices for the years 1910 - 1920. The stronger rise in WPI is consistent with established results regarding the comparison of consumer (or cost-of-living) indices and wholesale price indices. The CPI increased by a factor of 3.0 between 1913 and 1920, the WPI by 3.82. The latter figure is very close to the rate of increase of the the wholesale price index launched by Farmand, which is 3.95.⁵⁴

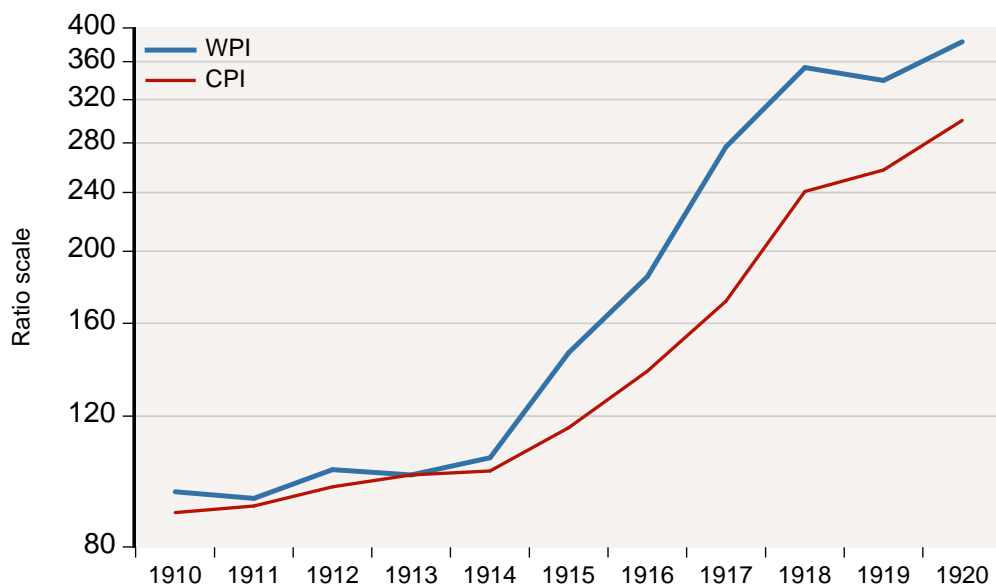


Figure 9.13 Wholesale price index and consumer price index, 1910-1920. June 1913=100.

9.7 A comparison with foreign price indices, 1767 onwards

In view of the extreme inflationary environment of the first decades of the nineteenth century and the discrepancy between the new evidence presented here and previously published data for this period it may be useful to get a cross-check of the behaviour of the new index for Norway. A comparison with the two other Scandinavian countries, Denmark and Sweden, and with Germany, is provided here for the years prior to 1830. This comparison is provided on an annual basis using annual averages of the new WPI. Finally, we also compare the new index on a monthly basis from 1820 onwards with similar indices for the United Kingdom.

⁵⁴ See *Statistiske oversikter 1948*, Statistics Norway, Oslo, 1949 for summary data on these indices.

Monthly wholesale price indices, 1767-1920

The extreme inflationary environment which characterised the first decades of the nineteenth century will be discussed in more detail in Chapter 11 providing additional cross-checks of both the WPI presented in this chapter and the revised CLI-CPI which will be presented next in Chapter 10.

A Scandinavian perspective, 1767 - 1830

Consumer prices indices have been constructed for all Scandinavian countries back to the 16th century. Here we use the indices published by Abildgren (2010) for Denmark and by Edvinsson and Söderberg (2010) for Sweden. It should be noted that the indices for both countries are constructed with consumption weights as a basis, and, as highlighted in the previous section, this is a potential source of differences when compared to our wholesale price index. Both the Danish and the Swedish indices are based on price material that were close to market prices, however.⁵⁵

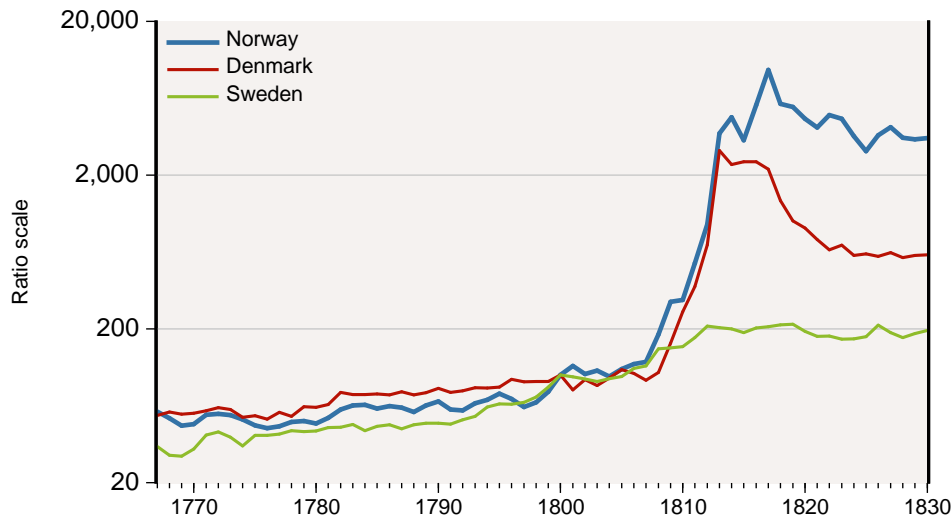


Figure 9.14 Price indices in Scandinavia, 1767-1830. 1800=100.

Because Norway and Denmark had a common currency until 1813, we would expect the two countries to experience approximately the same inflation history. Figure 9.14 shows clearly that this is the case. The price level edged up in both countries in the decades before the turn of the century, shifted upwards around the year 1800 and began to rise rapidly around 1807. The price level in Sweden rose a bit faster in the final decades of the 18th century, but in contrast to Denmark and Norway there was no extreme price inflation during the Napoleonic war period. When Norway got its own currency in 1813, the riksbankdaler, this did not create a more stable price level, as prices

⁵⁵ The Danish data are derived from accounting records of estates and manors, which, according to Abildgren (2010, pp. 6-7) is "the closest one can come to transaction-based consumer prices for the pre-1800 period". For Sweden the data come from the regional market scales, which according to Edvinsson and Söderberg (2010, p. 414) were 'semi-market prices.'

9.7 A comparison with foreign price indices, 1767 onwards

continued to rise until 1817. Denmark, on the other hand, managed to reverse the strongly rising price level. By 1817 the Norwegian price level had experienced a 97-fold increase from the year 1800, in Denmark the price level had increased by a factor of 22, while in Sweden prices had only doubled. These ratios are very close to the exchange rate changes over the same period. Against the silver-based Hamburg banco the Norwegian currency had increased (decreased in value) by a factor of 94, the Danish currency by a factor of 22, and the Swedish currency only by approximately 2.3.⁵⁶ We return to this in Chapter 11 when we discuss the principle of purchasing power parity (PPP) in more detail.

Norwegian and German prices, 1790-1830

Germany was the most important trading partner in the early years of this period. We use the general price index for Germany constructed by Jacobs and Richter (1935) for our comparison. This is a price index which comprises many of the same goods as the Norwegian index, weighted roughly in the same proportions as our WPI.⁵⁷ Agricultural products, for example, obtain a weight of 45 per cent in the German index, while these goods account for 58.4 per cent in the Norwegian index.

Figure 9.15 displays the Norwegian WPI and the German price index converted to Norwegian currency for the period 1792-1830, with 1800 set equal to 100 (scale on right axis). The real exchange rate (scale on left axis) is also shown, computed as

$$SR = S \cdot P^* / P$$

where S is the nominal exchange rate, P and P^* the domestic and the German price indices, respectively.

Looking at Figure 9.15 the Norwegian and German price indices do indeed give an impression of following each other fairly well over time. The great inflation occurring between 1797 and 1803 and again between 1808 and 1817 is closely related to the what one would expect given the German price index and the exchange rate on Hamburg, and so is the reversal of the trend in the direction of a deflationary environment in the 1820s.

The price material which forms the basis of the new price index is less than complete in this period, however. In addition, there are technical differences in the construction of the domestic and the German price index. It may therefore be useful to perform the same cross-check as above, but using a single commodity, thus testing the law of one price instead of PPP. Again, we will return to this in Chapter 11.

The 1820s were a much calmer period than the preceding decades in terms of price level and currency movements. There were still some swings in the real exchange rate, however; the general price indices and the rye price conveys much the same picture here. In the middle of the 1820s it is

⁵⁶ See Table 9.2 above, Svendsen (1968), Edvinsson (2010) and Bohlin (2010).

⁵⁷ The prices underlying the German index are computed from prices quoted in currencies with a fixed silver content (Jacobs and Richter (1935, p. 17)). There are several alternative index series in this source; here, we use the total index with 1820 weights tabulated on page 80. These data are annual and go back to 1792.

Monthly wholesale price indices, 1767-1920

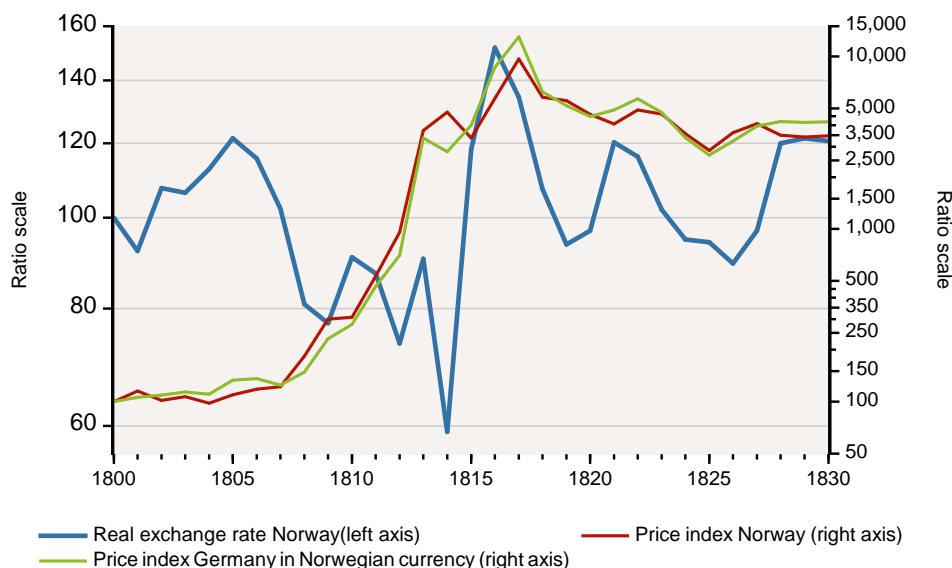


Figure 9.15 Price indices for Norway and Germany, the real exchange rate, 1792-1830. 1800=100.

of some interest to note that the real exchange rate (Figure 9.15) had reverted to virtually the same level as it started from in the year 1800, hovering around 100. Towards the end of the 1820s there is a real exchange rate depreciation.

Norwegian and UK prices, 1820-1920

This subperiod overlaps with the one used in the previous section because we now focus more on the cyclical behaviour of prices, using British prices as the foreign benchmark.

We use the monthly wholesale price index constructed by Gayer et al. (1953) for the period 1820 - 1845, spliced to a modified and extended version of the Sauerbeck (1886) price index for the years 1846 - 1890 and contemporary estimates of the same index from 1891 - 1920.⁵⁸

1820-1850

Figure 9.16 portrays the Norwegian WPI index and the British price index for the period 1820-1850. Also shown is a variable constructed by converting British prices into Norwegian currency, setting this series equal to Norwegian prices in April 1842, the month in which Norway returned to the par value of silver envisaged for the speciedaler.

As to cyclical behaviour we see that Norwegian and British price indices are not highly correlated

⁵⁸ Klovland (1993) presented monthly values of the annual Sauerbeck index beginning in 1846. This source also corrects some inconsistencies in the original index, using market prices (duty paid) for all commodities, and adding some of the data series that were missing for the early years. Beginning 1891 monthly figures were taken from the summary table published in *Journal of the Royal Statistical Society*, March 1922, p. 275.

9.7 A comparison with foreign price indices, 1767 onwards

in the first part of this subperiod, which is natural given the changing exchange rate between Britain and Norway. When British prices are converted into Norwegian currency, however, the short cycles are more similar, in particular from the 1830s.

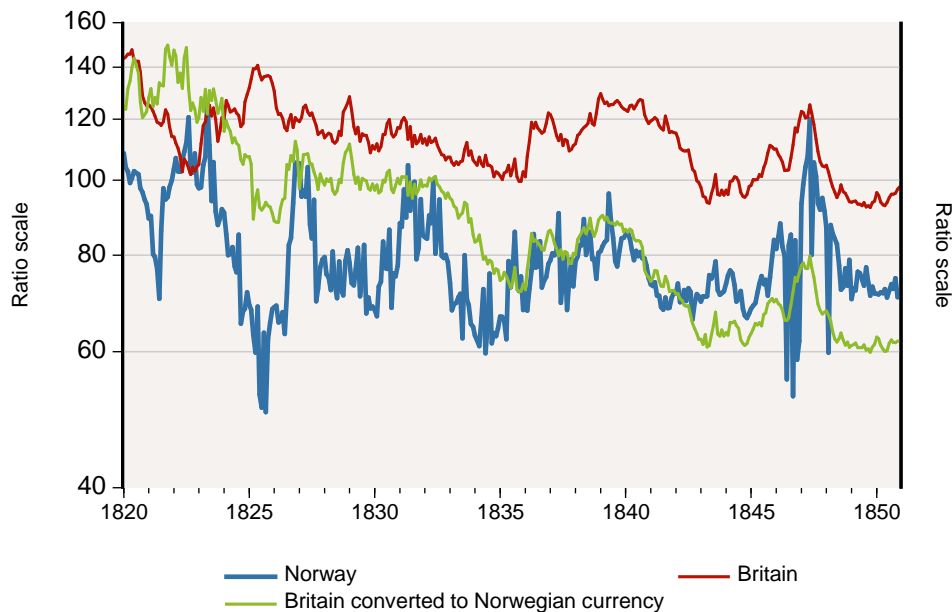


Figure 9.16 Price indices for Norway and Britain, 1820-1850. June 1913=100.

There is, however, a marked downward shift in the relationship in the middle of the 1830s. Such shifts may have been caused by changes in relative prices between the major commodities, which are weighted unequally in the two indices. More weight is attached to coal, iron, textiles and wheat in the British prices than in the Norwegian index. But it is also tempting to conjecture that the shift is due to the value of the Norwegian currency being held artificially low (the exchange rate too high) in this period. Norges Bank kept the minimum price for silver exchange fixed at 135 per cent from 1827 to February 1834, which contemporary critics, led by professor Schweigaard, claimed was too high in consideration of the underlying strength of the economy, given the long-term aim of resumption at par.⁵⁹ Within a couple of years from 1834 the official rate was brought down to 115 per cent. In the currency markets the speciedaler appreciated by roughly 20 per cent against Hamburg banco and sterling.⁶⁰

The British price boom in 1847 was basically driven by the surge in grain and provision prices

⁵⁹ See Rygg (1918, pp. 202-209).

⁶⁰ Hamburg banco was fixed to silver and sterling to gold, so that the exchange rate against Hamburg and London could move somewhat differently, reflecting the relative prices of the two metals on world markets.

Monthly wholesale price indices, 1767-1920

following a season of bad harvests in northern Europe.⁶¹ The Norwegian price index follows a very similar pattern, peaking in the same month (May 1847) as the British index.

1850-1880

The general impression conveyed by Figure 9.17 is that the inflationary episodes in the middle of the 1850s and the early 1870s are broadly similar in the two countries, but the timing of the peaks differ. A great inflationary boom period was under way by early 1853. From the winter of 1854 the Crimean War interfered with the course of prices, primarily through sharply higher grain prices following the closure of the Black Sea ports. The well-known commercial boom of 1857 is not much visible in the Norwegian index, in contrast to the surge in the British index. The 1860s present a somewhat irregular pattern, but there is a distinct peak in Norway in the first half of 1868 not found in the British index.⁶²

In the early 1870s there was a strong international boom in economic activity and prices throughout Europe. In Britain coal and iron prices were driven to unprecedented levels at the peak of economic activity at the end of 1872, with the peak in the price index occurring in January 1873. Prices of wood and timber had a somewhat delayed response to the general surge in demand, contributing to a later peak in Norwegian prices, in July 1874 according to our data. The final part of the 1870s was a period of subdued economic activity and persistent fall in prices until the nadir was reached in 1879, in March in Britain and in April in Norway.

1880-1910

The general view of common turning points in price cycles, with prices in Britain often leading Norway with a few months is evident from Figure 9.18. The cycle peaks in Norway are June 1881, September 1891, July 1900 and July 1907. These are all close to dates of business cycle peaks in the international economy.⁶³ The dates are also within a whisker of the corresponding British price peaks.

Although similarities are far more evident than differences, particularly after 1891, there are two features which present a question mark. The first one concerns the years 1879 - 1882. Britain had a particularly strong but short-lived recovery in 1879-1880, driven by a surge in American demand for British iron. Prices rose sharply until the beginning of 1880, but then collapsed.⁶⁴ These factors did not affect Norway much, where prices rose more evenly during 1879 in line with the international expansion in economic activity.

The second noteworthy feature is the more severe deflation in Norway during the second half of the 1880s, culminating in March 1888. We have seen above that our estimates indicate a marked deterioration in terms of trade in this period, which signify a weak demand for Norwegian export goods on international markets. In Britain the period of falling prices from the early 1870s until the

⁶¹ Gayer et al. (1953, p. 508).

⁶² Grain prices were particularly high in Norway around 1868.

⁶³ Moore and Zarnowitz (1986).

⁶⁴ This is documented in Klovland (1998b).

9.7 A comparison with foreign price indices, 1767 onwards

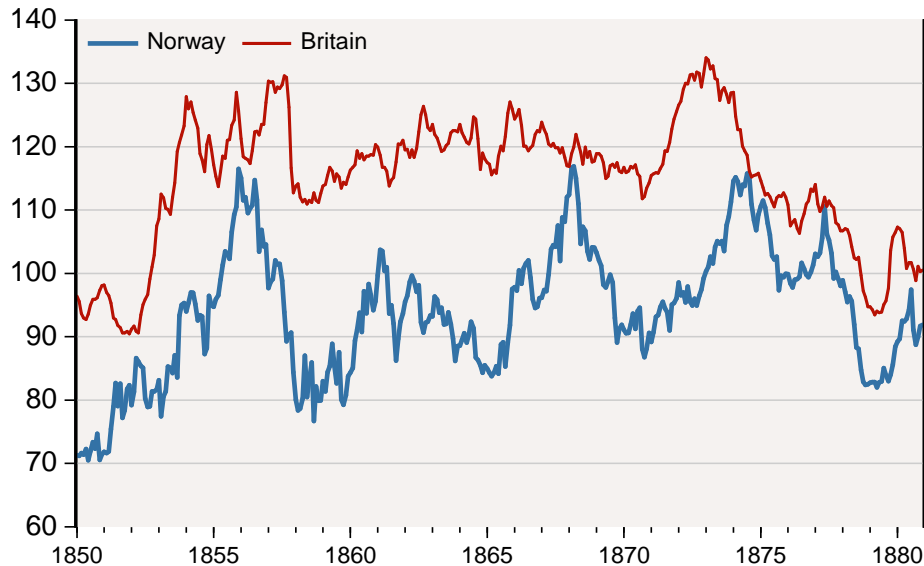


Figure 9.17 Price indices for Norway and Britain, 1850-1880. June 1913=100.

middle of the 1890s used to be called the Great Depression by contemporary observers.⁶⁵ In Norway this description surely fits the second part of the 1870s and much of the 1880s, as economic growth was very sluggish. The 1876 figure for gross domestic product per capita, in fixed prices, was not surpassed until 1888.⁶⁶ Although we cannot wholly exclude that the differences between British and Norwegian prices during the 1880s are due to such factors as a different composition of the indices and changes in relative prices, it may be conjectured that the observed phenomenon is related to the contractionary forces affecting the Norwegian economy.

1910-1920

The great inflation of WWI and its aftermath is the dominant feature of Figure 9.19. The tranquility of the prewar years is in marked contrast to the steeply rising prices during WWI.

Prices in Norway got a kick-start in the first month of the war as the WPI rose by 6.7 per cent from July to August 1914. Foodstuff prices in particular rose steeply during the first weeks of panic following the declaration of war.⁶⁷ But then there is a reaction in September, with prices falling by 3.2 per cent in this month. A somewhat similar fluctuation can be observed in Britain as well, where there was a mild decline in prices from September to November 1914. Although this is a minor event it is interesting to note this feature, which is likely to be connected with the lull in economic activity that can be observed world wide in the first few months of the war. The war implied major

⁶⁵ See e.g. Fletcher (1961); Turner (1992).

⁶⁶ Calculated from Table 6 in Grytten (2004b).

⁶⁷ The atmosphere of panic after the war was declared is vividly narrated by Keilhau (1927, pp. 11-19).

Monthly wholesale price indices, 1767-1920

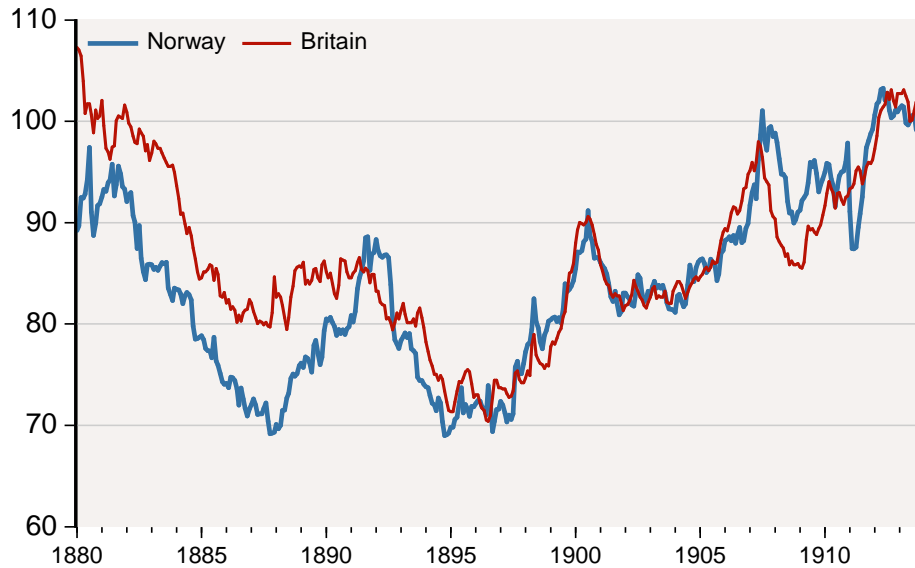


Figure 9.18 *Price indices for Norway and Britain, 1880-1913. June 1913=100.*

upheavals in the business of foreign trade that created much uncertainty, particularly concerning financing, insurance and direction of trade. Fayle (1920, p. 186), maintained that "[T]he proportion of the volume of British commerce thus brought to a standstill was serious". Rygg (1954, p. 354) describes a similar situation in Norway, but noting that the uncertainty was soon overcome. This is reflected in the price index, which started rising again in October.

From then on prices in Norway rose without interruption until August 1918. The rate of inflation was remarkably steady during the war, being slightly below 40 per cent per year throughout most of the period.⁶⁸ Between August 1918 and August 1919 prices fell by 12.1 per cent. Price movements in this period present a rather messy picture that is difficult to squeeze into an index number because of the extensive price control measures and general interference with markets that were introduced.

Government purchases comprised both major import goods such as grain, sugar, coal and fats, as well as large stocks of fish in conjunction with more or less forced agreements with the belligerent nations Britain and Germany. For fish there was an export ban, which implied that export market quotations ceased. Late in 1917 there was only one type of commodities, namely paints and linseed oils, for which price quotations still were not discontinued on the Christiania commodity exchange. Although the quality and completeness of the price data underlying the index calculations are getting poorer in this period it is nevertheless believed that our index gives a roughly representative view of the course of prices in these years as well. It may be added that there is a similar decline in the

⁶⁸ Note that, since Figure 9.19 applies a ratio scale the rate of change in prices is constant if the price curve follows a straight line, which it basically does over the period from the autumn of 1914 until the beginning of 1918.

9.8 A comparison with other domestic price indices, 1920-1940

price level in Britain in the second half of 1918, but here the renewed expansion sets in earlier than in Norway.

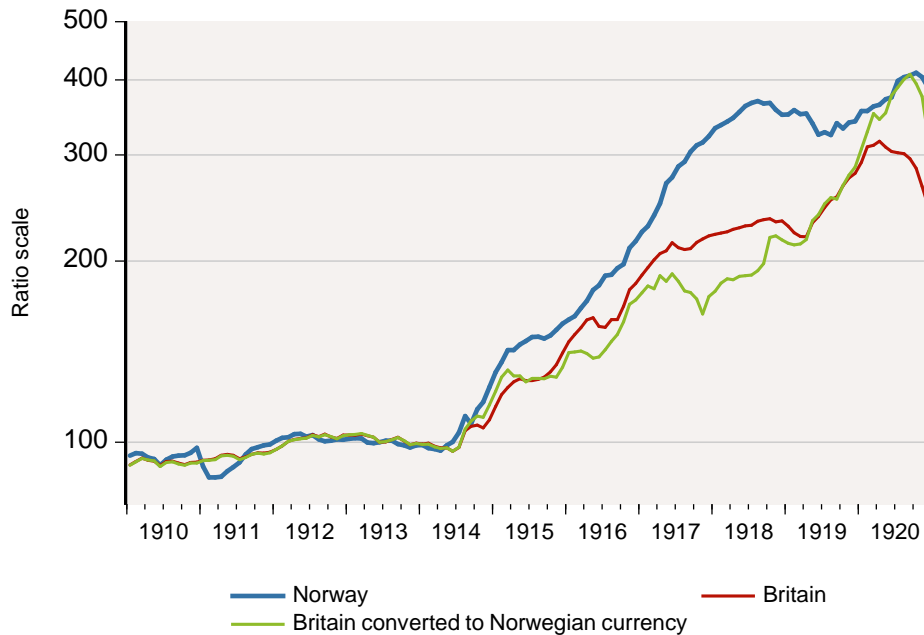


Figure 9.19 Price indices for Norway and Britain, 1910-1920. June 1913=100.

From June 1919 the inflationary environment was back, as prices rose significantly until October 1920. In Britain we see a similar upward movement starting 2 months earlier, in April 1919, and ending 6 months earlier, in April 1920. A main driver of this development is the international restocking boom and dismantling of price controls 1919-1920. The spectacular 1920 boom ended in a short but particularly severe downturn in 1921 in many European countries.⁶⁹

9.8 A comparison with other domestic price indices, 1920-1940

The sample period for the new price series collected here ends in December 1920. In order to get a coherent view of the price fluctuations in the whole interwar period the new WPI index has been linked to the existing wholesale price index published by the weekly financial journal *Økonomisk Revue*.⁷⁰ This index exists on an end-of-year basis for the years 1913-1919 and monthly from 1920.

⁶⁹ See Eichengreen (1992, pp. 100-124) for the international evidence. In terms of industrial output loss (relative to peak production level) the 1921 slump was most severe business cycle in Scandinavia during the whole century, even surpassing the Great Depression of 1929-1932, see Klovland (1998a).

⁷⁰ The data are tabulated in detail in *Statistiske Oversikter 1948*, Statistics Norway, 1949.

Monthly wholesale price indices, 1767-1920

An alternative wholesale price index is the one constructed by Statistics Norway, which starts in January 1923.⁷¹

These two indices are shown in Figure 9.20. By construction these indices are fairly similar with respect to commodities included and weighting, but subindices for various commodity groups are somewhat differently arranged. As can be seen from the graph they give very much the same picture of the course of prices in the interwar years. The Økonomisk Revue index was chosen here primarily because the data extend back to 1920. This index was spliced with the WPI index in December 1920.

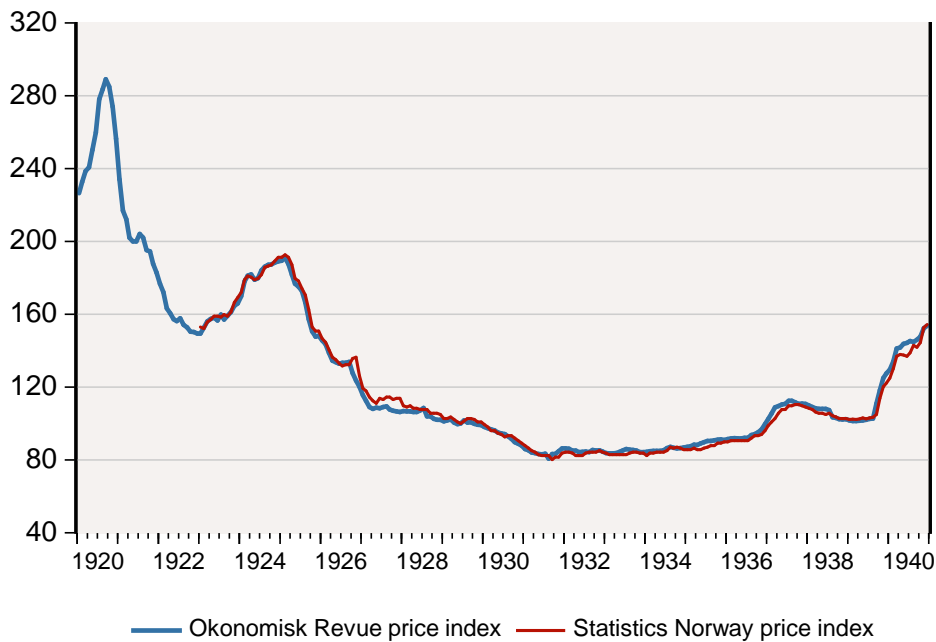


Figure 9.20 Wholesale price indices, 1920-1940. June 1929=100.

The two interwar price indices were based on price data from various published and unpublished sources, the latter often being private information obtained from importers, domestic producers and grocers. This information set cannot be reproduced now, which leaves the existing indices as the best available source for the study of price fluctuations in this period.

An attempt was also made to extend the price series on export and import goods throughout the interwar years, using the information available from the 12 subindices of the Økonomisk Revue index and the 11 subindices of the Statistics Norway index. The weights used reflect the composition of foreign trade in 1928. This exercise can only produce very approximate results because most of the

⁷¹ The construction of this index is explained in Wedervang (1924). A revised version was presented in *Statistiske Meddelelser*, 1931, no. 2, pp. 197-203, with a revised data set going back to January 1928. The total index as shown here has been recalculated for the years 1923-1927 applying the new weights to the original subindex figures published for this period.

9.8 A comparison with other domestic price indices, 1920-1940

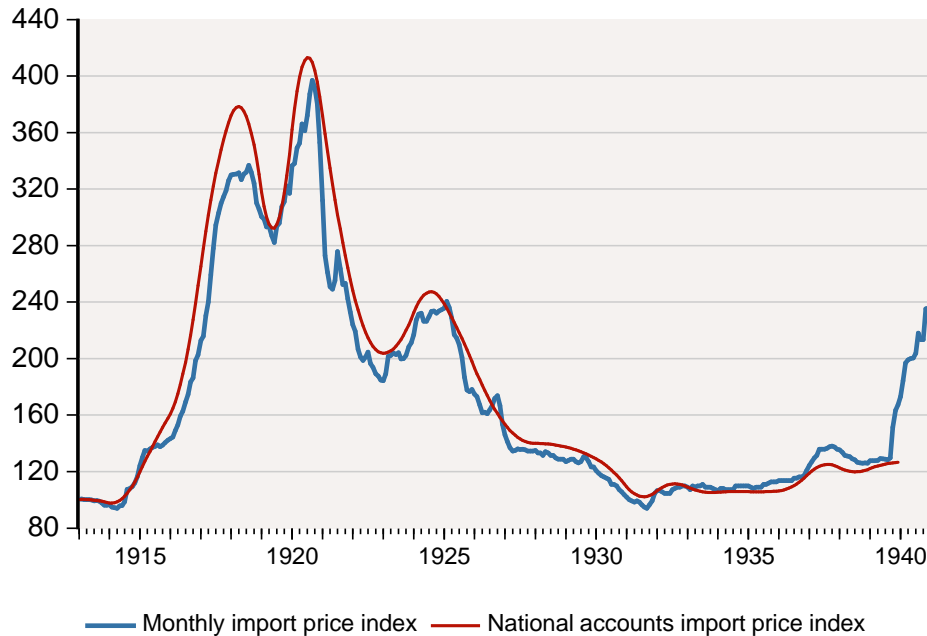


Figure 9.21 *Monthly import price index and national accounts import price index, 1913-1940. June 1913=100.*

subindices comprise both domestic and foreign goods. Fortunately, the Statistics Norway included a monthly subindex of prices of import goods as from January 1928, which is the best alternative for the period 1928-1940 in the case of import prices.

The Statistics Norway's monthly import price index, spliced with a reconstructed approximative index for the years 1921-1927 and our new import price index for the years 1913-1920, are shown in Figure 9.21. Also shown is the implicit price index of total imports from the annual national accounts.⁷² Annual figures are smoothed and distributed on monthly data by the Litterman (1983) procedure. By construction the national accounts (NA) index comprises a number of items not included in the wholesale price indices, the most important of which are imports of ships and operating costs and repairs of Norwegian ships abroad.

The figure has been extended back to 1913, using the new index presented here, to get a perspective on the measurement of wartime prices as well. In general the indices give the same impression of a strongly inflationary environment until 1920, then a long period of falling prices towards the 1930s, with a notable reaction in 1923-1924.

For exports a comparison with national account deflators is difficult because it is not possible to exclude gross freight revenues earned by the ocean shipping industry before 1930. After 1920, when

⁷² The price deflators in Statistics Norway (1968, pp. 354-355) were used here.

Monthly wholesale price indices, 1767-1920

ocean freight rates had come down substantially from the extreme levels of the wartime period, this component does not exert such a great influence on the NA export deflator. As can be seen from Figure 9.22 the constructed export index largely follows the NA index in the interwar years after 1920, which indicates that it is not widely off the mark, although it should once again be noted that it is measured on a rather uncertain basis.

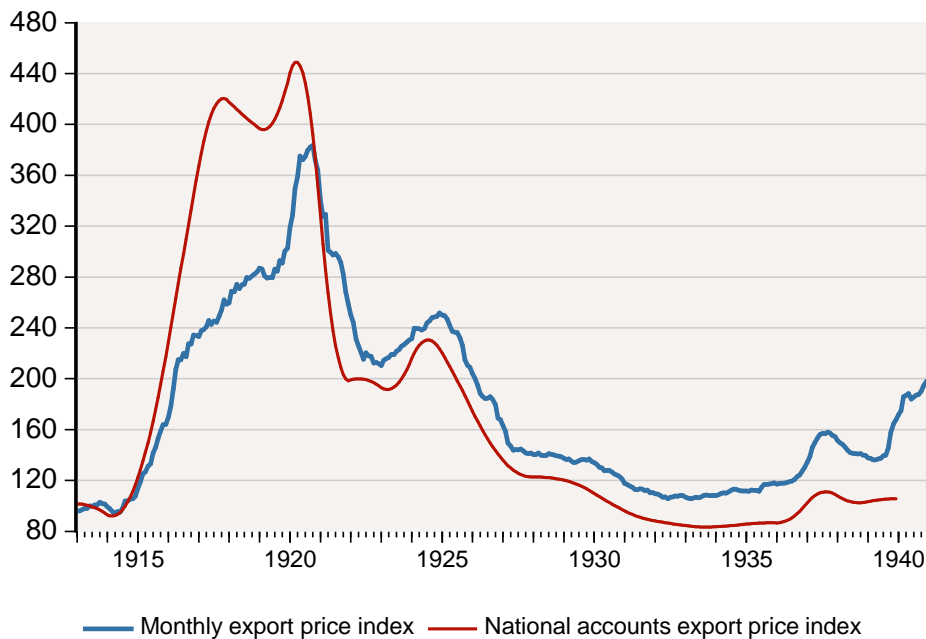


Figure 9.22 *Monthly export price index and national accounts export price index, 1913-1940. June 1913=100.*

9.9 Concluding remarks

The Swedish price historian Lennart Jörberg once remarked that "investigations into price history raise more questions than can be answered."⁷³ Hopefully, this has also been achieved by the present study. Using price history as a starting point for further analysis of issues in macroeconomic history may prove to be useful in many instances. One application, which has been dealt with here, albeit rather cursorily, is the light that price history may shed on exchange rate movements and, in more general terms, public confidence in the way monetary policy is conducted. This is but one of many applications in which an accurate measure of prices may be useful.

⁷³ Jörberg (1972, p. 3).

9.9 Concluding remarks

But as eloquently noted by the authors of recent history of agricultural prices in Ireland:⁷⁴ "The case for price history can be pressed too far. Prices represent pinpoints of light in the darkness of the past: a kind of scatter diagram in the night skies, as it were. So supplementary information is often needed to illuminate the surrounding circumstances."

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⁷⁴ Kennedy and Solar (2007, p. 3).

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9.A Appendix, Sources and data

This appendix contains the following items:

- Sources
- Notes on the location, units and currency of price quotations
- Commodity specification list
- Weights used in the construction of the aggregate price indices
- Table D1: Annual averages of index numbers: aggregate price indices 1767 - 1920

9.B Appendix, Data sources

In the early years before the early 1820s the main source of market prices is the *Bergen Price Courant*, see main text for further details.

In the early 1820s newspapers began to publish market prices. The newspapers and periodicals used as primary sources include the following: *Morgenbladet* (1820-1900), *Norsk Handels Tidende* (1825-1847), *Christiania Intelligenssedler* (1820-1840), *Bergens Stiftstidende* (1840-1855), *Bergenske Blade* (1848-1854), *Bergensposten* (1854-1889), *Bergens Tidende* (1871-1914), *Aftenposten* (1870-1920), *Bergens Aftenblad* (1890-1891), *Farmand* (1891-1920), *Norges Handels- og Sjøfartstidende* (1914-1920), *Økonomisk Revue* (1918-1921).

Some - but far from all - of the price material published in these newspapers beginning 1830 were transcribed during the 1930s and are filed in the Wedervang Archive at the Norwegian School of Economics. References to the most relevant Wedervang files used here are given below as W().

These are the abbreviations used in the commodity specification list printed on the following pages.

- A - Commodity exchange Christiania.** Official price quotations for various commodities from *Christiania Børs* 1894-1920, published weekly in *Farmand* and contemporary newspapers. W(274).
- B - Commodity exchange Bergen.** Prices negotiated on *Bergen Børs*, taken from the official records of the commodity exchange (*børsprotokoller*) and the monthly *Bergen Price Courant*. The first available issue of the courant is from October 1767. Before May 1777 data for 1 - 3 months are missing in most years, but there is a longer period extending from July 1771 to August 1773 for which no issues have been retrieved. A summary of this price current may also be found in contemporary newspapers from about 1825. Beginning with the 1850s, the information is collected from the records of commodity brokers (*meglerprotokoller*) and daily market reports in contemporary newspapers. W(207), W(263).
- C - City markets (*torvpriser*)** in Christiania, Bergen, Trondhjem and Stavanger. The main series of market prices from Christiania were collected by the city registrar (*stadsveieren*) and published in contemporary newspapers. This series is supplemented by prices quoted at the various market places (*Youngstorvet*, *Ankertorvet*), as well as those recorded by the city meat inspection (*kjøttkontrollen*), and published in *Farmand* and other newspapers. Christiania: W(258), W(382), W(387); Bergen: W(128), W(129), W(130), W(389); Stavanger: W(394)
- D - Retail prices** in various towns, national averages collected by the government and published in *Sociale Meddelelser* (1915-1918), from 1919 collected by Statistics Norway and published in *Statistiske Meddelelser*.
- F - Wholesale price current for Christiania, Farmand**
- FB - Export prices quoted in Bergen**, reported in *Farmand*
- FT - Wholesale prices quoted in Trondhjem**, reported in *Farmand*

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- L - Agricultural prices collected by Christiania Landmandskontor**, published in *Norsk Landmandsblad* (1882-1920), some series were also reproduced in newspapers. W(126).
- M - Commodity brokers in Bergen**, wholesale price current (*mellombudsvarer*). W(262), W(264).
- N - Nordlandspriskurant** price current issued in Bergen twice yearly (May and August) stipulating prices for the Nordland trade fairs in Bergen. These are available (with some gaps, particularly in the early years) beginning in 1815. This source was used through 1865. Some early copies and extracts are held by the University of Bergen Library (Fredrik Meltzer Wallem papers (Ms 1589) and Jørgen Grip papers (Ms 1294)). From 1842 this source is available at the Bergen City Archive. W(270)
- OR - Price relatives for various commodity groups**, published in *Økonomisk Revue*. End-of-year data 1914-1918, January, June and December observations for 1919 and monthly in 1920.
- Q - Market prices collected by local magistrates in 40 towns**, quarterly 1832-1871. W(139).
- P - Wholesale prices in Stavanger, Arendal and Fredrikshald**, prices recorded in *Norsk Handels Tidende* and other contemporary newspapers. W(392).
- R - Prices quoted ex wharf or ex railway in Christiania** as reported in newspapers. W(131).
- S - Parliamentary Papers** (*Stortingsmeddelelser*)
- TA - Implicit export and import prices**, derived from the annual foreign trade statistics (NOS *Norges Handel*) published by Statistics Norway. Monthly values were smoothed and distributed over the year using a RATS procedure due to Litterman (1983).
- TM - Implicit export and import prices**, derived from the monthly foreign trade statistics collected by Statistics Norway 1895-1912 and published in *Statistiske Meddelelser*. Prices were calculated by dividing the monthly value figures by monthly volumes.
- V - Commodity brokers in Christiania**, price quotes of commodities sold *ex ship* or *ex warehouse*, published in contemporary newspapers. W(131), W(137), W(273).
- X - Other sources** (see table footnotes)
- Y - Trade fairs**, annual or semi-annual. W(392)

9.C Appendix, Data descriptions

The detailed list of commodities on the following pages gives information on where the particular commodity description was quoted, the source (see above), the range of years for which data have been collected, the unit in which prices were quoted, and the number of monthly observations within the range. Names of commodity groups and individual items are given in both English and Norwegian in cases where the translation is not obvious. For some goods, in particular fish, only the specific Norwegian denomination can be given.

9.C Appendix, Data descriptions

The location of price quotations

The places where prices were quoted are abbreviated as follows:

BER - Bergen
CHA - Christiania
STA - Stavanger
TRH - Trondhjem
FRH - Fredrikshald
ARL - Arendal
DRA - Drammen
LAR - Larvik
KON - Kongsberg
SKI - Skien
SAN - Sandefjord
NAT - national

The units of price quotations

The most common units in which prices were quoted are⁷⁵

pund - 0.498 kg
mark - 1/2 pund = 0.249 kg
bismerpund - 12 pund = 5.977 kg
vog - 3 bismerpund = 17.931 kg
skippund - 159.396 kg
spann - 8.971 kg
bbl = tønne (barrel) - 139 litres (grain), 115.8 litres (fish)
skjeppe - 1/8 barrel = 17.372 litres
anker (anchor) - 38.6 litres
oksehode (hogshead) - 6 anchors = 231.6 litres
pott - 0.965 litres
kanne - 1.93 litres
alen - 2 feet = 0.62753 metres
deger - 10 (hides or skins)
skok - 60 pieces

⁷⁵ The information is taken from Evanths (1941) and the webpage <http://www.maritimt.net/arkforsk/norskem.htm>.

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The currency of price quotations

In the monthly databank prices are quoted in the following currency units (following the Bergen Priskurant):

October 1767 - February 1813 Rigsdaler Danish Courant (RDC)

March 1813 - January 1817 Riksbankdaler (RBD)

February 1817 - December 1876 Speciedaler (SPD)

January 1877 - December 1920 Kroner (NOK)

The rates of conversion between these currencies are as follows

		From		
To				
	RDC	RBD	SPD	
RDC	1.0000			
RBD	0.1667	1.0000		
SPD	0.0167	0.1000	1.0000	
NOK	0.0666	0.4000	4.0000	

9.D Appendix, Data tables

9.D Appendix, Data tables

Table 9.D1 Aggregate price indices and inflation rates
Annual averages. 1913=100.

Year	TPI	WPI	PPI	EXP	IMP	TT	Δ TPI	Δ WPI	Δ PPI	Δ EXP	Δ IMP	Δ TT
1767	1.16	1.21	1.04	1.06	1.73	61.3	0.0	0.0	0.0	0.0	0.0	0.0
1768	1.12	1.09	1.00	1.16	1.33	87.1	-3.4	-10.0	-3.5	9.0	-26.1	35.1
1769	1.02	0.98	0.92	1.08	1.24	87.0	-10.0	-11.1	-8.1	-7.2	-7.1	-0.1
1770	1.02	1.00	0.90	1.03	1.27	81.2	0.4	2.3	-2.1	-4.4	2.6	-6.9
1771	1.12	1.15	1.00	1.04	1.54	67.4	9.5	13.8	10.3	0.5	19.1	-18.6
1772	1.13	1.17	1.01	1.03	1.65	62.3	0.2	1.7	0.6	-1.3	6.5	-7.9
1773	1.16	1.15	1.05	1.13	1.36	82.9	2.7	-1.9	4.0	9.6	-19.0	28.5
1774	1.10	1.07	0.99	1.12	1.25	89.3	-5.2	-6.6	-5.5	-1.1	-8.6	7.5
1775	1.01	0.98	0.91	1.05	1.27	83.0	-8.1	-8.8	-8.5	-6.0	1.3	-7.3
1776	0.98	0.94	0.89	1.04	1.22	85.1	-3.0	-4.1	-2.2	-1.0	-3.4	2.4
1777	1.02	0.97	0.93	1.12	1.22	91.6	3.5	2.4	3.6	6.8	-0.7	7.4
1778	1.05	1.03	0.91	1.05	1.30	81.0	3.1	6.7	-1.5	-5.6	6.7	-12.3
1779	1.10	1.05	0.97	1.17	1.33	88.0	4.2	1.6	6.1	10.5	2.3	8.3
1780	1.07	1.01	0.96	1.19	1.31	90.9	-2.0	-3.7	-1.4	2.0	-1.3	3.2
1781	1.14	1.10	0.99	1.21	1.48	81.6	6.2	8.2	3.7	1.3	12.1	-10.8
1782	1.21	1.24	1.06	1.10	1.73	63.5	6.0	12.6	6.9	-9.8	15.3	-25.1
1783	1.32	1.32	1.18	1.26	1.67	75.0	8.2	6.1	10.2	13.4	-3.3	16.7
1784	1.33	1.34	1.21	1.27	1.68	75.5	1.1	1.1	2.5	1.0	0.4	0.6
1785	1.29	1.26	1.17	1.30	1.53	85.3	-3.1	-5.5	-3.3	2.7	-9.5	12.3
1786	1.34	1.31	1.24	1.36	1.60	84.8	3.8	3.7	5.8	4.3	5.0	-0.7
1787	1.32	1.28	1.18	1.37	1.58	86.4	-1.6	-2.4	-4.6	0.5	-1.5	1.9
1788	1.27	1.20	1.12	1.38	1.50	92.3	-4.3	-6.5	-5.8	0.9	-5.6	6.6
1789	1.36	1.32	1.22	1.40	1.61	86.5	7.1	9.7	9.1	1.2	7.7	-6.5
1790	1.41	1.41	1.27	1.36	1.77	76.8	3.4	6.0	4.1	-2.8	9.0	-11.8
1791	1.27	1.25	1.18	1.30	1.44	90.0	-9.8	-12.0	-7.3	-4.3	-20.2	15.8
1792	1.24	1.23	1.15	1.22	1.42	85.9	-2.8	-1.3	-3.2	-6.4	-1.7	-4.7
1793	1.34	1.37	1.23	1.23	1.64	74.9	7.8	10.8	6.9	0.6	14.3	-13.6
1794	1.39	1.44	1.23	1.24	1.72	71.8	3.6	4.9	0.4	0.9	5.2	-4.3
1795	1.49	1.58	1.31	1.23	2.06	59.8	6.7	9.6	6.2	-0.4	17.9	-18.3
1796	1.41	1.46	1.26	1.25	1.91	65.6	-5.5	-8.4	-4.1	1.5	-7.7	9.2
1797	1.36	1.29	1.25	1.49	1.57	94.7	-3.1	-11.7	-0.7	17.5	-19.2	36.7
1798	1.41	1.39	1.30	1.41	1.68	84.0	3.3	6.8	3.8	-5.4	6.6	-11.9
1799	1.55	1.62	1.42	1.34	2.04	65.8	9.4	15.8	8.9	-5.4	19.1	-24.5
1800	1.87	2.09	1.62	1.40	2.66	52.7	18.7	25.2	13.5	4.6	26.9	-22.2
1801	2.18	2.40	1.89	1.69	3.05	55.6	15.4	13.8	15.4	19.0	13.5	5.5
1802	2.02	2.12	1.81	1.74	2.48	70.2	-7.7	-12.5	-4.4	2.8	-20.5	23.3
1803	2.13	2.23	1.92	1.84	2.59	71.0	5.3	5.1	5.7	5.4	4.2	1.2
1804	2.02	2.04	1.81	1.89	2.50	75.4	-5.2	-8.7	-5.5	2.5	-3.5	6.0
1805	2.25	2.29	2.03	2.08	2.81	74.1	10.7	11.4	11.4	10.0	11.8	-1.8
1806	2.39	2.46	2.15	2.15	2.97	72.4	5.9	7.1	5.5	3.3	5.6	-2.3
1807	2.43	2.54	2.17	2.09	3.14	66.7	2.0	3.5	0.9	-2.7	5.5	-8.2
1808	3.42	3.83	2.99	2.69	4.75	56.7	34.1	41.0	32.0	25.0	41.3	-16.3

TPI = total supply price index (domestic goods, imports and exports), WPI = wholesale price index (domestic goods and imports)
PPI = producer price index (domestic goods and exports), EXP = export price index, IMP = import price index,
TT = ratio of export to import price indices, Δ denotes continuously compounded annual rates of change

Monthly wholesale price indices, 1767-1920

Table 9.D1 Aggregate price indices and inflation rates
Annual averages. 1913=100.

Year	TPI	WPI	PPI	EXP	IMP	TT	Δ TPI	Δ WPI	Δ PPI	Δ EXP	Δ IMP	Δ TT
1809	5.76	6.26	5.07	4.90	7.76	63.1	52.0	49.1	52.9	60.0	49.2	10.8
1810	5.76	6.44	5.10	4.44	7.68	57.8	0.1	2.9	0.5	-9.9	-1.1	-8.8
1811	9.46	11.13	7.99	6.50	13.82	47.1	49.6	54.7	44.9	38.1	58.7	-20.6
1812	15.84	19.98	13.35	9.38	23.95	39.2	51.5	58.6	51.4	36.6	55.0	-18.4
1813	77.91	77.69	69.02	71.43	65.58	108.9	159.3	135.8	164.3	203.0	100.7	102.3
1814	94.13	99.14	81.80	87.46	131.79	66.4	18.9	24.4	17.0	20.2	69.8	-49.6
1815	75.91	69.66	72.29	99.86	78.90	126.6	-21.5	-35.3	-12.3	13.3	-51.3	64.6
1816	123.14	117.93	113.61	141.23	140.80	100.3	48.4	52.6	45.2	34.7	57.9	-23.3
1817	191.63	200.07	168.83	163.80	253.10	64.7	44.2	52.9	39.6	14.8	58.6	-43.8
1818	111.27	121.25	98.58	89.97	144.31	62.3	-54.4	-50.1	-53.8	-59.9	-56.2	-3.7
1819	112.89	115.57	101.33	104.17	138.50	75.2	1.4	-4.8	2.8	14.6	-4.1	18.8
1820	92.68	96.64	83.98	78.66	111.58	70.5	-19.7	-17.9	-18.8	-28.1	-21.6	-6.5
1821	80.85	84.90	73.53	67.78	96.41	70.3	-13.6	-13.0	-13.3	-14.9	-14.6	-0.3
1822	98.45	101.38	89.34	87.60	117.42	74.6	19.7	17.7	19.5	25.7	19.7	5.9
1823	94.07	94.86	86.36	91.57	108.19	84.6	-4.5	-6.7	-3.4	4.4	-8.2	12.6
1824	77.41	73.94	74.00	88.07	78.28	112.5	-19.5	-24.9	-15.4	-3.9	-32.4	28.5
1825	58.04	58.47	53.38	55.50	65.49	84.8	-28.8	-23.5	-32.7	-46.2	-17.8	-28.3
1826	72.69	74.43	66.32	67.11	86.21	77.8	22.5	24.1	21.7	19.0	27.5	-8.5
1827	78.47	83.75	70.35	62.18	99.81	62.3	7.7	11.8	5.9	-7.6	14.7	-22.3
1828	68.81	71.78	60.99	60.01	89.28	67.2	-13.1	-15.4	-14.3	-3.5	-11.2	7.6
1829	69.96	73.53	61.49	59.47	93.28	63.8	1.7	2.4	0.8	-0.9	4.4	-5.3
1830	73.18	74.68	65.35	67.73	92.77	73.0	4.5	1.6	6.1	13.0	-0.5	13.5
1831	85.80	90.86	75.76	71.81	112.68	63.7	15.9	19.6	14.8	5.9	19.4	-13.6
1832	80.85	84.11	71.47	70.70	105.84	66.8	-5.9	-7.7	-5.8	-1.6	-6.3	4.7
1833	68.13	68.83	61.02	63.87	85.82	74.4	-17.1	-20.0	-15.8	-10.2	-21.0	10.8
1834	62.72	62.61	56.66	61.47	76.74	80.1	-8.3	-9.5	-7.4	-3.8	-11.2	7.4
1835	66.08	68.62	60.10	58.23	79.30	73.4	5.2	9.2	5.9	-5.4	3.3	-8.7
1836	69.51	72.43	63.63	60.34	81.34	74.2	5.1	5.4	5.7	3.5	2.5	1.0
1837	70.18	74.72	64.35	57.93	81.49	71.1	1.0	3.1	1.1	-4.1	0.2	-4.2
1838	75.08	78.47	68.96	65.27	89.64	72.8	6.7	4.9	6.9	11.9	9.5	2.4
1839	75.56	79.99	68.32	63.31	94.16	67.2	0.6	1.9	-0.9	-3.0	4.9	-8.0
1840	72.22	77.04	64.76	60.13	92.22	65.2	-4.5	-3.8	-5.3	-5.2	-2.1	-3.1
1841	64.05	66.84	57.48	57.29	82.27	69.6	-12.0	-14.2	-11.9	-4.8	-11.4	6.6
1842	65.12	66.35	60.21	62.53	78.28	79.9	1.7	-0.7	4.6	8.8	-5.0	13.7
1843	70.97	67.78	69.85	79.50	73.32	108.4	8.6	2.1	14.9	24.0	-6.5	30.5
1844	68.65	66.47	67.46	73.53	71.28	103.2	-3.3	-1.9	-3.5	-7.8	-2.8	-5.0
1845	69.40	68.15	67.09	71.85	74.99	95.8	1.1	2.5	-0.6	-2.3	5.1	-7.4
1846	74.52	77.04	69.88	66.81	86.81	77.0	7.1	12.3	4.1	-7.3	14.6	-21.9
1847	89.03	97.47	82.07	69.07	106.30	65.0	17.8	23.5	16.1	3.3	20.3	-16.9
1848	76.28	77.61	71.04	71.64	88.69	80.8	-15.5	-22.8	-14.4	3.7	-18.1	21.8
1849	70.37	70.93	65.41	68.01	82.23	82.7	-8.1	-9.0	-8.3	-5.2	-7.6	2.4
1850	69.49	69.57	65.09	68.87	79.24	86.9	-1.3	-1.9	-0.5	1.3	-3.7	5.0

TPI = total supply price index (domestic goods, imports and exports), WPI = wholesale price index (domestic goods and imports)
PPI = producer price index (domestic goods and exports), EXP = export price index, IMP = import price index,
TT = ratio of export to import price indices, Δ denotes continuously compounded annual rates of change

9.D Appendix, Data tables

Table 9.D1 Aggregate price indices and inflation rates
Annual averages. 1913=100.

Year	TPI	WPI	PPI	EXP	IMP	TT	Δ TPI	Δ WPI	Δ PPI	Δ EXP	Δ IMP	Δ TT
1851	72.24	75.29	66.48	63.71	86.31	73.8	3.9	7.9	2.1	-7.8	8.5	-16.3
1852	75.74	79.54	69.93	65.63	90.08	72.9	4.7	5.5	5.1	3.0	4.3	-1.3
1853	78.11	83.21	70.73	65.24	99.48	65.6	3.1	4.5	1.1	-0.6	9.9	-10.5
1854	88.22	90.59	79.89	80.36	113.21	71.0	12.2	8.5	12.2	20.8	12.9	7.9
1855	94.19	99.96	85.66	79.25	119.12	66.5	6.5	9.8	7.0	-1.4	5.1	-6.5
1856	100.36	106.00	92.41	85.49	122.01	70.1	6.3	5.9	7.6	7.6	2.4	5.2
1857	92.09	92.57	86.39	89.29	105.45	84.7	-8.6	-13.6	-6.7	4.3	-14.6	18.9
1858	78.84	78.44	74.10	78.02	90.32	86.4	-15.5	-16.6	-15.3	-13.5	-15.5	2.0
1859	78.70	80.86	73.48	72.06	91.86	78.4	-0.2	3.0	-0.8	-7.9	1.7	-9.6
1860	86.11	89.53	80.41	77.17	100.29	76.9	9.0	10.2	9.0	6.9	8.8	-1.9
1861	91.52	92.76	86.27	87.00	102.71	84.7	6.1	3.5	7.0	12.0	2.4	9.6
1862	89.30	92.16	83.90	80.76	102.54	78.8	-2.4	-0.6	-2.8	-7.4	-0.2	-7.3
1863	87.81	89.13	82.44	83.55	100.55	83.1	-1.7	-3.3	-1.8	3.4	-2.0	5.4
1864	83.77	85.31	78.14	78.66	97.22	80.9	-4.7	-4.4	-5.4	-6.0	-3.4	-2.7
1865	83.20	84.38	78.02	79.18	95.50	82.9	-0.7	-1.1	-0.1	0.7	-1.8	2.4
1866	91.72	95.00	87.25	82.41	102.30	80.6	9.7	11.9	11.2	4.0	6.9	-2.9
1867	95.22	100.58	88.51	81.70	112.40	72.7	3.7	5.7	1.4	-0.9	9.4	-10.3
1868	98.85	105.96	92.21	80.89	115.09	70.3	3.7	5.2	4.1	-1.0	2.4	-3.4
1869	90.56	94.76	84.80	78.83	104.42	75.5	-8.8	-11.2	-8.4	-2.6	-9.7	7.1
1870	87.21	88.62	82.49	82.36	98.52	83.6	-3.8	-6.7	-2.8	4.4	-5.8	10.2
1871	89.41	91.06	85.02	84.40	100.13	84.3	2.5	2.7	3.0	2.4	1.6	0.8
1872	89.60	93.86	83.43	77.90	105.71	73.7	0.2	3.0	-1.9	-8.0	5.4	-13.4
1873	99.83	101.42	94.23	94.41	113.48	83.2	10.8	7.7	12.2	19.2	7.1	12.1
1874	105.72	109.07	101.40	95.71	114.97	83.2	5.7	7.3	7.3	1.4	1.3	0.1
1875	98.05	101.10	94.24	88.51	106.02	83.5	-7.5	-7.6	-7.3	-7.8	-8.1	0.3
1876	95.90	96.20	92.84	93.31	102.55	91.0	-2.2	-5.0	-1.5	5.3	-3.3	8.6
1877	98.07	99.61	95.33	92.34	103.53	89.2	2.2	3.5	2.6	-1.0	0.9	-2.0
1878	85.71	87.35	82.20	80.75	93.93	86.0	-13.5	-13.1	-14.8	-13.4	-9.7	-3.7
1879	80.43	81.14	76.36	77.29	90.51	85.4	-6.4	-7.4	-7.4	-4.4	-3.7	-0.7
1880	88.47	88.81	85.11	85.98	96.08	89.5	9.5	9.0	10.8	10.7	6.0	4.7
1881	90.63	90.94	88.55	87.83	95.35	92.1	2.4	2.4	4.0	2.1	-0.8	2.9
1882	88.67	85.83	88.22	95.64	89.93	106.3	-2.2	-5.8	-0.4	8.5	-5.9	14.4
1883	86.40	82.16	86.82	97.64	85.23	114.6	-2.6	-4.4	-1.6	2.1	-5.4	7.4
1884	80.96	78.98	79.93	85.28	82.77	103.0	-6.5	-3.9	-8.3	-13.5	-2.9	-10.6
1885	74.49	74.33	72.81	73.40	76.98	95.3	-8.3	-6.1	-9.3	-15.0	-7.2	-7.8
1886	70.51	70.81	68.11	68.42	74.73	91.5	-5.5	-4.9	-6.7	-7.0	-3.0	-4.1
1887	68.09	68.75	64.69	65.07	74.99	86.8	-3.5	-3.0	-5.1	-5.0	0.4	-5.4
1888	69.80	70.55	67.06	66.58	75.52	88.2	2.5	2.6	3.6	2.3	0.7	1.6
1889	73.11	74.43	69.91	68.26	79.81	85.5	4.6	5.3	4.2	2.5	5.5	-3.0
1890	74.63	77.20	70.73	66.69	83.01	80.3	2.1	3.7	1.2	-2.3	3.9	-6.2
1891	80.36	82.13	77.73	74.37	86.11	86.4	7.4	6.2	9.4	10.9	3.7	7.2
1892	77.26	81.16	74.93	66.16	82.13	80.6	-3.9	-1.2	-3.7	-11.7	-4.7	-7.0
1893	72.29	74.48	69.99	65.52	77.09	85.0	-6.6	-8.6	-6.8	-1.0	-6.3	5.4
1894	69.09	69.17	67.88	67.93	71.54	95.0	-4.5	-7.4	-3.1	3.6	-7.5	11.1
1895	69.60	68.92	68.94	70.45	71.14	99.0	0.7	-0.3	1.6	3.6	-0.6	4.2
1896	70.43	69.35	70.51	72.50	70.72	102.5	1.2	0.6	2.2	2.9	-0.6	3.4
1897	71.43	70.66	71.81	72.78	70.99	102.5	1.4	1.9	1.8	0.4	0.4	0.0
1898	76.15	76.37	76.64	74.82	75.26	99.4	6.4	7.8	6.5	2.8	5.8	-3.1
1899	79.64	79.00	80.36	80.62	78.08	103.2	4.5	3.4	4.7	7.5	3.7	3.8
1900	86.02	84.82	86.15	88.30	86.05	102.6	7.7	7.1	7.0	9.1	9.7	-0.6
1901	81.45	80.80	81.85	82.60	80.94	102.0	-5.5	-4.9	-5.1	-6.7	-6.1	-0.6
1902	80.36	80.23	80.61	80.09	80.12	100.0	-1.3	-0.7	-1.5	-3.1	-1.0	-2.1
1903	81.70	80.41	82.23	84.31	81.00	104.1	1.6	0.2	2.0	5.1	1.1	4.0

TPI = total supply price index (domestic goods, imports and exports), WPI = wholesale price index (domestic goods and imports)
PPI = producer price index (domestic goods and exports), EXP = export price index, IMP = import price index,
TT = ratio of export to import price indices, Δ denotes continuously compounded annual rates of change

Monthly wholesale price indices, 1767-1920

Table 9.D1 Aggregate price indices and inflation rates
Annual averages. 1913=100.

Year	TPI	WPI	PPI	EXP	IMP	TT	Δ TPI	Δ WPI	Δ PPI	Δ EXP	Δ IMP	Δ TT
1904	82.85	81.14	83.79	86.42	80.92	106.8	1.4	0.9	1.9	2.5	-0.1	2.6
1905	85.17	83.04	86.22	89.66	82.94	108.1	2.8	2.3	2.9	3.7	2.5	1.2
1906	87.71	85.79	88.36	91.78	86.58	106.0	2.9	3.3	2.4	2.3	4.3	-2.0
1907	93.97	93.55	93.73	94.39	93.90	100.5	6.9	8.7	5.9	2.8	8.1	-5.3
1908	89.90	90.57	88.94	88.23	91.38	96.6	-4.4	-3.2	-5.2	-6.7	-2.7	-4.0
1909	88.97	90.82	87.83	84.94	90.75	93.6	-1.0	0.3	-1.3	-3.8	-0.7	-3.1
1910	90.28	90.66	90.24	89.41	90.31	99.0	1.5	-0.2	2.7	5.1	-0.5	5.6
1911	92.70	93.78	92.17	90.07	93.38	96.5	2.6	3.4	2.1	0.7	3.4	-2.6
1912	98.73	101.57	97.03	92.53	101.85	90.8	6.3	8.0	5.1	2.7	8.7	-6.0
1913	100.00	100.00	100.00	100.00	100.00	100.0	1.3	-1.6	3.0	7.8	-1.8	9.6
1914	104.20	105.62	104.59	100.86	102.81	98.1	4.1	5.5	4.5	0.9	2.8	-1.9
1915	144.01	145.48	147.05	140.56	137.19	102.5	32.4	32.0	34.1	33.2	28.8	4.3
1916	193.21	184.53	205.32	212.87	170.35	125.0	29.4	23.8	33.4	41.5	21.6	19.9
1917	266.11	276.03	261.73	247.63	277.58	89.2	32.0	40.3	24.3	15.1	48.8	-33.7
1918	327.19	353.75	324.58	276.42	329.48	83.9	20.7	24.8	21.5	11.0	17.1	-6.1
1919	322.70	339.74	333.45	289.37	302.71	95.6	-1.4	-4.0	2.7	4.6	-8.5	13.1
1920	379.14	384.92	383.42	365.65	368.50	99.2	16.1	12.5	14.0	23.4	19.7	3.7

TPI = total supply price index (domestic goods, imports and exports), WPI = wholesale price index (domestic goods and imports)
PPI = producer price index (domestic goods and exports), EXP = export price index, IMP = import price index,
TT = ratio of export to import price indices, Δ denotes continuously compounded annual rates of change

Annual cost of living/consumer price indices, 1492-2021

Ola Honningdal Grytten

10.1 Introduction

When HMS I was published in 2004, Grytten (2004b, 47-98) presented a combined cost of living index (CLI) and consumer price index (CPI) for Norway 1516-2003. It recorded decadal prices until 1665 and thereafter annual series. Data coverage before 1830 was limited and the index represented only a crude attempt to measure consumer prices before 1830. We will mark the old CLI-CPI as *HMS I* in this chapter.

This chapter, drawing on the material presented in Grytten (2018, 2020), presents a new composite annual cost of living and consumer price index for Norway covering 1492-2021, a total period of 530 years. The new historical price index has been constructed using a significantly richer data material than the previous one, which also makes it cover a longer period of Norwegian price history. This has been possible by the increased availability of quantitative data from numerous sources, mostly originating from the eighteenth, nineteenth, and early twentieth centuries, with grain prices stretching back to 1492. The new combined cost of living and consumer price index is constructed by a Laspeyres approach using weights which shift over time as the groups of commodities and expenditures change and more information becomes available. We will mark the new CLI-CPI presented in this chapter as *HMFS*.

The revised price index allows us to follow annual inflation and deflation in Norway over a period of 530 years. When compared with the old consumer price index, the new series reveals significant and in some periods quite substantial revisions. The revisions produce a picture of the historical price development in Norway more in line with those of its neighbouring countries, and more in line with the pattern of wholesale prices (Klovland, 2014, 2018). Norges Bank took these improvements into account in their mark *HMS II* version of the historical CLI-CPI in 2014.

Recent research literature on historical price development leaves scholars with different challenges regarding both price history and the existing historical CLI-CPI for Norway. Firstly, there are reasons to ask how representative price indices are for historical development. Secondly, alternative price indices have challenged the existing CPI-CLI during high inflation periods (Klovland, 2018). Thirdly, international CPIs reveal that the existing Norwegian index departs considerably from the development in price indices for neighbouring economies during the sixteenth and seventeenth centuries (Abildgren, 2010, 2-24). Fourthly, parts of the existing historical CLI-CPI rest on a statistically weak basis.

Thus, this paper has two aims. Firstly, it seeks to construct a more valid and reliable combined historical CLI-CPI for Norway. Secondly, it seeks to find out whether this new price index has a significant bearing on the understanding of Norwegian price history. The inclusion of a significant amount of more data than in previous Norwegian CLIs confirms the need for reinterpreting Norway's price history. Firstly, inflation was significantly higher than hitherto observed during the sixteenth and early seventeenth centuries. Secondly, the price level showed larger fluctuations until the mid-1800s than what was reported by the old index. Thirdly, price development during the eighteenth century was more in line with that of the Scandinavian counterparts Denmark and Sweden. Fourthly,

10.2 Existing historical CLI-CPIs

inflation was higher both during the Napoleonic wars in the early 1800s and during World War I than reported by previous indices.

Understanding history on its own premises

When economic historians for a long period were occupied with constructing traditional CLIs to understand price developments for consumers, many international long-term studies now relate to a seminal study by Allen. He studied divergence in wages and prices in Europe from the middle ages to the First World War, where he applied ideas of respectability and barebones baskets (Allen, 2001, 411-447). The approach included the construction of baskets of respectable consumption for wealthy countries and subsistence consumption for poorer countries. These included specific volumes of food, non-food, and rent. The standard of living was connected to which degree the public was able to fill these baskets.

The methodology has gained increasing impact, and it has been refined and carried on by Humphries and Weisdorf in an extensive study of real income and economic growth in England for the period 1260-1850 (Humphries and Weisdorf, 2019). Furthermore, Gary and Olsson use a popularised version in their novel work on real wages in Southern Sweden (Gary and Olsson, 2019). These works question the use of general weights and missing price data in historical CLIs, which may cause substantial bias in the indices.

In the case of Norway, price data were basically collected and organised from the seventeenth century onwards (Ruud, 1911, 136-149). Non-food and rent notations were scarce. In addition, the majority of the population basically produced their own necessities. Hence, most markets for consumer goods were in urban areas. This was common far into the nineteenth century. One may ask how relevant a CLI is for historical self-sufficient economies. It is supposed to reflect the costs of living, given a fixed utility level. This implies that, e.g. working hours to maintain a certain utility level would have been a relevant alternative, since only a minority of the population's necessities was sold in markets.

Nevertheless, as early as 1641, clergy collected prices as information on the necessity of poor relief. They considered prices for food and other subsistence goods a way of measuring common needs, and along with income data the ability to cover these. Also, there still is a demand for CLIs in historical research and in comparative studies, both regarding historical comparisons and cross-border comparisons. In addition, the notion of respectability in Allen's approach is not always easy to use in comparable studies, as respectability is not always a clear measure. Thus, CLIs still can provide important information on consumer price developments as long as they are both cautiously computed and used. Hence, refined traditional CLIs and respectability approaches to CLIs can be used as supplementary tools in the standard of living research.

10.2 Existing historical CLI-CPIs

Holter constructed a price index with a Laspeyres approach for Norway 1835-1865 (Holter, 1996). This was spliced with Statistics Norway's CLI-CPI from 1865 onwards (NOS, 1995, 296-297). Both

Annual cost of living/consumer price indices, 1492-2021

indices were based on sparse and fragile data until 1920. The series also lacked satisfactory documentation.

As mentioned above, a historical price index covering the years 1516-2003 was published in Grytten (2004a) (HMS I, 2004). The major sources were Statistics Norway, merchants' and retailers' archives, public records and the Wedervang archive on historical wages and prices (Grytten, 2004b, 61-79).

The combined CLI-CPI published in 2004 was constructed as ten indices covering different periods and spliced into one over-all series. The coverage altered substantially in respect of the number of observations, geography coverage and sources, as described in Table 10.1. For the period until 1666, it represents a grain price index (GPI), as grains are the only commodities included.

Table 10.1 *Descriptive statistics Norges Bank's historical CLI-CPI 1516-2003*

Period	Type	Constructed by	Commodities	Locations	Main sources
1516-1666	GPI-WPI	Grytten	3-6	2+	PR
1666-1709	CLI-WPI	Grytten	7-21	West Norw	ParR
1709-1819	CLI-WPI	Grytten	18	1	MA, PC
1819-1830	CLI-WPI	Grytten	29	13	PC, MA
1830-1871	CLI	Grytten	47	40	PR
1871-1910	CLI	Ramstad	55	1	PR
1901-1916	CLI	Kristiania Statistical Office	57	1	LR
1916-1920	CLI	Ministry of Social Affairs	53	6-16	PR
1920-1960	CLI	Statistics Norway	120-340-700	16-100	SN
1960-2003	CPI	Statistics Norway	app. 1000	National	SN

Notes: PR: Public records; ParR: Parish records; MA: Merchant archives; PC: Price currents; LR: Local records; SN: Statistics Norway, WA: Wedervang Archive, Sources: Grytten (2004a, 47-98); Grytten (2004b, 61-79).

Alternative price indices

In 1960, Statistics Norway constructed a deflator for private consumption stretching back to 1865 (Statistics Norway, 1965, 352-355). Thereafter, Ramstad published a CLI for Kristiania (Oslo), for 1850- 1910 (Ramstad, 1982, 158-238), including prices of 55 commodities with expenditure weights derived from the Kristiania Statistical Office. Ellingsæther constructed a revised CLI for 1871-1910 by including more data and covering larger parts of household consumption (Ellingsæther, 2007, 47-66). Klovland's work on Norwegian historical prices is the most authoritative in its respect, containing monthly production, wholesale, export and import price indices for 1767-1920 (Klovland, 2018, 10-13). Klovland chose a repeated sales method in order to estimate the lacking observations. The inflation in the early 1800s is significantly higher in Klovland's than in the existing CLI-CPIs figures. This is basically a result of different splicing techniques between currencies during the period in question.

Increased availability of price data recorded in urban areas has made it possible to use new and better price data for most of the eighteenth century and the early nineteenth century. These have been utilised by Dhawan and Langdal to construct price indices for consumer, production, and wholesale

10.3 New combined CLI-CPI

goods for five ports 1737-1767 (Dhawan and Langdal, 2018). Retail prices from the supply office in the mining town Røros constitute persistent price notations for consumption goods in the eighteenth century (Sakrisvold, 2017). Ølmheim and Stubhaug used these data to construct a CLI covering 1737-1816 (Ølmheim and Stubhaug, 2018).

10.3 New combined CLI-CPI

Based on newly available data, it is possible to construct a new annual historical price index for consumer goods covering the period from 1492 until the present time. Since the statistical data for the first period still sits on grain prices only, it is still a GPI for 1492-1665.

Methodology

We use a standard Laspeyres approach since Paasche or a Fisher price indices are neither practical nor common to use in this matter. The approach implies the use of base years, preferably representative years, in respect of prices and consumption baskets towards the middle of each subperiod. This is done to weigh the importance of the commodities, according to household spending.

The index is constructed in three tires. The first contains individual commodities. The second represents expenditure groups, calculated as weighted averages of commodities. The third is the general index, where all the second-order indices are weighted according to their consumption basket shares. Commodity indices I_i for each product i are constructed by calculating relative price changes from the base year b to the index year t :

$$I_i^t = p_i^t / p_i^b \quad (10.1)$$

Thereafter, we add adherent commodity indices into expenditure group indices I_g for each product group g . We give commodities different weights w according to their relative share in a typical household budget at its time:

$$w_i^b = (p_i^b q_i^b) / \sum (p_i^b q_i^b) \quad (10.2)$$

Hence, the second-order indices, representing subindices for consumer groups, are calculated as quoted in Equation 10.3:

$$I_g^t = \sum (w_i^b I_i^t) \quad (10.3)$$

Finally, in the general CLI-CPI (I_L), we sum up the second-order indices weighted according to their relative share of total consumption in the base years.

$$w_g^b = (p_g^b q_g^b) / \sum (p_g^b q_g^b) \quad (10.4)$$

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P_L then denotes the general Laspeyres price index as the sum of weighted second-order price indices:

$$P_L^t = \sum (w_g^b I_g^t) \tag{10.5}$$

Our data set does not allow us to use geometric micro indices, where prices on similar products are transformed into geometric means.

Periodisation and base years

Since commodities and expenditure groups change their importance over time, weights and base years should be changed correspondingly. Thus, one needs to use sub-periods containing different weights on first- and second-order indices. The periodisation applied here implies that the new CLI-CPI consists of price indices for ten periods, spliced into one over-all price index, as listed in Table 10.2. Weights of each commodity and expenditure group are set equal to their share in base years. We splice the series together with one reference year as departure. Here we have chosen 1913, in line with the NCB pattern.

Table 10.2 *Periodisation, base years and reference years for the new CLI-CPI.*

Periodisation		Base years	Reference year	
First year	Last year		Period	Spliced series
1492	1665	1600	1600	1913
1665	1736	1688	1688	1913
1736	1816	1750	1750	1913
1816	1830	1825	1825	1913
1830	1871	1850	1850	1913
1871	1910	1895	1895	1913
1910	1920	1913	1913	1913
1920	1959	1914,1939,1949	1939	1913
1959	1979	1959,1968,1974,1979	1968	1913
1979	2021	<i>t</i> – 1 calculations	2000	1913

Source: see Appendix.

10.4 Sources

It is of course not possible to follow a fixed number of commodities during the entire period 1492-2021. The coverage varies a lot. For the first 150 years, we have prices on a handful of commodities of grain only, when Statistics Norway’s CPI from 1960 onwards includes more than 1,000 products. Thus, the latter index, refined from 1979, represents a full spectre of consumption commodities and should be considered a full bread consumer price index.¹

¹ www.ssb.no: Publikasjoner konsumprisindeksen, om statistikken.

10.4 Sources

The most important difference between the old and the new CLI-CPI presented here is found in newly compiled and digitalized price currents for the eighteenth and parts of the seventeenth and nineteenth centuries. They have been available thanks to the infrastructure project led by Hutchison. It enables writers on Norwegian economic history to conduct quantitative studies on a period which in many respects has been neglected hitherto. With the exception of Hutchison's own research.²

This research draws on different sources. One is appraisal prices, kept at state archives and city archives.³ They report representative prices within regions and were set on the basis of *ex ante* and *ex post* prices collected by public servants. Another important source is price currents. Many of these are now digitalised in a database for historical trade and price statistics. Others are taken from state archives.⁴ As a rule, price currents were given by merchants, commodity bourses, brokers, or local traders. They report market prices of export and import commodities, products, wholesale, and retail prices.

The Wedervang Archive is also a key source, reporting more than 1.3 million observations of prices from the 1640s until 1940 (Grytten, 2007, 203-230). They are mainly retail prices compiled by public servants by decree from the central administration. From 1910, Statistics Norway serves as the most important source. The agency collected price data from both urban and rural areas. From 1920, they established their own CLI and from 1960 a CPI. These were constructed on the basis of hundreds of retail price observations and frequent consumption surveys (Bye and Hægeland, 2014, 3-5). In addition, one finds relevant data from Coldevin's work on private archives (Coldevin, 1938). Most prices are market prices and are valid for our study.

1492-1665

The price data for this first period are very scarce, in as much as they cover grain only. In 1888 the Norwegian economist Aschehoug published a research paper on the historical development of Norwegian prices of grain since Christopher Columbus' rediscovery of America. His data basically include domestically produced grains of oat, barley, and maslin (basically mix of barley and oat) and imported rye, oat, and barley, i.e. six commodities. Until 1640, Aschehoug collected prices from public institutions, many of them were indicative prices set by public servants (Aschehoug, 1888, 81-116).

His most important sources were the garrisons at Bergen Castle and the Akershus Castle in the capital Christiania, public accounts kept by bishops and local church parish accounts. Most of his data were compiled from the two major cities Bergen and Christiania, and the largest rural county of Akershus. From 1641 onwards, Aschehoug basically compiled appraisal prices for his series. Local

² Hutchison (2012). For an overview of the database on price currents, see <https://databaser.tidvis.no/price/priceLists.jsp>.

³ State Archive of Bergen, Bergen Domkapittelsprotokoller 1639-1833, City Archive of Bergen, Nordfarkladder 1709-1819, A-0581 Rb 0001, Nordfaruttrekk 1712-1819, A-0581 Ra 0001. A-620 Ra 0001, Bergens Pric-Curant for Norlandshandlerne 1739-1818.

⁴ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister, <https://databaser.lokalhistoriewiki.no/price/priceLists.jsp>.

public servants collected these by decree from the central administration. Again, these were from the Bergen, Oslo and Akershus area. But also included counties in the Oslo-fiord area.⁵

For some years prior to 1641 one finds gaps in the Norwegian sources. Hence, Aschehoug chose to use Danish price records for these years, reasonably arguing that the two countries had a common market on imports of grain as well as a currency union. The Danish central administration also controlled a grain monopoly in Norway for most of the time, except for the late 1600s and early 1700s.⁶ Here, we additionally draw on new available Danish data compiled by Abildgren (2017, 67-78).

In the 1930s staff of the Wedervang Archive at the Norwegian School of Economics in Bergen included Aschehoug's price data in the records of the archive, along with other notations of prices on different types of crops from 1641 and onwards.⁷

1665-1736

From 1665 and onwards, the number of items we have been able to include in our index gradually increased from 13 to 28 commodities. They are basically reporting grain, fish, vegetables, beverages and colonial goods, manufacturing goods, leather and skin. These were basically reported as merchant prices from Bergen or appraisal prices in parishes in western Norway.⁸ The latter were collected by local vicars and reported to the bishop in Bergen.

The appraisal records are dominant until 1709. Thereafter, merchant prices make up the bulk of the data.⁹ At this stage we are also able to trace important price materials for Christiania, Christiansand, Arendal, Fredrikstad and Drammen in the newly established database on historical trade made available by Ragnhild Hutchison. These are in the form of price currents. Different brokers and merchants set these price lists on the basis of their observations of market prices at the time. Usually, they met and negotiated standard prices once a month, quarterly or at some times every half year in order to find and record the typical market prices at the time.¹⁰ These data are scarce. However, they serve as a supplement for the already established data and contribute to making our series constructed on the basis of more valid data available.

A list of externally traded goods in the town of Arendal, located at the south coast, is shown in Figure 10.1. Along with these lists price currents were compiled in order to record price levels and movements. Price currents could convey representative export, import, wholesale and retail prices. They seldom represented calculated average ex post prices. Rather, they reflected normal ex ante

⁵ Aschehoug (1888, 86-92).

⁶ Falbe-Hansen (1869), Scharling (1869).

⁷ Wedervang Archive, W155.

⁸ State Archive in Bergen, Bergen Domkapittelsprotokoller 1639-1933, Wedervang Archive, W051, W155, W210 and W217.

⁹ The City Archive in Bergen, Nordfarkladder 1709-1819, A-0581 Rb 0001, Nordfaruttrekk 1712-1819, A-0581 Ra 0001, A-620 Ra 0001, Bergens Pric-Curant for Norlandshandlerne 1739-1818, Coldevin (1938), Wedervang Archive, W051, W155, W210 and W217.

¹⁰ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

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The image shows two pages from a historical ledger. The left page is titled 'Arendal 1686' and the right page is titled 'Sjøgaarde 1686'. Both pages have columns for 'Import', 'Export', and 'Balance'. The entries are handwritten in cursive and include various goods and their corresponding values. The right page has the number '211' written in the top right corner.

Figure 10.1 List over exported and imported goods to Arendal 1686. Source: www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

prices set by merchants or brokers. Still, they serve as some of the best data sources we have on historical prices into the first decades of the 19th century.¹¹

A price current from the small town Holmestrand along the southeastern coast from January 1720 and one from the second largest city, Bergen, from August 1848 are shown in Figure 10.2. Contrary to the larger ports the price currents from the smaller ports only contain price observations of a few key products. As for Holmestrand, they reported seven basic food commodities only.¹² This limited coverage represents the case for most local price currents at the time. Since most of the locations that reported price currents were quite small, mostly with less than 1 500 inhabitants.

1736-1816

The statistical basis of our new price index improves significantly in 1736 and 1737. We have been able to follow the annual prices of 60 products for most of this period, representing ten different expenditure groups. These groups are grain, flour and bread, vegetables, dairy products, meat, fish, beverages, and tobacco. colonial goods, clothing and footwear and finally fuel and lighting.

This significant improvement basically stems from the rich price data recorded in the previously

¹¹ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

¹² www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

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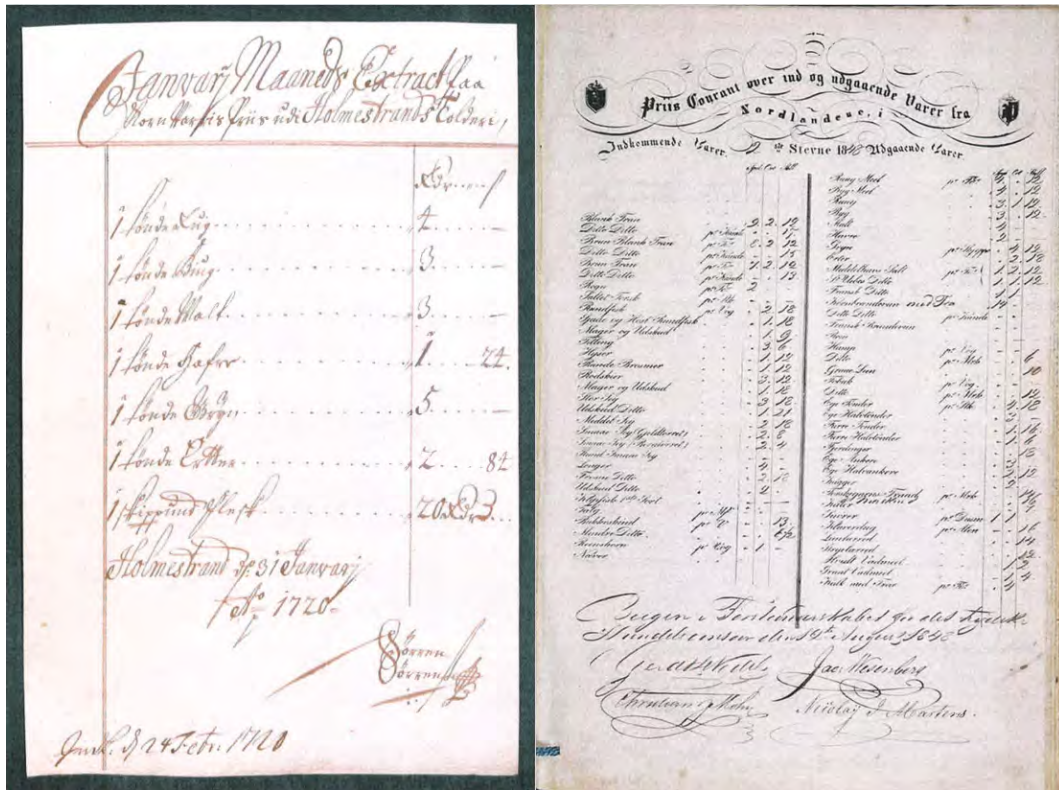


Figure 10.2 Price current from Holmestrand 1720 (left) and price current on outgoing domestic trade Bergen August 1848 (right). Source, www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister and Bergen byarkiv: priskurant: www.bergenbyarkiv.no/oppslagsverket/2003/10/24/priskuranter.

mentioned ongoing trade statistics database project monitored by an independent research group under the leadership of Ragnhild Hutchison.¹³ We have been able to use lists of consumer prices recorded at the supply office in the mining town of Røros in northeastern Norway during the entire period.¹⁴ In addition we have compiled data from price currents from the west coast city Bergen from 1767 onwards. This was by far the biggest Norwegian city and capital for business and trade at the time.¹⁵

Admittedly, we find some gaps and statistically weaker periods in the data. However, we have been able to construct persistent annual series on the basis of price currents from coastal ports and notations of prices on substitute products in Røros and Bergen.¹⁶ Thus, we use price currents from coastal ports to fill in gaps in other to interpolate. In addition, we draw on the price notations in times of turbulent price developments, i.e. 1740-1749, 1756-1759 and 1763-1765. In these years products from 6-18 ports and market places are weighted equally to the Røros prices. Additionally, they serve

¹³ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

¹⁴ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

¹⁵ The State Archive of Bergen, Bergens Pric-Curant 1767-1818, made available by Ragnhild Hutchison.

¹⁶ Ølmheim and Stubhaug (2018, 24-28).

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as sources for establishing a few commodity series, which lack support in the Røros and Bergen series.¹⁷

The Røros data in principle consist of *ex ante* prices since they are price lists given at the supply office for the coming six months. They were published on the 1st of January and 1st of July almost every year. Normally these notations served as indicative prices, and they were followed closely. However, they could be replaced by deviant short-term prices in times of high inflation or deflation. Nevertheless, they were set on the basis of historical prices and contemporary prices at the time of the publication of the price lists. In order to get a grip on the price development during the last half year between July 1st and December 31st, we also apply the price list of January 1st of the coming year. This was set in late December of the previous year. Thus, we in reality take into consideration three observations per year.¹⁸

Also, the supply office had a retail monopoly in Røros. However, illegal trade was quite common, and in 1801 privileges were given to a handful of merchants in order to conduct trade in the mining town. Still, the supply office was the main provider of consumer goods.¹⁹ The competition and the increase in the inflation rate in the early 1800s, however, must have caused the office to alter the prices relative to the listing prices. This has been taken into consideration by using the list prices of January 1st the following year, set on the basis of the actual prices during the second half of the previous year.

Figure 10.3 shows a price list from the supply office of Røros from December 31st 1760. It was supposed to serve as a price list for the first half of the coming year 1761.

The available price currents from Bergen covering the period from 1767 onwards, in principle reported export, import, wholesale and production prices. However, they were set in what we can consider close to a spot market, and they contain some price data that should be considered indicative prices for retail sales to consumers.

Price lists for a coming period, mostly for the coming month, were established on *ex post* price observations recorded in previous periods, $t - n$, where $t - 1$, i.e. the last period, was the most important. Thus, these price currents reflect the movements of the actual price level. Prices were typically recorded as average prices estimated by eight to ten trusted brokers in Bergen. These were of different nationalities: German, Dutch, British and Norwegian. They reflect the fair share of the market. From the late 1830s, The Bergen Exchange took over the responsibility for collecting data and publishing the price currents. We basically use wholesale prices from Bergen, which are closest to retail prices. Additionally, a significant part of them could, as mentioned above, be considered retail prices.²⁰

When we have been able to use the Røros supply price lists from 1736 onwards, we also use the Bergen price currents from 1767 onwards. In addition, we use, as mentioned previously, price observations from 9-18 ports and market places to fill in gaps and in turbulent times with less reliable

¹⁷ Dhawan and Langdal (2018, 66-102).

¹⁸ Ølmheim and Stubhaug (2018, 29-32).

¹⁹ Sakrisvold (2017, 34-43).

²⁰ Klovland (2018, 185-211).



Figure 10.3 Supply price list for Røros. Source: www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister

data from Røros.²¹ This means that the new CLI basically consists of prices from the inland town of Røros for the period 1737-1767. Thereafter, we chiefly use average prices from both Røros and Bergen. The two are weighted equally. For some products, we have data from only one of these locations. In addition, we use complementary prices from other ports and market places in order to close gaps in the data sets.²²

1816-1830

The next period, 1816-1830, was, like the early 1800s, a very turbulent period in international and Norwegian economic history. Prices and currency exchange rates fluctuated widely. Thus, it is quite complicated to construct relevant price indices for this period. However, it is possible to do so on the basis of the listed prices from the Røros supply office and the Bergen price current.²³

We have been able to follow 44 consumption commodities during this period of time. Thus, they are included in our index covering the 1816-1830 period. The commodities represent ten different expenditure groups, i.e. grain, flour and bread, vegetables, fruits and berries, dairy products, meat, fish, colonial goods, beverages and tobacco, clothing and footwear, and finally, fuel and lighting.

The sources of these data are already presented in the elaboration of the data for the 1736-1816

²¹ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

²² www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

²³ The State Archive of Bergen, Bergen Pric-Curant 1767-1818, made available by Ragnhild Hutchison.

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period. However, it should be clear that the Bergen price currents become even more important in the index for this period, when the Røros data cease in coverage. Also, the Røros data here represent a period of more competition within retail trading in this important inland mining town. Thus, the indicative prices in the lists were probably not as precise as in previous lists.

We also use records from price currents elsewhere to interpolate in order to fill in gaps in the time series. These latter data are still compiled from the trade statistics project carried out by the independent research group, Historical Infrastructure.²⁴ Admittedly, also these data cease in magnitude from 1800 onwards. However, still some observations exist, mostly from ports in the west and mid-Norway. The two most common providers of data after Bergen and Røros, were the cities of Trondheim (Trondhjem) and Stavanger.

The first of these cities, Trondheim, is located close to the geographical centre of Norway, while Stavanger is located along the southwest coast. They respectively also served as the third and fourth biggest cities in the country. Today they make up the popular and economically dominant cities in their respective regions. Trondheim even hosted the headquarters of the Norwegian central bank 1816-1897.²⁵

It should be noted that the series covering this period is weaker in their statistical basis than those for the previous period 1736-1816. However, also the 1736-1816 series have their weak spans, i.e. basically the period 1800-1816, when the data coverage is more limited than before 1800. Nevertheless, the new CLI covering the years 1816-1830 stands out as considerably better and more valid and reliable than those constructed previously.

1830-1871

In the existing CPI-CLI constructed for the Norwegian central bank, the indices covering the period 1830-1871, stand out as far better than those constructed for previous years.²⁶ This is basically so due to the larger coverage of the data. However, it is still possible to improve the price index for this period due to new research on prices and consumption as well as more data available.

In the new CLI presented here we include 71 commodities, still representing ten expenditure groups, which are grain, flour and bread, vegetables, fruits and berries, dairy products, meat, fish, beverages and tobacco, colonial goods, clothing and footwear, and finally, fuel and lighting. These represent the bulk of actual consumption at the time. The fair share of the data is taken from reported market prices on consumption items. These were basically retail prices recorded at market places and general prices on consumption items recorded by the local magistrates in up to 40 urban communities around the country.²⁷ They were taken by public servants and assembled and quality checked by local magistrates at least quarterly. Thereafter, they were reported to the ministry of internal affairs,

²⁴ www.Lokalhistoriewiki.no: Historiske Toll- og Skipsanløpslister.

²⁵ Øksendal (2008).

²⁶ Grytten (2004b, 61-79).

²⁷ Wedervang Archive, W272.

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which again quality-checked and filed the different price observations as tools of social and taxation statistics.

They should be considered valid for our use, as they represent homogenous commodities collected at the same time by the same means and definitions in markets covering most of the country. Their reliability should be equally good, as they are recorded under strict supervision and have been through a double set of quality-checks. In the 1930s these data were included into the Wedervang Archive kept at the Norwegian School of Economics in Bergen. Due to their uniqueness and availability they have served as the major sources for most research-based cost of living indices for 19th century Norway.

Other sources are price currents and similar price quotations on normal prices per month. These are also to a large degree kept in the Wedervang Archive. These price quotations report prices on wholesale and consumption commodities in important markets of its time, e.g. Christiania, Bergen, Trondheim, Stavanger, Kristiansand, Fredrikstad, Drammen, Kristiansund, Aalesund, Bodø, Tromsø and other key locations²⁸ The data were to a great extent compiled on a monthly basis. The original sources were basically public records compiled by public servants, notations from market brokers, price lists and price currents from retail merchants.²⁹

We also draw information on prices on imported grain and flour to Norway, as these made up a significant part of the household consumption. Such prices were recorded in the most important import ports 1835-1910 and statistically processed and published by Statistics Norway in 1915. Admittedly, these prices are not retail prices. However, we only use them as a supplement to the reported retail prices on grain.³⁰

Figure 10.4 shows a manually recorded file from the Wedervang Archive kept at the Norwegian School of Economics. containing monthly and quarterly price data on representative retail goods from Norwegian towns in the 19th century.

As important supplements to these sources, we apply listed market prices from Kristiania, compiled by public servants and officials connected to the Kristiania Exchange. The statistical office of the city reported these on a monthly basis. In addition, we utilise fish prices compiled by the inspector of fisheries Fredrik Meltzer Wallem and processed by Dr Camilla Brautaset. These latter data help us to fill in lacunas in other sources.³¹

The ministry of internal affairs exchange rate adjusted some of the data compiled before 1843.³² In order to make this series relevant for a CPI-CLI they have been readjusted back to their current values according to historical exchange rates reported by the Norwegian central bank, Norges Bank.³³

²⁸ Wedervang Archive, W131, W269, W271 and W383.

²⁹ Wedervang Archive, W269.

³⁰ NOS VI. 23 (1915, 3*-5*).

³¹ NOS (1978, 523-525), Wallem (1888, 1893), Brautaset (2002, 63-71).

³² Wedervang Archive, W269 and W271.

³³ Grytten (2004b, 61-79).

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W. pr. 100kg	W. pr. 100kg	W. pr. 100kg	W. pr. 100kg	W. pr. 100kg	W. pr. 100kg
25.63 1	23.66	24.90	26.45 8	16.03 1	
21.29 11		30.15	32.20 8	22.62 7	
27.96 12		25.76	25.77 8	21.62 9	
18.43 11	18.59	17.51	23.39 6	19.01 12	
16.73 9	14.19	16.23	19.18 6	14.94 11	
13.45 12	12.59	14.84	14.81 1	14.54 7	
15.00 12	14.19	15.12	15.59 3	14.82 5	
16.29 10	17.28	16.54	17.66 4	16.18 6	
19.85 9	19.02	20.31	21.90 1	20.66 3	
27.25 5	24.65	26.59	26.42 6	24.19 7	
22.73 9	22.98	25.11	24.95 3	24.59 4	
19.05 9	17.19	18.52	17.94 5	19.58 5	
18.97 12	18.80	20.93	21.02 3	21.57 7	
15.83 12	15.99	16.53	17.66 8	17.20 6	
15.15 12	14.81	16.14	17.35 7	16.42 9	
16.05 11	14.66	16.98	17.60 9	15.93 8	
17.45 9	20.59	21.34	21.03 8	20.04 6	
24.81 7	27.44	27.09	25.24 1	24.02 2	
20.41 2	20.90	-	19.61 7	19.49 4	
-	17.09	18.65	19.24 4	19.89 10	
17.16 4	16.18	18.12	19.36 8	19.64 4	
16.33 7	17.09	18.90	19.36 7	18.56 6	
16.26 3	17.82	18.15	18.71 9	19.02 4	
23.80 6	22.63	23.01	23.54 2	24.54 3	
29.15 7	27.27	28.26	28.12 9	29.57 5	
31.41 7	26.32	31.20	28.54 6	32.28 2	
28.76 1	29.52	27.13	32.28 1	-	
26.54 1	25.02	23.45	23.96 4	22.73 4	
-	28.41	20.89	20.78 5	21.95 3	
20.16 5	19.27	20.31	-	20.76 3	
24.98 9	23.66	24.21	-	24.18 6	
25.88 2	26.22	22.42	-	-	
22.41 2	22.87	21.39	-	28.16 4	
-	17.76	20.25	22.45 4	20.73 7	
-	17.90	17.84	-	18.71 4	
-	17.66	-	-	19.63 5	
-	21.74	-	-	-	
-	21.75	-	-	-	
-	21.87	-	-	-	
-	22.20	-	-	-	
22.25 6	21.91	-	-	21.27 9	
25.36 12	22.53	-	-	-	
24.55 11	24.12	-	-	24.12 4	

Figure 10.4 Price list on retail commodities from the Wedervang Archive. Source: Wedervang Archive. W269.

1871-1910

As for the period 1871-1910, the available price data make it possible to include two more expenditure groups, i.e. transport and communication and housing. In addition, we are able to increase the number of representative goods from 71 for the period 1830-1871 to 111 for 1871-1910. When this index includes significantly more commodities than those constructed for the previous periods, it lacks the nationwide coverage for some time spells and commodity series.

We use 55 of the commodity price series from notations compiled in Kristiania (Oslo).³⁴ These made up all the commodities in Jan Ramstad's price index constructed for Oslo in 1982.³⁵ Sverre Ellingsæther has additionally been drawing on price information from 24-40 different locations all over the country in order to construct a price index including 96 representative commodities. We include these data in our new series. Thus, the new index has a better coverage both in respect of numbers and geography compared to Ramstad's index.

Ellingsæther constructed his index by adding new observations to Ramstad's index. The present CLI presented here rest on both the Ramstad and the Ellingsæther indices.³⁶ Additionally, we include series of another 15 commodities. These data are taken from private archives and the Wedervang Archive. They report prices in major cities like Kristiania, Bergen, Trondheim, Stavanger, Kristiansand, Drammen, Tromsø, Fredrikstad, Kristiansund, Aalesund and Hamar.³⁷

We have also discovered some errors in the previously compiled data sets. These have been corrected in the new index. A wider set of sources has also made it possible for us to make better interpolations than previously. The interpolations are basically carried out by following the annual trends of substitutional representative goods in the years of gaps in the data.

The bulk of the data comprising our new CLI are notations of monthly and in some cases quarterly marketplace prices from major cities, but also some medium-sized and smaller communities. All the main marketplaces in the four largest cities, Kristiania, Bergen, Trondheim and Stavanger are included. The second most important source is prices recorded by local public servants and Statistics Norway. Other primary sources are public institutions, e.g. hospitals, prisons, schools, social institutions and public ministries. We also derive data from private companies and archives. These data are all recorded in the Wedervang Archive and published in the central bank's CLI from 2004 and in Klovland's price indices.³⁸

Most of the prices in this new CLI are retail prices, but obviously substantial parts of our data are recorded wholesale and institutional prices.³⁹ This makes the validity of the series good, but not perfect. It is by far margin better than any previously constructed CLIs for this period. Surely, the reliability of the data seems to be quite good. as the bulk is reported and controlled by public decree or as private or public institutional accounting information.

³⁴ Wedervang Archive, W128, W137, W139, W206, W213, W219, W258, W275, W276, W382, W383, W384, W387 and W396.

³⁵ Ramstad (1982, 158-238).

³⁶ Ellingsæther (2007, 47-66).

³⁷ Wedervang Archive, Hodne and Grytten (1997, 373-374).

³⁸ Wedervang Archive, W386, Grytten (2004b, 79-93), Klovland (2018, 185-211).

³⁹ Klovland (2018, 185-211).

10.4 Sources

In conclusion, we consider the new annual price index, covering 1871-1910, as a valid and reliable CLI for Norway. It certainly represents a considerable improvement compared to existing indices for this period. Its representativeness has increased substantially regarding geography, commodities and expenditure groups compared to previously constructed CLIs for these years.

1910-1920

This period constitutes quite a problematic period for the construction of CLIs for Norway. In the first place, 1914-1920 represents a high inflation period due to the First World War and strong inflationary monetary policy during the war.⁴⁰ Secondly, the period in some sense represents a vacuum in cost of living indexing. The Statistical Office of Kristiania constructed its own CLI for the period 1901-1916, including 57 commodities and six expenditure groups, i.e. food, fuel and lighting, clothing and footwear, rent and miscellaneous.⁴¹ Thereafter, the Ministry of Social Affairs produced its own price index, including 53 commodities, in order to map the cost of living during the last years of the war and until the budget year 1918/1919. At that point, Statistics Norway took over the task.⁴²

Both the Ministry of Social Affairs' and the Kristiania Statistical Office's CLIs were constructed on the basis of a consumption survey for some of the largest regional cities in Norway in 1912 and 1913. These were Kristiania, Bergen, Trondheim, Kristiansand, Drammen and Hamar.⁴³ Both the Oslo index and the Ministry of Social Affairs index included continuous price observations on more than 50 commodities. The latter was recorded in 16 large and small communities all over the country.⁴⁴

Again, our new price index for this period rests on these data. By combining them and including additional sources we are able to include 125 representative commodities. These represent 13 expenditure groups. Those are grain, flour and bread, vegetables, fruits and berries, meat, fish, dairy products, colonial goods, beverages and tobacco, clothing and footwear, fuel and lighting, housing, transport and communication, and finally medical care and health. This rich coverage makes this index almost fully represent typical household consumption in the period.

The most important source for our data is Statistics Norway, which compiled monthly price data from 6-16 key urban areas for this period. These were basically published in the Statistical year-books and in the bulletin of social statistics.⁴⁵ In addition, Statistics Norway published branch price data for some main industries, such as agriculture and fisheries in addition to house rents.⁴⁶ By reorganising these data, it is possible to construct a set of price indices for wholesales, exports, imports, production, and consumer prices.

In addition, we still draw on price observations reported in the Wedervang Archive, private archives

⁴⁰ Eitrheim, Klovland and Øksendal (2016, 263-300).

⁴¹ Statistical Office of Kristiania (1916, 1-19).

⁴² Bye and Hægeland (2014).

⁴³ Statistical Office of Kristiania (1915).

⁴⁴ Statistical Office of Kristiania (1911, 166-175).

⁴⁵ NOS (1911-1924).

⁴⁶ NOS (1978, 523-536).

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and branch organizations, such as the national association for dairy producers.⁴⁷ Most of these data have been scrutinized by historians before. In consequence, their reliability has been checked and approved by experts in the field. When it comes to validity the data set we use is definitely better than those for the previous time periods presented here. Most of the price notations are retail prices on sale to consumers. Thus, they suit the purpose very well. Admittedly, we use some wholesale or marketplace prices to fill in the gaps or to establish some of the less central series.⁴⁸ However, the extent of these kinds of operations are limited.

In consequence, we conclude that the new CLI for the period 1910-1920 is far better than previously calculated CLIs for this period. Hence, it probably reflects the development of consumer prices for this period in a satisfactory manner.

Interpolations

In some of the series, in particular those which are stretching way back in time, we find gaps in the data. To some extent we fill these by drawing on alternative sources. For the two decades previous to 1800, we use price information given in the travel descriptions and diaries of Mary Wollstonecraft (1796), Thomas Robert Malthus (1799) and Edward Daniel Clarke (1799).⁴⁹ These distinguished scholars and writers all visited Norway towards the end of the eighteenth century. As for the first half of the nineteenth century, we find valid data in the books of Anton Martin Schweigaard and Maximilian Braun Tvethe, who both gave quantitative descriptions of the Norwegian economy and society at the time.⁵⁰

However, we have to do several interpolations on the commodity level. This is basically done by finding a weighted average of substitutes, i.e. commodities that are closest to the missing ones regarding attributes and price development. As an illustration, we for a shorter period during the 1700s chain the movements of North-German rye with Danish rye prices, when Danish observations are missing.

In some cases we also let production or wholesale prices serve as indicators of price movements for missing data in our series. This is possible by drawing on Klovland's extensive work on historical price indices.⁵¹ And as mentioned previously, up until the early 1700s, we still use some Danish prices in order to interpolate gaps in the Norwegian data.⁵²

1920-1959

As for the years from 1920 and later, we do not establish any new price index. This is due to the solid work on price indices by Statistics Norway from that time onwards. For the first more than 40 year period, 1919-1960, the bureau constructed a CLI. They first compiled prices of 120 representative

⁴⁷ Mork (1941, 277-278).

⁴⁸ Klovland (2018, 185-211).

⁴⁹ Wollstonecraft (1796), Malthus [1799] (1968).

⁵⁰ Schweigaard (1840), Tvethe (1848).

⁵¹ Klovland (2018, 164-211).

⁵² Falbe-Hansen (1869), Scharling (1869), Abildgren (2010, 2-24).

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commodities from 1920. In 1928 the number increased to 180. After The Second World War, the commodity sample included in the index passed 340 in 1949; and finally, it passed 700 in 1959. Thus, most of the relevant consumption goods and services were represented in the index.⁵³

As a procedure, Statistics Norway applied the standard Laspeyres approach to their CLI. However, their emphasis on consumption surveys made it possible to change the base year more often, which strengthens their index compared to ours. Their general index was an aggregation of a variation of sub-indices for different expenditure groups. Nevertheless, they could easily be summed up in seven sub-indices, representing food, beverages and tobacco, fuel and lighting, gas and electricity, clothing, house rent and other expenditure.⁵⁴

Also, the geographical coverage of their indices increased significantly over time. In 1919 prices were taken from retail sellers in 16 representative urban areas. It increased to 26 urban areas the following year. The town sample reached 31 in 1928 and 53 in 1949. Finally, it included 100 densely populated communities and areas in 1959.

Still, the choice of commodity weights, consumption items and the choice of urban retail prices revealed that the index reflected the cost of living for common working-class households. This is also reflected in the title given to this index, i.e. Statistics Norway's Cost of Living Index, which after The Second World War was considered a detailed, valid and reliable CLI of its time compared to similar indices for other western countries.⁵⁵

1959-1979

Statistics Norway adopted a consumer price index from 1959. The major difference from the previous cost of living index was that the new index reflected consumption costs not only for working-class households, but for all households. In addition, they added price data and consumption surveys including both urban and rural areas.⁵⁶ They introduced new commodities and expenditure groups, reflecting more of the steadily increasing consumption volume of services and luxurious goods.

The basis for the new index was household consumption surveys, decisive both for which representative commodities to include and their weight in the index. This demanded such surveys to be taken regularly. Consumption expenses were registered by means of detailed accounting and in some cases interviews. The net sample has varied from 1,000 to 1,500 households.

The index holds a sample of approximately 1,000 representative commodities. Corresponding prices have been collected from a representative sample of retailers and service establishments. In sum, Statistics Norway compiled 40,000 to 45,000 price observations per month. The data was thereafter summed up to a variation of sub-indices dependent on different time periods. However, these were often presented in ten expenditure groups, i.e. food, beverages and tobacco, clothing and

⁵³ NOS (1995, 289-293).

⁵⁴ NOS (1995, 298).

⁵⁵ Grytten (2004a, 71-73.)

⁵⁶ Johannessen (2014, 13-16).

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footwear, rent with fuel and heating, furniture and household equipment, medical care and health, transportation, recreation and education, and other goods and services.⁵⁷

1979-2021

Statistics Norway has refined its CPI from 1979 onwards by revising and adding extra expenditure groups and introducing $t - 1$ calculations, i.e. the weights of different commodities and expenditure groups are revised according to estimated consumption per year. Additionally, Statistics Norway has modernised its CPI considerably over the past decades. The CPI has in principle been transformed into a $t - 1$ -based index, a form of chain index through the annual splicing of index values where weights are continuously updated based on new consumption data. Additionally, Statistics Norway apply geometrical indices at the micro level. This is done for several reasons, including taking better account of price-motivated substitution effects of consumers. The CPI has also become better adapted to international standards, which makes it easier to compare to other countries' series.⁵⁸

The general CPI-index serves as the benchmark measure of inflation and deflation. In addition Statistics Norway also produces CPI-indices measuring underlying or core inflation.⁵⁹ Around the time when inflation targeting was introduced as a principal goal for monetary policy from March 2001, there was also renewed interest in core inflation. Hence, Statistics Norway started the production of price indices adjusted for energy commodity prices and direct taxes on commodities. One of these indices, denoted CPI-JAE, is still the most frequently reported benchmark measure of underlying or core inflation in Norway.

10.5 Revised and extended price index

By first aggregating commodity indices with representative weights we arrive at expenditure group price indices. Thereafter, we apply the given weights to the expenditure group indices and arrive at general indices for each sub-period. In order to construct a complete annual CLI-CPI 1492-2021, we have to splice the eleven series covering the eleven sub-periods.

Since the range and character of commodities change substantially, we limit ourselves to splice the expenditure group and general indices for the entire period in question. Additionally, we splice our new commodity price indices for the period 1736-1920. Different weights and variation in expenditure groups implies a lack of cross-period additivity between the expenditure group indices and the general index.

At the end years of each sub-period, we have overlapping observations. These allow us to calculate running series at three levels by splicing the series at the overlapping years. We then arrive at representative commodity and expenditure group series and a general index.

⁵⁷ Hov and Rochlenge (2014, 17-20).

⁵⁸ Rønnevik (2014a).

⁵⁹ See Rønnevik (2014b, 26-33).

10.5 Revised and extended price index

Due to the large consumption survey of 1912/1913, we have an impressive number of price observations and a fairly detailed picture of the consumption pattern at that point. Thus, we choose 1913 as our reference year. Sub-indices, which are not covered annually, are linked to this year by relating recorded prices to their reference year. This can be illustrated by an example: We do not have any sub-index of postal and electronic services before 1979. However, we are able to find the 1979 index value with the help of prices recorded for postal services in the 1912/1913 survey and similar prices in 1979.⁶⁰ Thus, we conclude with a CLI-CPI for the entire 530-year period 1492-2021. Figure 10.5 reports this new general series.

According to the new series, the annual compound rate of inflation for Norway 1492-2021, was close to 2.14 percent. By using a log-linear regression we arrive at an annual inflation rate of 1.98 percent. In other words, one may conclude that an inflation rate of around two percent has been a long-term normality.

Figure 10.5 and Figure 10.6 reveal a period of significant inflation in the sixteenth century, and thereafter substantial short-term variation, but long-term price stability in the seventeenth and eighteenth centuries. This was followed by a period of a significant increase in the price level and even hyperinflation during the Danish-Norwegian involvement from 1807 in the Napoleonic Wars and their aftermaths. 1808-1817. In 1813 the uncontrolled annual inflation rate reached its peak at 234.4 percent, according to the new series. From 1797 to 1817 total inflation amounted to an astonishing 12 517 percent.

⁶⁰ Statistical Office of Kristiania (1915, 56-61), www.ntnu.no/klv/portotakster.html: Portotakster i Norge.

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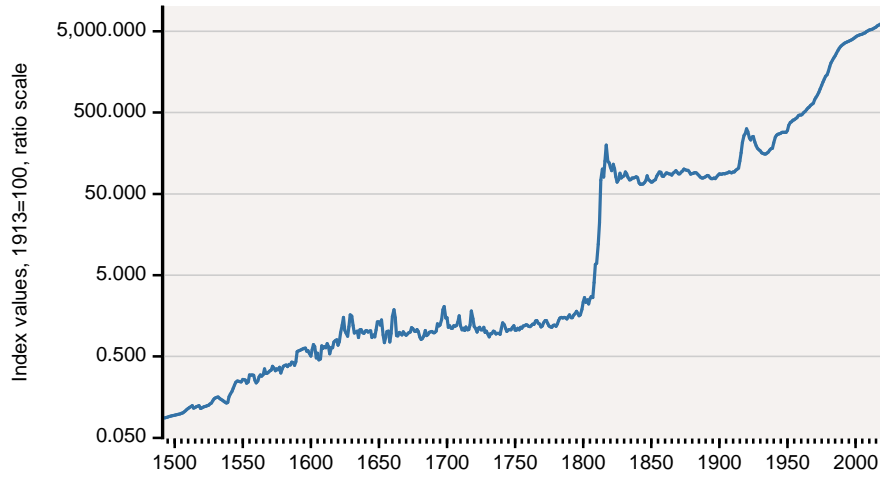


Figure 10.5 Revised and extended price index in HMFS, 1492-2021. Semi-logarithmic scale. (1913=100).

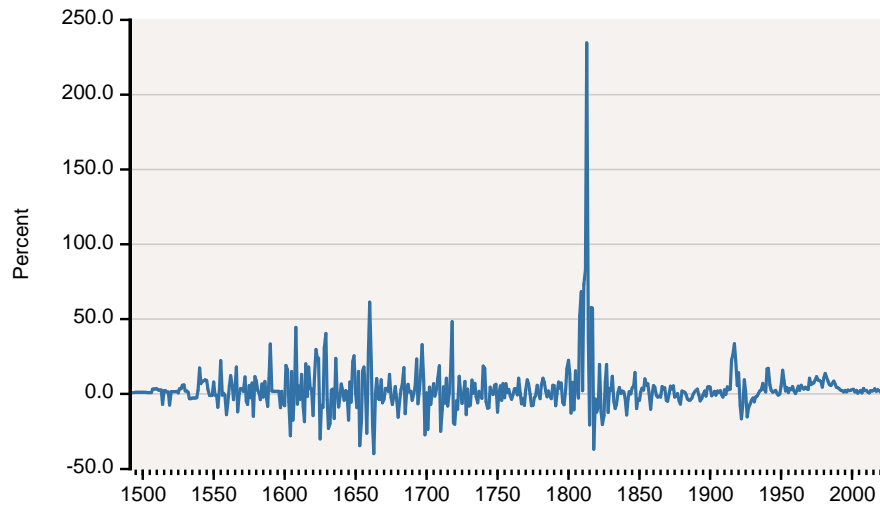


Figure 10.6 Annual inflation rates. Revised and extended price index in HMFS, 1493-2021.

10.5 Revised and extended price index

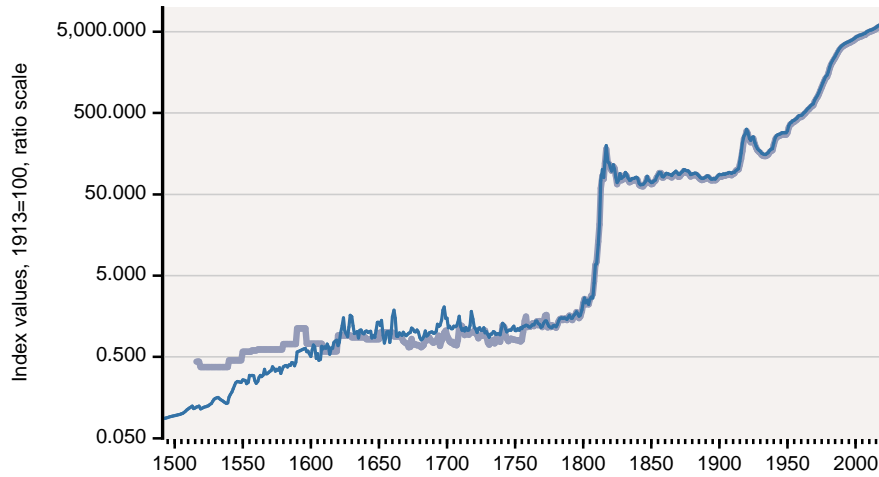


Figure 10.7 Revised and extended price index in HMFS vs. the old HMS II version, 1492-2018. Revisions are primarily in the 18th century. Semi-logarithmic scale. (1913=100).

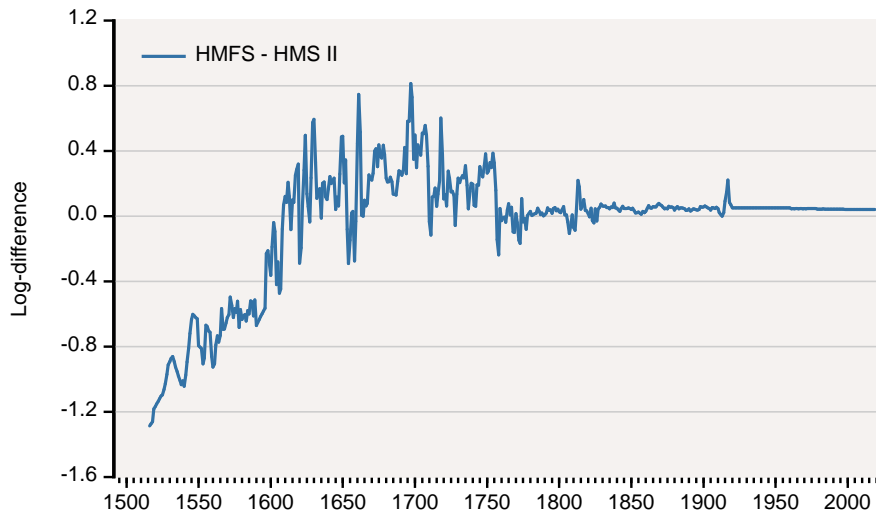


Figure 10.8 Revised and extended price index in HMFS vs. the old HMS II version, 1492-2018. Revisions are primarily in the 18th century. Log-differences.

10.6 Comparison with old CLI-CPI

In order to check the validity and reliability of the new series, we compare them with alternative price indices. In the first place, the new CLI-CPI should be compared to the old CLI-CPI published by the central bank.⁶¹ This comparison is shown in Figure 10.7 and Figure 10.8.

The new series gives estimates of annual prices for the entire period 1492-2021, whereas the old reported interval prices from 1516 until 1666, and thereafter annual prices 1666-2003.

Since the new series is constructed on the basis of higher numbers of commodities and observations, it should reflect a more valid and reliable picture of the price movements during these years than the old series does.

10.7 Comparison with alternative price indices

The new price index should also be compared with other relevant Norwegian historical price indices. First, we compare with Klovland's revised wholesale price index (WPI) for Norway 1767-1920 (Figure 10.9).⁶² When using the same splicing technique for the turbulent high inflation period 1813-1817, we find that the series show similar, but not identical short-term and long-term movements. It is hardly a surprise that we find slightly less volatile cost of living prices than wholesale prices. This mirrors that the sale prices of retail goods are normally more stable than wholesale, at least in the short run.

We also find that the wholesale and cost of living inflation rates during the First World War and its aftermath 1914-1920 become closer when we apply this new index. This makes it easier to reconcile the price gaps between wholesale and consumer commodities for this period, as the new CLI shows less divergence with the WPI.

The period from the early 1700s until the 1820s can be characterized as turbulent economy- and inflationary-wise. This was basically due to three major periods of war. The Great Nordic War (1700-1721). The Seven Years War (1756-1763) and the Napoleonic Wars (1803-1815). However, between the wars, we find significant periods of stability and growth in the Norwegian as well as in the international economy.⁶³ This economic stability was also mirrored in price stability.

Secondly, we can compare the new CLI-CPI with the alternative CLIs constructed by Ølmheim and Stubhaug for 1737-1816 and Dhawan and Langdal for 1737-1767.⁶⁴ Their alternative series make it possible to compare similar types of historical price indices, i.e. CLIs. Thus, we compare them visually in Figure 10.10.

Again we find satisfactory correspondence in short- and long-term price developments for these series. The Dhawan and Langdal index represents first-hand market prices, i.e. production and import

⁶¹ The old CLI-CPI is a revised version of the original CLI-CPI published in Grytten (2004a, 79-93) and was downloaded from www.norges-bank.no in 2018.

⁶² Klovland (2018, 185-211).

⁶³ Hutchison (2012).

⁶⁴ Ølmheim and Stubhaug (2018, 82-85), Dhawan and Langdal (2018, 89-91).

10.7 Comparison with alternative price indices

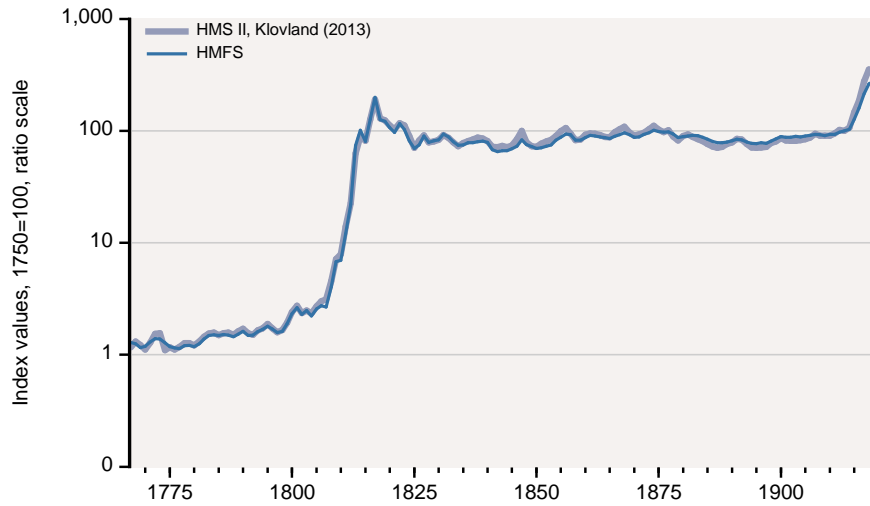


Figure 10.9 New price index in HMFS compared with alternative price indices. Compared with Klovland 1767-1920.

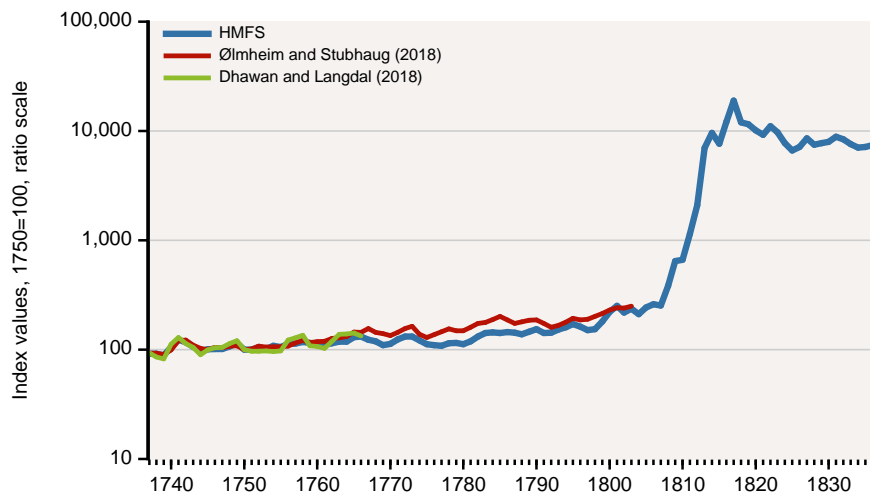


Figure 10.10 New price index in HMFS compared with alternative price indices. Compared with Ølmheim & Stubhaug and Dhawan & Langdal 1736-1816.

prices, to a greater extent than the two others. Hence, it does not come as a surprise that their series are slightly more volatile than our series.

From the 1760s until 1780 the Ølmheim and Stubhaug index comes out with slightly lower inflation rates than the new CLI-CPI. Thereafter, we find a catching-up process until 1800. This can basically be explained by a deliberate policy at the supply office in Røros. The supply managers set

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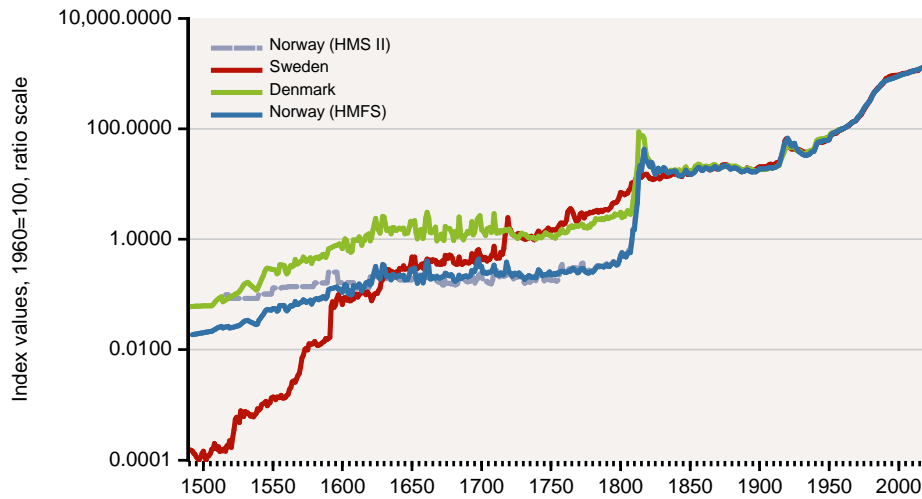


Figure 10.11 New Norwegian, Danish and Swedish CLI-CPI 1492-2021. Semi-logarithmic scale. (1913=100). Sources, Norway: this chapter, Denmark: see Abildgren (2010, 2-24), Sweden: see Edvinsson and Söderberg (2011, 270-292).

prices with low profit as means of social policy and in order to keep wages down.⁶⁵ Hence, we find price divergence between Ølmheim and Stubhaug's index on the one hand and the new index on the other hand. The supply office gave up this policy in the period 1780-1800. In consequence, we find price convergence for this latter period.⁶⁶

10.8 Comparison with Danish and Swedish CLI-CPIs

Finally, we compare the new Norwegian price index with similar series made for Sweden and Denmark. Rodney Edvinsson and Johan Söderberg constructed the Swedish historical cost of living index we use here, whereas Kim Abildgren constructed the Danish index (Figure 10.11).⁶⁷ Since Denmark and Norway basically had the same currency and currency system until 1813, it would be reasonable to assume fairly uniform price development between the two. Admittedly, possible exceptions could occur in years of shocks into the economy or due to substantial institutional differences. These could be differences in size and organisation of markets and how they were conducted.

As we can see there seems to be an evident and striking correlation between the two series. Additionally, the new Norwegian series corresponds better with the Danish than the old one. This can

⁶⁵ Sakrisvold (2017, 43-66).

⁶⁶ Ølmheim and Stubhaug (2018).

⁶⁷ See Edvinsson and Söderberg (2011, 270-292), Abildgren (2010, 2-24).

10.9 Conclusions

partly be explained by our inclusion of some Danish data up until 1665. However, the pattern seems to continue also after that period.

A striking difference is that the Danish inflation rate was higher than the Norwegian until the early 1600s. This can partly be explained by a relative fall in prices of grain to Norway and reduced transaction costs on imported commodities to Norway. Hence, the extra cost of shipped goods to Norway was falling. Thus, imported commodities to Norway recorded lower inflation rates than domestically produced grain to Denmark, which was under market protection from imported grains.

Additionally, the increase in foreign trade and fiercer competition over Norwegian exports gave way to a more efficient Norwegian economy with lower inflation than Denmark, which had taken advantage of these factors earlier.⁶⁸ Perhaps even more important was the Danish monopoly on exports of grain to Southern Norway during the period 1735-1788. However, they were not able to produce enough grain, but it gave them a privilege that made Danish and Norwegian prices on grain correspond better than before. And it made Norwegian prices of grain increase significantly.⁶⁹

We also find that the hyperinflation period in the early 1800s was stronger and longer in Norway than in Denmark. This is in line with the findings of Klovland and Abildgren.⁷⁰ It can be explained by the dismissal of the monetary union between the two nations, which implied that currency ties were broken. Finally, we will remark that the new Norwegian price index is more in line with the Danish than the old one during the eighteenth century. This is reassuring since the two countries had common currencies and common monetary policies at that time.

Due to heavy pressure on the state finances after decades of war, Sweden experienced higher inflation than both Denmark and Norway until the Napoleonic Wars.⁷¹ When long-term price stability prevailed in Denmark and Norway for most of the seventeenth and eighteenth centuries. This was certainly not the case for Sweden.

10.9 Conclusions

This chapter presents a new combined annual cost of living index (CLI) and consumer price index (CPI) for Norway for the period 1492 until 2021. It presents a combined index according to a standard Lapeyres approach. It includes several sub-indices according to time spells, expenditure groups and commodities. We have been able to include price data from six to 125 consumption items from 1492 until 1920. Thereafter, we apply a CLIs and a CPI from Statistics Norway for the years 1920-2021.

The new price index mostly reflect retail prices of consumer commodities. However, we use some appraisal, institution, wholesale, exports, imports and product prices in order to fill in gaps in our sources. The new combined price index is significantly better than the existing ones regarding both validity and reliability. Its coverage is substantially better and the data more precise and abundant.

⁶⁸ Bjørsvik and Solberg (1996).

⁶⁹ Herstad (2000).

⁷⁰ Klovland (2018, 185-211). Abildgren (2010, 2-24).

⁷¹ Magnusson (2000, 57-76).

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This is very much due to a better utilisation of data from the Wedervang Archive and several primary and secondary sources.

The new index makes it necessary to rewrite parts of Norwegian price history. In the first place, inflation was higher and more in line with neighbouring countries during the sixteenth and seventeenth centuries. Secondly, prices were significantly less volatile than reported in the old index until the mid-1800s. Thirdly, prices developed more in line with those of Denmark and Sweden in the eighteenth century. Thus, one does not find a shift to higher price levels in the 1750s as reported in the old index. Fourthly, consumer inflation was higher during the Napoleonic wars and the first world war than believed hitherto. All in all, it constitutes a more solid ground for understanding and explaining Norwegian historical price developments.

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10.A Appendix, Tables with commodity and expenditure group weights

Table 10.A.1 *Commodity and expenditure group weights 1665-1736. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.*

Commodity	Weights
Barley	0-34
Oat	0-34
Maslin	0-34
Rye	0-33
Imported barley	0-33
Imported oat	0-33
Grain	100 100
Food	100
General	100

10.A Appendix, Tables with commodity and expenditure group weights

Table 10.A.2 Commodity and expenditure group weights 1665-1736. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	
Barley	30-60	
Oat	20-40	
Rye	15-30	
Maslin	15-30	
Imported barley	20-40	
Grain	100	25
Barley flour	45-70	
Oat flour	15-30	
Oat meal	15-30	
Rye flour	25-70	
Flour	100	20
Peas	65-100	
Yellow peas	35-100	
Vegetables, fruits & berries	100	5
Stockfish round	30-60	
Stockfish split	30-60	
Clip fish	20-40	
Others	20-40	
Fish	100	20
Salt	100	
Colonial goods	100	5
Food		75
Beer	70-100	
Tobacco	30-100	
Beverages & tobacco	100	5
Linen	35-100	
Hemp	25-100	
Wool	40-100	
Clothing & footwear	100	20
General		100

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Table 10.A.3 Commodity and expenditure group weights 1736-1816. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights
Danish barley	3.5	French salt	33
English barley	3.5	Norwegian salt	34
Holstein barley	3.5	Spanish salt	33
Irish & Scottish barley	3.5	Salt	100
Norwegian barley	21	Colonial goods	100 5
Barley	35	Food	70
Danish oat	7	Braunsviger hops	12.5
Holstein oat	7	Dutch hops	12.5
Norwegian oat	21	Beer hops	25
Oat	35	Danish malt	16.25
Rostock & Holstein rye	6	Irish & Scottish malt	8.75
Koenigsberg & Riga rye	5	Beer malt	25
Danzig rye	5	Beverages	50
Danish rye	4	Tobacco mats	7.5
Rye	20	Dutch tobacco mats	7.5
Polish buckwheat	5	Trondhjem tobacco mats	10
German buckwheat	5	Tobacco mats	25
Buckwheat	10	Snuff tobacco	7.5
Grain	100 12	Dutch snuff tobacco	7.5
Barley flour	40	Trondhjems snuff tobacco	10
Oat flour	40	Processed tobacco	25
Rye flour	20	Tobacco	50
Flour	100 14	Beverages & tobacco	100 6
White peas	100	Riga hemp	13.75
Vegetables, fruits & berries	100 5	Unprocessed hemp	11.25
Butter	100	Hemp	25
Dairy products	100 7	Linen, supreme	20
Pork	20	Linen, inferior	10
Mutton	40	Wood linen	20
Beaf	40	Linen	50
Meat	100 13	Sacking of linen	15
Cod, round	20	Sacking of hemp	10
Cod, split	20	Sacking	25
Stockfish	40	Clothing & footwear	100 16
Clip fish	11	Tar	15
Salt fish	10	Tallow	15
Ling	7	Wood	65
Coalfish	8	Fish oil	5
Pollock	8	Fuel & lighting	100 8
Flounder	5		
Herring	11		
Fish	100 14	General	100

10.A Appendix, Tables with commodity and expenditure group weights

Table 10.A.4 Commodity and expenditure group weights 1816-1830. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights
Barley	35	Spirit	30
Oat	35	Malt	30
Rye	10	Beverages	60
Wheat	5	Div tobacco	40
Maslin	10	Tobacco	40
Rice	5	Beverages & tobacco	100 7
Grain	100 13	Hemp	15
Barley flour	30	Linnen	20
Oat flour	20	Sacking	15
Oat meal	20	Buckskin	15
Rye flour	20	Goatskin	15
Wheat flour	10	Calfskin	20
Flour	100 14	Clothing & footwear	100 15
Peas	50	Tallow	20
White peas	50	Tar	15
Vegetables, fruits & berries	100 7	Fish oil	15
Butter	60	Coal	15
Milk	40	Wood	35
Dairy products	100 7	Fuel & lighting	100 10
Pork	100		
Meat	100 11		
Cod, round	18		
Cod, split	18		
Stockfish	36		
Clip fish	10		
Salt fish	8		
Ling	6		
Coalfish	6		
Pollock	6		
Herring	14		
Fish oil	7		
Roe	7		
Fish	100 11		
Raffinade	30		
Sugar	40		
Salt	30		
Colonial goods	100 5		
Food	68	General	100

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Table 10.A.5 Commodity and expenditure group weights 1830-1871. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights	
Rye	15	Raffinade	20	
Wheat	10	Sugar	20	
Barley	30	Lump sugar	6	
Oat	20	Syrup	6	
Maslin	15	Coffee	15	
Rice	10	Coffee, grounded	15	
Grain	100	8	Salt	12
Rye flour	20	Vinegar & olive oil	6	
Oat flour	20	Colonial goods	100	
Barley flour	20	Food	64	
Wheat flour	20	Spirits	30	
Oatmeal	20	Malt	10	
Flour	100	Humulus	5	
Potatoes	70	Beer	25	
Peas	15	Beverages	70	
White peas	15	Tobacco, smoke	20	
Vegetables, fruits & berries	100	Snuff tobacco	10	
Butter	25	Tobacco	30	
Cream	12	Beverages & tobacco	100	
Cheese	25	Cotton	15	
Milk	25	Wool	15	
Eggs	13	Woolen goods	10	
Dairy products	100	Linen	10	
Grouse	5	Hemp	10	
Beef	23	Sacking	10	
Veal	10	Buckskin	10	
Mutton	21	Goatskin	10	
Lamb	7	Calfskin	10	
Pork	20	Clothing & footwear	100	
Game & poultry	7	Pinewood	14	
Goat	7	Whitewood	14	
Meat	100	Birchwood	18	
Herring	10	Wood	7	
Stockfish	10	Tallow	13	
Stockfish, round	8	Tar	8	
Stockfish, split	8	Fish oil	8	
Stockfish, pollock	7	Veg oil	7	
Clipfish	15	Coal	11	
Cod	22	Fuel & lighting	100	
Coalfish	10			
Fish oil, light	2			
Fish oil, dark	2			
Roe	3			
Others	3			
Fish	100	General	100	

10.A Appendix, Tables with commodity and expenditure group weights

Table 10.A.6 Commodity and expenditure group weights 1871-1910. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights	
Barley	25	Cod	20	
Oat	25	Coalfish	10	
Rye	13	Stockfish, round	5	
Wheat	13	Stockfish, split	5	
Maslin	13	Stockfish	5	
Rice	11	Clipfish	10	
Grain	100	4	Halibut	3
Barley flour	12	Salmon	4	
Oat flour	13	Mackerel	6	
Wheat flour	9	Herring	12	
Barley meal	6	Sprat	4	
Rye flour	9	Anchovy	2	
Potato flour	3	Lobster	3	
Oatmeal	5	Roe	3	
Sago meal	3	Fish oil, light	2	
White bread	10	Fish oil, medium	3	
Brown bread	20	Fish oil, black	3	
Rye bread	10	Fish	100	
Flour & bread	100	9	Allspice	2
White peas	5	Vinegar	4	
Peas	9	Honey	3	
Potatoes	58	Coffee	23	
Raisins	6	Cocoa bean	4	
Plums	8	Rock candy	3	
Berries	14	Cardamom	2	
Vegetables, fruits & berries	100	5	Curry	2
Egg	9	Pepper	5	
Cream	7	Raffinade	8	
Margarine	15	Salt	8	
Whole milk	16	Syrup	2	
Skimmed milk	7	Chocolate	3	
Butter	20	Sugar	15	
Farm butter	5	Tea	8	
Dairy butter	5	Farina, supreme	3	
Goat's cheese	8	Farina	3	
Fermented cheese	4	Icing sugar	2	
Soft cheese	4	Colonial goods	100	
Dairy products	100	12		
Pork	23			
Smoked pork	7			
Mutton	20			
Hazel grouse	3			
Veal	10			
Beef	30			
Black grouse	3			
Grouse	4			
Meat	100	8	Food	51

Annual cost of living/consumer price indices, 1492-2021

Table 10.A.7 Commodity and expenditure group weights 1871-1910 (continued). Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights
Tobacco smoke	40	Rent	55
Snuff tobacco	20	Misc housing	45
Tobacco	60	Housing	100 15
Beer	25	Train	60
Misc alcohol	15	Tram	40
Beverages	40	Travel & transport	100 4
Beverages & tobacco	100 3	Cleanser	34
Greased leather	15	Soap	43
Canvas	8	Medisintran	19
Linen	15	Natural ice	4
Shoe leather	12	Medical care & health	100 3
Wool	20		
Homespun	15		
Hides	5		
Dried skin	5		
Salted skin	5		
Clothing & footwear	100 17		
Birch wood	18		
Olive oil	5		
Pine wood	18		
Spruce wood	14		
Misc wood	5		
Coal	12		
Misc oil	7		
Paraffin	5		
Tallow	5		
Candles	5		
Fish og lignende	3		
Matches	3		
Fuel & lighting	100 7	General	100

10.A Appendix, Tables with commodity and expenditure group weights

Table 10.A.8 Commodity and expenditure group weights 1910-1920. Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights	
Barley	15	Beef. supreme	15	
Oat	15	Beef. secondary	15	
Maslin	10	Mutton. supreme	8	
Rye	15	Mutton. secondary	7	
Wheat	15	Salted mutton	8	
Rice	30	Veal, supreme	4	
Grain	100	3	Veal, secondary	4
Wheat flour	15	Veal, newborn	4	
Rye flour	9	Pork	8	
Oat flour	9	Bacon	8	
Oat meal	4	Bacon, American	8	
Oat meal, big	3	Game	3	
Oatmeal, American	2	Poultry	5	
Barley flour	10	Reindeer	3	
Barley meal	3	Meat	100	
Potato flour	2	8	Cod, round	6
Rice meal	5	Cod, fresh	10	
Rye bread	10	Cod, misc	5	
Malted bread	18	Cod, salted	5	
White bread	10	Cliffish	6	
Flour and bread	100	8	Stockfish, round	3
Peas	10	Stockfish, split	3	
Peas, yellow	10	Stockfish, pollock	3	
Potatoes	60	Roe	2	
Carrots and turnips	10	Herring, fresh	8	
Prunes	3	Herring, salted	8	
Berries and fruits	7	Halibut	3	
Vegetables, fruits & berries	100	4	Mackerel, fresh	10
Whole milk	12	Mackerel, salted	8	
Skimmed milk	6	Coalfish, fresh	6	
Sour whole milk	3	Coalfish, round	6	
Sour skimmed milk	3	Haddock	3	
Misc milk	4	Misc fish	3	
Butter, dairy	8	Fish oil, supreme	2	
Butter, mountain	4	Fish	100	
Butter	10	5	Coffee	10
Cream	5	Coffee, Java	8	
Sour cream	2	Coffee, Guatemala	8	
Margarine, supreme	6	Coffee, Santos	10	
Margarine, secondary	6	Rafinade	10	
Goats cheese	5	Sugar, crushed	5	
Brown cheese	5	Sugar, farina	5	
White cheese	6	Sugar	10	
Fermented cheese	2	Syrup	5	
Eggs	7	Chocolate	5	
Veg oil, superior	2	Chocolate, dark	5	
Veg oil, secondary	2	Cocoa bean	5	
Cod liver oil	2	Salt	7	
Dairy products and eggs	100	15	Spices	7
		Colonial goods	100	
		5	Food	48
	565			

Annual cost of living/consumer price indices, 1492-2021

Table 10.A.9 Commodity and expenditure group weights 1910-1920 (continued). Subgroups are marked in green, expenditure groups in light blue and the general price index in dark blue colours.

Commodity	Weights	Commodity	Weights
Beer	55	Rent	65
Malt	10	Timber	10
Tobacco	35	Saw timber	10
Beverages & tobacco	100	Maintenance	15
Hides	4	Housing	100
Calf skin	4	Cod liver oil, supreme	15
Goat skin	4	Soap	39
Cotton products	20	Cleanser	39
Wool	15	Natural ice	7
Woolen products	20	Medical care & health	100
Linen	3	Transport. tram	30
Linen products	10	Transport. train	50
Textiles	20	Hotel	20
Clothing & footwear	100	Transport and hotel	100
Oil, supreme	5		
Oil, secondary	5		
Coal	7		
Coke	13		
Pine wood	15		
Birchwood	20		
Spruce wood	17		
Misc wood	10		
Fish oil	3		
Tallow	5		
Fuel & lighting	100	General	100

Revisions and break-adjustments in composite house price indices

Øyvind Eitrheim

11.1 Introduction

Norges Bank published its first long time series for House Price Indices (HPIs) for Norway in 2004. In this chapter we publish a set of revised historical HPIs. The revisions reflect our own learning and practical experiences from using these HPIs for Norway over the past three decades. We have also benefitted from the participation in a working group on Historical Monetary and Financial Statistics (HMFS), which is today organized under the Irving Fisher Committee on Central Bank Statistics at the Bank for International Settlements (BIS). The working group has recently published a report on historical monetary and financial statistics for policymakers (Bignon et al., 2022). Methodological aspects related to the design and construction of HPIs are discussed in Eitrheim and Jobst (2022), which illustrates the complexities involved in the aggregation of price information on heterogeneous assets into an HPI for the country as a whole.

In addition, when we want to construct HPIs which cover a long historical period this will in practice force us to splice together HPIs of different types. In a later section we provide a short overview of different methods which are used today to construct HPIs. In practice the choice of method may be dictated by the availability of data from primary sources. This means that one may be severely restricted in choosing between these methods in subperiods when the availability of data is scarce. The box below provide a short summary of the splicing procedures we have used when we have constructed HPIs for Norway from 1819 onwards.

Splicing procedures

Sales-weights

The splicing of HPIs based on *sales-weights* involve the combination of five types of HPIs starting with *Repeat Sale HPIs* before 1985. From 1985 onwards we use HPIs produced in different private sector partnerships, first between The Real Estate Agents Association (NEF) and the Norwegian Building Research Institute (NBR), later in a partnership with a consultancy company Econ (see Econ (2004) for an overview). *Mix-adjustment HPIs* are used for the late 1980s. From 1989 onwards we use two types of *Hedonic HPIs*, one available on a quarterly or tertial basis from 1989 to 1996 and one available on a monthly basis from 1997 to 2013. Later, from 2014 onwards, we have used the monthly *SPAR-type HPI*, notably a *Sales Price to Predicted Price Ratio HPI*, produced by Eiendomsverdi AS.

Stock-weights

The splicing of HPIs based on *stock-weights* from 1985 onwards starts with *Mix-adjustment HPIs* for the late 1980s, which are spliced with the *Hedonic HPIs* produced by Econ from 1989 to 1991 followed by Statistics Norways quarterly *Hedonic HPI* from 1992 onwards.

11.1 Introduction

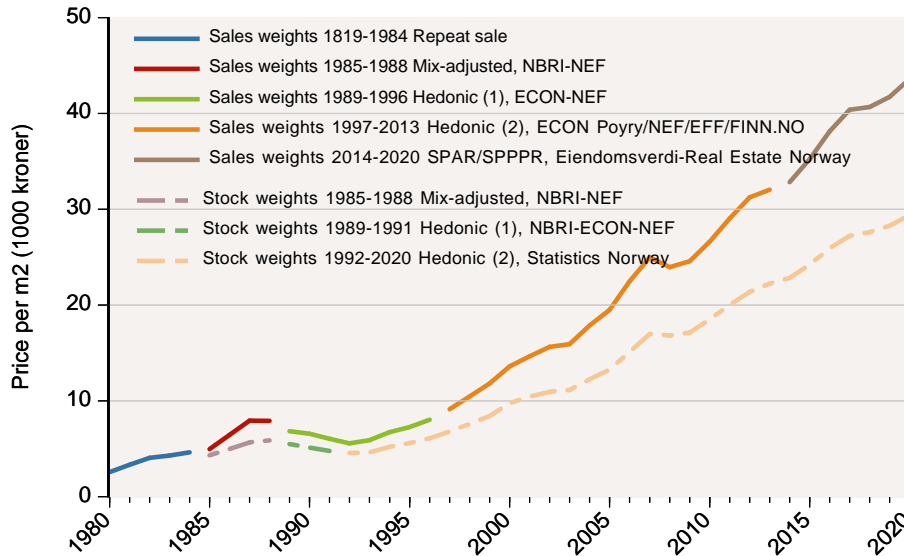


Figure 11.1 Sales-weighted and stock-weighted composite House Price Indices, 1980-2020. The data are expressed as prices per m² (in 1000 kroner). We have normalized the sales-weighted and stock-weighted HPIs, respectively, using benchmark estimates of the average price levels observed in 1985 provided in Econ (2004). A short description of the splicing procedure is provided in a box on the previous page.

Figure 11.1 shows the developments in HPIs in Norway since 1980, focusing on how we have spliced HPIs based on different methods when constructing *sales-weighted* vs. *stock-weighted* HPIs from 1985 onwards.¹ We see that the trends of the two HPIs differ from 1985 onwards. A short article by Baug, von Brasch and Takle (2018) zoom in on the 2010s and explains why this is the case between 2011 and 2017.

The remaining sections in this chapter discuss properties of the different types of HPIs we have combined to form the composite historical HPIs shown in Figure 11.1. We start with a short recapitulation of the first vintage of HPIs in HMS I (Eitrheim and Erlandsen, 2004), followed by a short overview of sales-weighted and stock-weighted HPIs. We provide a detailed historical account of the available HPIs for Norway from different sources from 1985 onwards.

We wrap up this chapter with two historical illustrations of long run trends in Norwegian housing prices. Firstly, we have provided a brief presentation of the *Kristiania crash*, a crash in the real estate market in the country's capital in 1899, illustrated by a comparison of real housing prices in the capital relative to the country average. Secondly, we have illustrated how housing prices have

¹ Here *sales-weights* denotes the case where aggregated HPIs are constructed using sample specific weights calculated from the actual sample of houses sold in a particular period, whereas *stock-weights* denotes the case where aggregated HPIs are constructed using weights based on the entire population of houses in Norway.

developed relative to the wage level, using wage data from Grytten (2007). See also Chapter 14 in this volume for more details about the aggregated historical wage data.²

11.2 The first vintage of composite historical HPIs in HMS I

In order to construct the composite housing price indices published in HMS I we combined HPIs from two different sources, which were based on different methods of construction. For the 1800s and 1900s until 1985 we employed the repeat sale HPIs reported in Eitrheim and Erlandsen (2004, 2005). From 1985 onwards we spliced these HPIs with HPIs which had been published by the Norwegian Association of Real Estate Agents (NEF). The basis for these HPIs were observed transaction prices collected by NEF, from the early 2000s in collaboration with the Association of Real Estate Undertakings (EFF) and the internet adviser FINN.NO.³

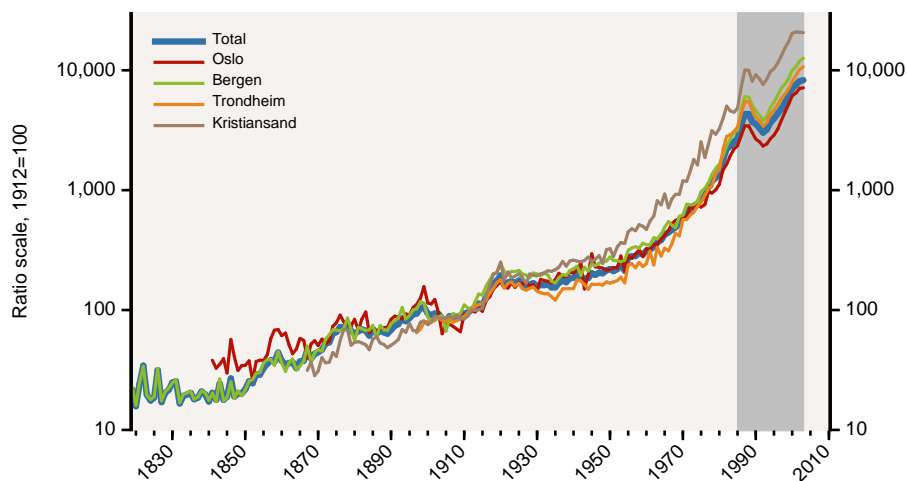


Figure 11.2 Composite House Price Indices (HPIs) in HMS I (2004). Repeat sale based HPIs are combined with HPIs based on hedonic regressions from 1985 onwards (shaded in grey). Ratio scale, 1912=100

Figure 11.2 shows the composite historical House Price Indices (HPIs) as they were published in HMS I (2004) including data until 2003.

The present study of the revision history of the HPIs will provide useful information about the

² Thanks to André Kallåk Anundsen and Lisa Reiakvam for thoughtful comments to a previous draft of some of the sections in this chapter. Thanks also to the members of the HMFS BIS project for input, in particular to Marc Flandreau, Clemens Jobst and Jan F. Qvigstad. The views expressed in this paper are solely those of the author.

³ For most of the period from the early 1990s onwards these were hedonic HPIs constructed by a private consulting firm Econ in a partnership with NEF and from 2002 on also with EFF and FINN.NO. For the period from 1985 onwards NEF had published weighted average housing prices (a form of mix-adjusted HPIs) for the years 1985-1988 and from 1989 onwards they published hedonic HPIs which were calculated by Norwegian Building Research (NBR) in a joint partnership. Section 11.5 below provides a brief description of the history of modern era HPIs in Norway from 1985 onwards.

11.2 The first vintage of composite historical HPIs in HMS I

need to make break-adjustments in the updated and revised composite national HPI we employ in *HMFS for Norway*. Before we dig deeper into the details of the calculation of national HPIs and their revisions in realtime it may be useful to take a bird's perspective on the "modern era" of HPIs from 1985 onwards. This corresponds to the grey-shaded area shown in Figure 11.2.

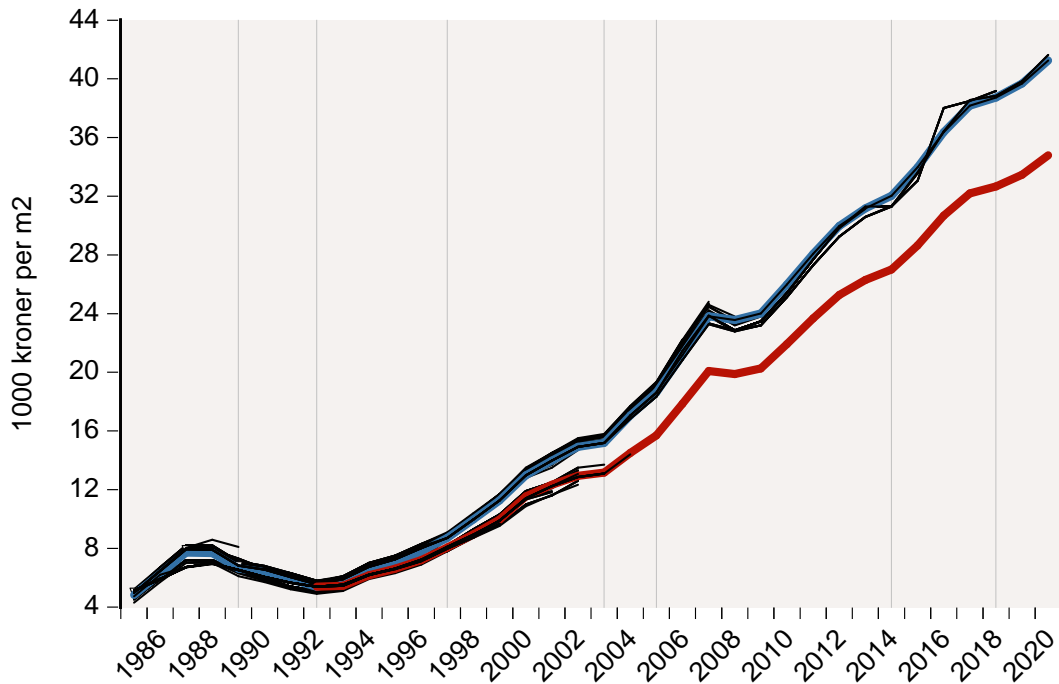


Figure 11.3 A collection of 88 House Price Indices (HPIs) for Norway for the period 1985-2020 (in 1000 kroner per square meter). HPIs which were originally normalized to 100 in a base year have been rescaled such that their value in 1992 is set to, respectively, 5 293 kroner per square meter (*stock-weighted*) and 5 543 kroner per square meter (*sales-weighted*). The main distinction between the two groups in this graph relates to whether the HPIs are based on sales-weights (represented in blue) or housing stock-weights (represented in red).

Figure 11.3 shows a collection of 88 aggregated national HPIs observed in realtime for Norway. The data are produced and published by different agencies and institutions since the mid 1980s onwards. For HPIs that were originally normalized to 100 in a base year we have rescaled these such that their value in 1992 is set to, respectively, 5 293 kroner per square meter (*stock-weighted*) and 5 543 kroner per square meter (*sales-weighted*), whereas HPIs that were originally reported in prices per square meter have been left "as is". This figure shows that although there seems to have been numerous revisions in these HPIs in real-time as they were updated, the HPIs seems to fall quite

Revisions and break-adjustments in house price indices

neatly into one of two main categories of HPIs, depending on whether they are based on *housing stock-weights* or *sales-weights*.⁴

A main purpose of this exercise is to describe the sources and methods behind these HPIs which will help us understand their complicated revision history since the first HPIs of the "modern era" appeared around 1985. This exercise will also provide insights in properties of the first vintage of composite historical HPIs published in HMS I (2004), and it will be a useful guide when we revise the composite national HPI and regional HPIs for this *HMFS for Norway* project. We will also give a brief account of the history of national HPIs in Norway since 1985.

11.3 A brief overview of sales-weighted and stock-weighted HPIs for Norway

Figure 11.3 illustrates that revisions in HPIs have been frequent and there are also several examples of level shifts in the data series. These shifts represent key differences underlying these individual HPIs, such as the type of model used to control for quality differences in the sample or the choice of weights used in the aggregation procedure. We will provide more details on this below. The key message we take out from Figure 11.3 is that the HPIs seem to follow distinct trends as we observe the developments from the early 1990s onwards depending on whether the HPIs are based on *housing stock-weights* or *sales weights*.

In the following subsections we will discuss the main sources behind these revisions and shifts in further detail. Furthermore, this section also draws on related work in the HMFS-BIS project mentioned in Chapter 1, which involves ongoing work in ten central banks on the collection and documentation of historical monetary and financial data, including house prices.

- The *HMFS for Norway* project offered an opportunity to conduct a broader evaluation of the sources and methods available to construct long runs of composite historical HPIs for Norway.
- We detected a break in the updates from 2014 to 2018 right after the transition to NEF/Eiendomsverdi, which required correction to make the HPIs consistent with previous constant-quality HPIs.
- The evaluation revealed numerous breaks in real time updates of the hedonic HPIs produced by NEF/FINN/Econ. In a study we have evaluated the real-time properties of a wide range of monthly, quarterly and annual HPIs from this source across the period 1985-2013 (Eitrheim, 2022). Over this period the production and publication of HPIs was becoming more frequent and extensive, the number of regions which were covered increased, quarterly updates appeared from 1994 onwards and monthly updates replaced the quarterly reports in 2002.
- The brief history of HPIs from 1985 have reminded us about changes in aggregation procedures in 1996 and 2004, respectively, when house stock-weights first replaced sales weights in 1996 and

⁴ Figure 11.3 thus corroborates the view stated in Eurostat's Handbook on Residential Property Price Indices (RPPIs) in Eurostat (2013, 1.6 on page 14), "Broadly speaking, two separate types of RPPi can be distinguished: a constant quality price index for the stock of residential housing at a particular moment in time and a constant quality price index for residential property sales that took place during a particular period of time. The construction of these two types of index will be different; most particularly, the weighting associated with the two types will differ."

11.4 Econometric approaches to estimating HPIs

the years thereafter until this was reversed from 2004 onwards, and sales-weights have replaced house stock-weights thereafter.

- There is also a need to account for the sequence of breaks observed in 1997 due to real-time updating procedures and annual revisions of hedonic model estimates from 1997 onwards. There were also adjustments due to the enlargement of the sample of transaction prices from 2002 onwards when one started to use data collected by FINN.NO. See Eitrheim (2022) and Section 11.6 for more details.
- The changes in HPIs produced before and after 2013 needs some explanation. Unfortunately we lack comprehensive documentation of the SPAR-type HPIs produced by Eiendomsverdi AS in collaboration with NEF & FINN.NO. Access to data from Eiendomsverdi is subject to a licencing agreement and the data are not available in the public domain (private sector data).
- Quarterly HPIs produced by Statistics Norway are publicly available for the period back to 1991 for the total country, and from 2005 for regions similar (but not equal) to the cities covered by the repeat sale based housing price indices presented in HMS I.

Before we continue and explore in more detail the properties of the available vintages of aggregated HPIs in Norway since the mid 1980s we will provide some background and history of their sources and methods of construction.

Before we discuss the details of the different HPIs shown in Figure 11.3 it is useful to provide some background and a brief presentation of the main types of HPIs we consider in this chapter.

11.4 Econometric approaches to estimating HPIs

The construction of HPIs raise methodological problems primarily due to two main characteristics of the housing market. Firstly, houses are inherently heterogeneous in nature because of obvious quality differences between houses of different dwelling type, size, amenities and location. Secondly, houses are put to the market only infrequently. Typically, less than ten percent of the housing stock is subject to a sale/purchase transaction in any given year. In the following we provide a brief overview of the most common methods used to construct HPIs.⁵

We distinguish between crude average based HPIs and constant-quality HPIs. When we consider long runs of HPIs we have to combine different types of HPIs such as we have seen above. Depending on the amount of details available on house sales in a given period one may use different methods to control for quality differences when constructing HPIs from sample observations of transaction prices. We refer to Eitrheim and Jobst (2022) for a broader discussion of methodological aspects related to the design and construction of historical HPIs.

⁵ An international overview of HPIs appeared in BIS (2005) and offered some recommendations for future work. International standards on HPIs appeared in Eurostat (2013), Handbook on Residential Property Price Indices (RPPI handbook) and Eurostat (2017), Technical manual on Owner-Occupied Housing and House Price Indices (OOH manual).

Crude average HPIs

House price indices based on only broad summary statistics, such as the annual mean or median sales price, may be of some interest as they are readily available, albeit crude, indicators of house price developments. But it is important to recognize that such crude indicators might be heavily affected by compositional effects if the houses, which are traded in a given year, have a composition which changes from year to year, reflecting differences in quality, relating to the size, amenities, geographical location, etc. of the houses being traded. The quality of a given house may also change over time as a result of renovation and/or depreciation.

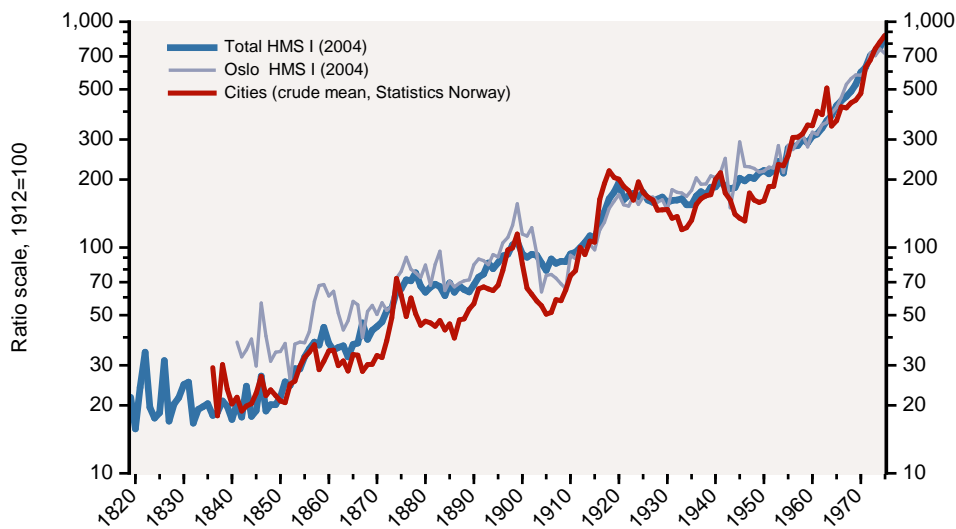


Figure 11.4 A comparison of composite historical HPIs in HMS I (2004) with the crude average property price HPI for Norwegian cities published by Statistics Norway from 1836 to 1975.

One example of a crude average HPI is the average property price for Norwegian cities which was published by Statistics Norway from 1836 until 1975. These data are shown in Figure 11.4 together with the Total and Oslo constant-quality HPIs published in HMS I (2004).⁶ The crude average HPI for Norwegian cities shown as the red line is clearly more volatile and shows larger swings compared with the two constant-quality HPIs in Figure 11.4. But in some of the periods with large swings in the 1800s, the crude HPI from Statistics Norway matches the development in the constant-quality HPI for Oslo (which was named Kristiania until 1925), in particular this seems to be the case during the buildup period before the Kristiania crash in 1899. We will return to this episode in a later section. From 1920 onwards Figure 11.4 shows that both constant-quality HPIs are less volatile in comparison with the crude HPI for Norwegian cities. We suspect that this has to do with changes in

⁶ See Eitheim and Erlandsen (2004, 2005).

11.4 Econometric approaches to estimating HPIs

the composition of property sales, at least this is a reasonable hypothesis during the crisis years of the 1920s. Interestingly, the constant-quality HPIs show only a moderate downward trend during the deflation years of the 1920s and early 1930s. We will therefore expect to see a significant rise in real house prices measured this way during these years.

Constant-quality HPIs

The following list give an overview of the methods which are typically being used to control for quality differences in HPIs. We note that for many countries constant quality-HPIs will often be available only for the past two or three decades or so. Their availability may also be limited in the public domain in cases when constant quality-HPIs are provided by one or more private companies subject to subscription and licencing conditions.

- 1 Mix-adjustment (stratified)
- 2 Hedonic model (data intensive)
- 3 Repeat Sale (wasteful of data)
- 4 Sales Price to Appraisal Ratio (SPAR)
- 5 Hybrid models combining 2 & 3 or 2 & 4

The methods for constructing HPIs we have listed above differ in their requirements for data input. The hedonic model is by far the most data intensive as it needs data on both sales prices and all available house characteristics required to form a well specified hedonic regression model from which the HPI can be backed out. The SPAR method requires data on sales prices and a matching appraisal value for each house in order to form the sales price to appraisal ratios, which constitute the basis for calculating the HPI. The repeat sale model only needs data on the sales price but restricts the sample to contain only those houses, for which matching pairs of two consecutive sales prices exist. The repeat sale method also require that the depreciation of the house which takes place between the times of two consecutive sales should match the upgrading and maintenance of the house during the same period.

11.5 A brief history of modern era HPIs in Norway from 1985 onwards

The Norwegian housing and credit markets were deregulated in the 1980s.⁷ A credit-fueled boom-to-bust episode developed and resulted eventually in a fully fledged banking crisis in Norway from 1988 onwards. The housing price bubble which emanated during these years triggered a lot of interest in HPIs, but the information available at that time was scarce.⁸

It may seem like a paradox in hindsight, but Statistics Norway had discontinued the reporting of their crude HPI-measure only a decade earlier (Figure 11.4). Statistics Norway had been reporting a small set of crude average property prices since 1836. For some reason, which is not known to the author of this chapter, these crude HPIs were discontinued in 1975, maybe because they were regarded as being of insufficient quality.

There was also a growing interest in HPIs internationally. The BIS started to pay closer attention to developments in property markets in the late 1980s and early 1990s. It was also recognized that there were numerous challenges involved in collecting good house price data. The time was ripe for a new era of HPIs to emerge on the scene, which could be of help to evaluate the developments in real estate and residential housing markets and their effects on the real economy.

The strong credit growth helped fuel the strong growth in housing prices as well as strong growth in GDP, in particular in private consumption and investment. This strong growth in private consumption was, however, largely undetected in the National Accounts data, in particular for 1985, and were subject to large revisions as described in a study of real-time data uncertainty and monetary policy by one of the editors of this volume (Qvigstad, 2001).

The role of housing prices as an explanatory factor for the cyclical behaviour of household saving in Norway was discussed in empirical studies of wealth effects on private consumption (Brodin, 1988; Brodin and Nymoen, 1992). These interactions between private consumption, household income and household wealth were also important building blocks in the household sector submodel of Norges Bank's macro model RIMINI (Bårdsen, Eitrheim, Jansen and Nymoen, 2005, Chapter 2).⁹

Equipped with better HPIs it became possible to make useful empirical models of housing prices, which were grafted into RIMINI from 1993 onwards (Eitrheim, 1993, 1994). These HPIs, which will be described in more detail below, entered into RIMINI's submodel for the household sector to help capture the interaction between housing prices and credit to households. Furthermore, on the basis of these submodels a set of indicators of financial fragility was also derived and integrated in RIMINI as explained in a BIS paper (Eitrheim and Gulbrandsen, 2001).

⁷ See Krogh (2010) for a detailed discussion of how the use of regulatory instruments of the 1965 Credit Act was changed in this period.

⁸ This bubble episode and that of the Kristiania crash in 1899 are among the 23 bubble episodes which were discussed in Brunnermeier and Schnabel (2016).

⁹ RIMINI is an acronym for a model for the Real economy and Income accounts – a MINI version. RIMINI was used by Norges Bank from the early 1990s until 2003 as a tool for making projections 4-8 quarters ahead as part of the bank's Inflation reports (Olsen and Wulfsberg, 2001). See also Berg and Kleivset (2014) for an overview of methodological developments in Norges Bank in the period 2001-2013.

11.5 A brief history of modern era HPIs in Norway from 1985 onwards

HPIs produced in partnerships with the Real Estate Agents Association (NEF)

A set of constant-quality HPIs for Norway are available from 1985 onwards. A private partnership was established in the late 1980s between the Real Estate Agents Association (NEF) and the Norwegian Building Research Institute (NBRI).¹⁰

The NEF-NBRI partnership produced a small set of sales-weighted hedonic HPIs which covered the period from 1989 onwards. For the period 1985-1988 a set of HPIs were constructed as crude average prices of observed sales prices for different dwelling types. Two sets of aggregated HPIs were made available from these, using either sales weights or stock weights. We denote these as mix-adjustment HPIs for these years.

The first constant-quality HPIs for Norway appeared in 1989 in two reports from NBRI, which reported estimates of HPIs based on hedonic regressions across three different dwelling types for each of the final three quarters of 1989. The main gain from these hedonic regressions was that they controlled for differences in size of the houses which were traded in each period and their location. The published HPIs were based on assumptions about a representative size of each of the three dwelling types, apartments, semi-detached homes and single homes. These representative sizes were based on sales-weights, i.e. on the average size of houses of each dwelling type which were traded across the three quarters in 1989 for which it was considered to be a sufficient number of sample observations. In addition there were estimates of HPIs across size groups for each dwelling type ranging across small, medium and large units. Regional HPIs were provided for four distinct geographical areas. In 1990 NBRI published three tertial reports each of which covered consecutive four-months periods.

In 1991 a consultancy company, Econ, took over as NEF's partner and continued to construct and update sales-weighted hedonic HPIs three times each year, and from 1994 on a quarterly basis. The published HPIs were predominantly sales-weighted until 1996 when Econ made changes both in the underlying model and in the weighting scheme. They still used sales-weights to form average prices for different dwelling types but the national HPI was from 1996 onwards based on stock-weights for these dwelling types using weights from the 1990 population and housing census. All HPIs were revised back to 1985 and we will see examples of the level shifts caused by the changes in weights in a later paragraph.

A substantial change took place in 2002 when the Association of Real Estate Undertakings (EFF, from 2014 Real Estate Norway) and the internet advertiser FINN.NO joined the partnership.¹¹ The set of transaction data underlying the reported HPIs was then substantially enlarged as FINN.NO, who collects data on behalf of the members of Real Estate Norway, contributed with IT-technology

¹⁰ The Norwegian Building Research Institute (NBRI) was originally established in 1946 as a free standing research institute in the public sector. With the increased interest in housing prices in Norway after the deregulation of housing markets in the early 1980s a few researchers at NBRI started to work on HPIs and joined this partnership with NEF which lasted until 1991. In 2007 NBRI joined the research organization SINTEF and was included into Sintef Building Research, which has thereafter expanded its research and marketing activities. In 2019 Sintef Building Research changed its name to Sintef Community.

¹¹ EFF/Real Estate Norway is since 2002 the owner and rights holder of these HPI statistics but continued the joint partnership and cooperation with NEF.

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which could collect transaction data more effectively. Regional HPIs were from January 2002 onwards published on a monthly basis and the enlargement of the data set also allowed for HPIs to be calculated for a larger number of geographical regions. The national HPI was revised using monthly data going all the way back to January 1997 whereas the monthly HPIs with a higher degree of regional granulation started in January 2002.

The Econ/NEF/EFF/FINN.NO partnership continued for more than two decades from 1991 through 2013. A substantial revision took place in 2004 when they decided to revise the weighting scheme in a way which affected the regional HPIs for the different dwelling types and consequently the national aggregated HPIs. One effect of this revision was that it reversed the 1996 decision such that the HPIs were again from 2004 onwards based on sales-weights rather than on stock-weights. This would in itself cause a new shift in HPI levels. It was however also decided that the HPIs from 2004 onwards should be based on a set of weights and assumptions about the representative size of each dwelling type which was updated on an annual basis.

The new aggregation methods implied that the history of HPI levels would change back to 1997 each time the weights were updated. This was as a consequence of the decision to let the HPIs from 2004 onwards be based on weights which were updated on an annual basis while the history of HPI levels before 2004 would be calculated on the basis of fixed weights and extrapolated backwards using historical growth rates. In Econ (2004) and the subsequent reports it was stated that these changes were small. We have looked at this in more detail and conclude that the accumulated revisions back to 1997 are of a magnitude which calls for a break-adjustment in 1996/1997.

In 2007 Econ merged into the Finnish consultancy company Pöyry and formed its Norwegian branch Econ Pöyry. The joint partnership between Econ Pöyry/NEF/EFF/FINN.NO continued and produced monthly updates of HPIs throughout the year 2013. In total the HPIs from this partnership cover the period 1985-2013, and on different frequencies, monthly, quarterly and annual. Annual data for the national HPI are available from 1985, quarterly data from the late 1980s and monthly data from 1997 onwards. We will look at the revision history of the national HPI in more detail in a later subsection.

This private sector partnership changed in 2014. A newly established company Eiendomsverdi AS, which is owned by four of the largest banking constellations in Norway, DNB, Sparebank 1, Eika and Nordea, joined a new partnership with Real Estate Norway, and they took over from Econ Pöyry the task of constructing monthly HPIs using transaction data from FINN.NO. Real Estate Norway owns and publishes The Norwegian Housing Price Statistics in cooperation with Eiendomsverdi AS and FINN Eiendom AS. In doing this Eiendomsverdi decided to apply a different methodology, a variant of the SPAR-method (Sales Price to Assessed price Ratio) briefly mentioned above, but where predictions from hedonic models are used to form the appraisal values in what we will denote as SPAR-type HPIs or Sales Price to Predicted Price Ratios HPIs (SPPPR HPIs). This set of SPAR-type HPIs have been calculated back to January 2003, which is still used as basis month-year and set equal to 100. Unfortunately, there is only a brief description available which explains the main

11.5 A brief history of modern era HPIs in Norway from 1985 onwards

elements of the econometrics behind the construction of SPAR-type HPIs from Eiendomsverdi. We will return to this in a paragraph below on revisions in the national HPIs.

We may summarize and note that the Norwegian Association of Real Estate Agents (NEF) contributed to the production of HPIs from the mid-1980s onwards, in different private sector partnerships, since 2002 with Real Estate Norway as the owner and rights holder of these HPI statistics. Their current partnership with Eiendomsverdi AS can be seen as the fifth generation of such arrangements, as briefly summarized in the following list.

- 1985-1988 Crude measures of average prices for some housing types with no further adjustments for quality differences. The first vintages of housing price statistics cover the years 1985-1988 and show crude average prices for different type of dwellings across different regions. The mix-adjustment HPIs for these years do not control for house size or other quality variables.
- 1989-1995 Hedonic HPIs were initially produced by NBRI/NEF until 1991 when Econ took over as partner. The HPIs were based on hedonic regressions controlling for house size and location. Econ/NEF calculated HPIs for up to 19 regions and three housing types. From 1992 onwards these HPIs were updated on a quarterly basis. A stock-weighted national HPI was calculated from estimates of sales-weighted national HPIs for the different type of dwellings.
- 1996-2001 Hedonic HPIs were based on a revised model developed by Econ/NEF. The HPIs were calculated for up to 39 regions and were updated on a quarterly basis. The HPIs were recalculated from 1985 onwards and reported for single homes with size 150 m², semi-detached homes with size 115 m² and apartments with size 80 m², respectively. A stock-weighted national HPI were calculated from estimates of sales-weighted national HPIs for the different dwelling types assuming constant dwelling sizes.
- 2002-2003 Hedonic HPIs were calculated by Econ/NEF/EFF/FINN.NO for up to 39 regions, from now on using data from the internet advertiser FINN.NO which joined in as a partner together with NEF, EFF and Econ. Since January 2002 on a monthly basis using data from 1997 in the estimation. A stock-weighted monthly HPI for the national HPI is available from January 1997. Regional monthly HPIs are reported from January 2002.
- 2004-2013 Hedonic HPIs were calculated by Econ/NEF/EFF/FINN.NO for up to 52 regions, on a monthly basis using data starting in January 1997. The aggregation methods are discussed in detail in Econ (2004). National HPIs were calculated from estimates of HPIs for different dwelling types using sales weights. Constant weights based on sales 1985-1995 were used when calculating national HPIs for the period 1986-1996. The weights were updated on an annual basis from 1997 onwards based on three-year rolling averages of reported sales of different dwelling types as well as their size. The result of this shift from stock-weights to sales-weights was a significant positive shift in the levels of the national HPI.
- 2014-2020 SPAR type HPIs (SPPPRs) are calculated by Eiendomsverdi/Real Estate Norway for up to 23 regions, starting in January 2003 and the HPIs are updated on a monthly basis. These HPIs are chain-linked and the data history is in general not subject to revision. There has been one exception in 2018 when the underlying calculation methods were changed. The resulting HPIs

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are available subject to a licence fee for subscribers. When this overview is written there is still no publicly available technical documentation of these HPIs, e.g. in the format of a published working paper.

HPIs used in Norges Bank's model RIMINI

As we have mentioned above, equipped with new HPI data in the late 1980s the first attempts were made to model in RIMINI empirically how private consumption would respond to changes in household income and wealth, but also how house prices would respond to shocks to unemployment and interest rates in a deregulated economy. We were also interested in exploring potential propagation channels of such shocks when the banks' mortgage loans to households were secured using housing capital as collateral. For these purposes we considered two alternative HPIs in empirical research.

The first HPI combined information about housing prices collected from different sources. Until 1984, it was simply equal to the price deflator for housing investments in the quarterly national accounts (QNA). Between 1984 and 1986, the index was based on information from the central register on real estate and dwellings in Statistics Norway¹², cf. Brodin (1989). From 1986 the HPI was based on market prices collected by the Norwegian Association for Real Estate Agents (NEF) and show a *sales-weighted* average of the prices of traded dwellings (a weighted average of prices on owner occupied single house units traded in different regions). From 1991 onwards a *stock-weighted* HPI was produced by Econ/NEF on demand from Norges Bank's Research Department for the purpose to supply the RIMINI-model with a *stock-weighted* HPI, which was used to calculate the value of the housing capital owned by the household sector as an important part of household wealth. These *stock-weighted* HPIs were updated on quarterly basis until 2003 and are shown in the lower branch of data shown in Figure 11.3.

The second HPI took into account some aspects of the Norwegian housing market during the 1970's and early 1980's which were not covered by Brodin's HPI. This HPI incorporated the effect on average housing prices from the price deregulation which took place in 1982 for a substantial fraction of the apartment buildings. By changes in the relevant legislation, price ceilings were either abolished completely or raised sufficiently to render price regulation practically ineffective after 1982. From 1988 this HPI was spliced with growth rates from the first HPI. This HPI was used in the empirical house price model in (Eitrheim, 1993, 1994), which was grafted into Norges Bank's macromodel RIMINI from 1993 onwards.

HPIs published by Statistics Norway

A small set of quarterly HPIs were published by Statistics Norway (SSB) from 1993 onwards. The HPIs started in 1991 and were based on hedonic regressions, which accounted for qualitative attributes of different types of dwellings across a small set of regions. A *stock-weighted* HPI for the country as a whole was also constructed. SSB's HPIs have later been revised and extended to cover

¹² The GAB-register.

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more geographical regions. From 2009 SSB's HPIs are based on data on house sales collected by FINN.NO, supplemented with information from the central property register (the cadastre). The most important explanatory quality variables represent house size and location.

The *sales-weighted* HPIs from Eiendomsverdi/Real Estate Norway, which appears on a more timely basis only a couple of days into each month, are frequently compared with the official *stock-weighted* quarterly HPI from Statistics Norway. On several occasions, the two indices have shown different developments in the housing market. A short article by Baug, von Brasch and Takle (2018) explains why.¹³

The article first states that the underlying price data material is the same for both indices, covering about 70 per cent of the turnover in the housing market. However, the indices are different in how the price trends for different types of housing by geographical region are weighted together. Large regional price growth differences, especially between the western parts of Norway and the Oslo area 2014-2018, explain the gap between the two indices according to Baug et al. (2018). In contrast to the HPI from Eiendomsverdi/Real Estate Norway the HPI from Statistics Norway is well documented in a series of documents (Lillegård, 1994; Statistics Norway, 2006; Takle, 2012).

11.6 A summary of real-time revisions in Norwegian HPIs

This section provides an overview and evaluation of the composite housing price indices (HPIs) which originally appeared in HMS I in 2004. Since then the composite HPI has continuously been updated in Norges Bank's HMS II (www.norges-bank.no) database. The updating has mainly been undertaken by Norges Bank's Data Management unit, which was established in the mid 2000s. The numerous changes in the HPIs listed in the paragraphs above indicate that it would have been an almost impossible task to monitor all these developments in real-time.

In the following we take a closer look at some properties of the updated HPIs which have appeared at www.norges-bank.no during the HMS II period since 2004. We have also conducted a study of the real-time properties of Norwegian HPIs (Eitrheim, 2022). This study has in particular been concentrated on describing revisions of HPIs produced by the private sector partnership Econ Pöyry/NEF/EFF/FINN.NO for the period 1985-2013, but we have also included the more recent vintages of HPIs produced by Eiendomsverdi, Real Estate Norway and FINN.NO Eiendom from 2014 onwards.

The main lessons from this study are the following: The main sources of revisions are changes in weighting schemes and changes in sample properties such as the average size of the traded houses in a given period. A minor source of instability arises from a cutoff of trading days when the HPIs were reestimated for a particular month, such that the HPIs could be published only a few days into the new month. Therefore, an incomplete sample of house price observations is used for the final month

¹³ This article originally appeared in Norwegian on 5 April 2018 on Statistics Norway's website. An English translation of this article is today available from Real Estate Norway's webpage at <https://eiendomnorge.no/blog/why-do-the-price-indices-from-real-estate-norway-and-statistics-norway-vary-article1459-944.html>

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and the sales that took place during the last trading days in that month would not enter the sample until the following month. A break-adjustment was deemed necessary to restore a reasonable rate of change in the national constant-quality HPI between 1996 and 1997.

The study confirms that we have more precise knowledge about the rate of growth in HPIs than in their levels. We also acknowledge the fact that the two current producers of HPIs, Eiendomsverdi and Statistics Norway, only publish HPIs in a true index format, which means that the published constant quality HPIs are set equal to 100 in a base year. Secondly, we take note of the fact that both producers follow the rule that their HPIs are not subject to revision. But, as we saw in January 2018, this rule has been subject to one exception for Eiendomsverdi's HPI.

We round off this chapter with an overview in Figure 11.5, which shows the national HPIs as they have developed through different vintages from 2005 until 2020. To keep track of the different HPIs we introduce some simple terminology. We denote as HMS0 and HMS1 the historical repeat sale HPIs which were reported in Eitrheim and Erlandsen (2004, 2005). HMS2 denote the composite HPIs which appeared in the updated HMS database, which spliced the repeat sales HPIs for the period prior to 1985 with hedonic HPIs produced by *Econ/NEF/FINN.NO* for the period 1985-2013, and, thereafter with the SPAR-type HPIs produced by *Eiendomsverdi/Real Estate Norway/FINN.NO* from 2014 onwards. Figure 11.6 shows a similar overview of the composite historical regional HPIs for Oslo, Bergen, Trondheim and Kristiansand as they developed in the period 2005-2020.

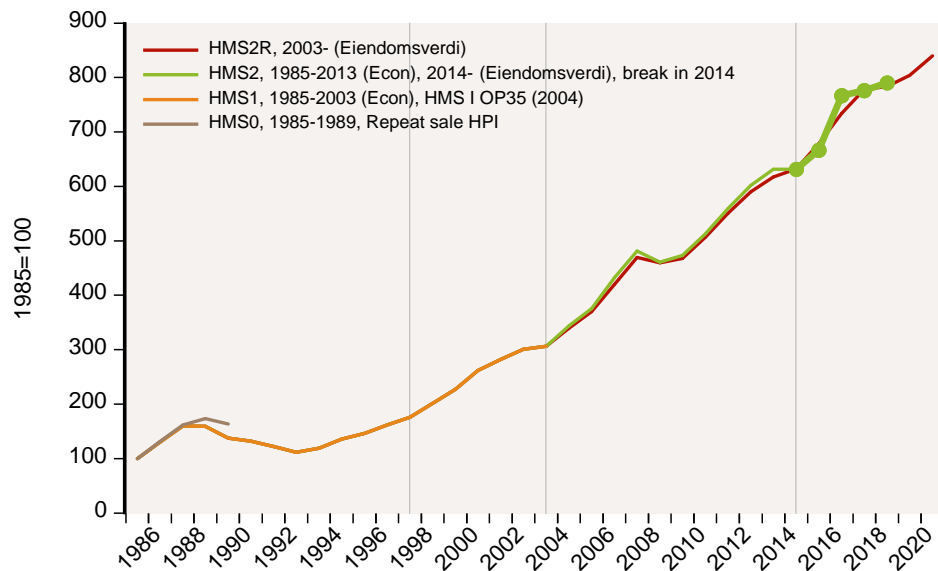
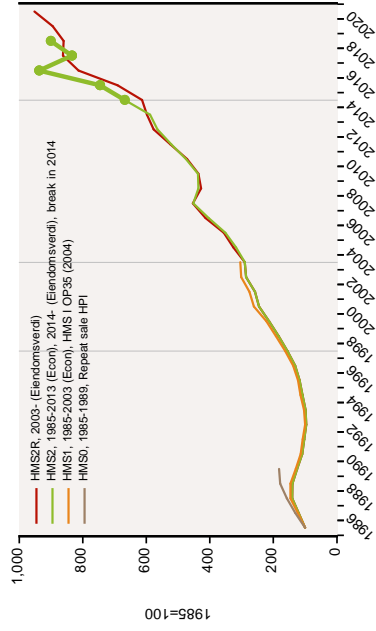
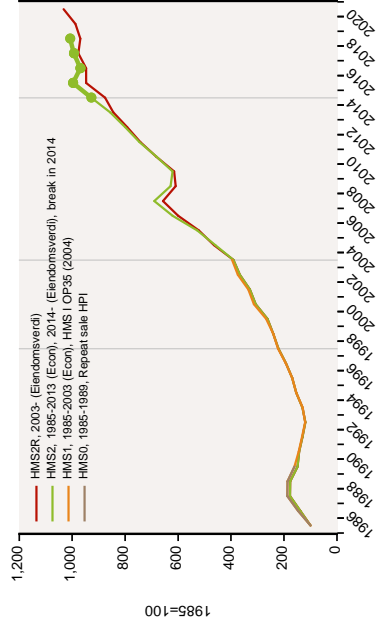


Figure 11.5 Total House Price Indices (HPIs) in different HMS vintages 2004-2020.

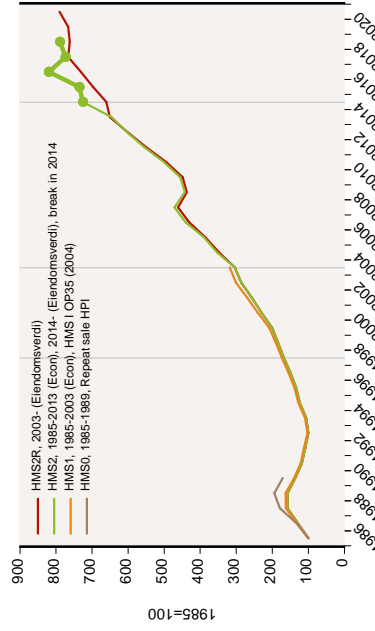
One problem we detected is illustrated by the green lines which are highlighted in Figure 11.5



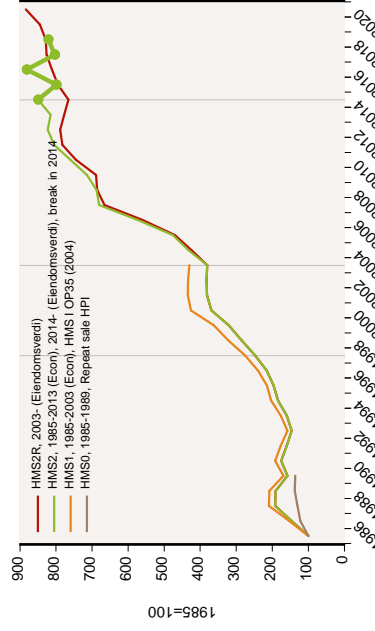
(a) Oslo



(b) Bergen



(c) Trondheim



(d) Kristiansand

Figure 11.6 Regional House Price Indices (HPIs) in different HMS vintages 2004-2020.

Revisions and break-adjustments in house price indices

and Figure 11.6. We see clear indications of a shift both in the national HPI and the four regional HPIs for Oslo, Bergen, Trondheim and Kristiansand, respectively, when we compare the green lines for 2014-2018 with the red lines which represents the constant-quality HPIs produced by *NEF/Real Estate Norway*, and which should have been used to update the HPIs in HMS from 2004 onwards. The constant-quality HPIs pick up the relevant differences in growth rates in this period but turn out to be much less volatile in comparison with the crude average house prices. Note that we have set all HPIs equal to 100 in 1985 for this comparison.

This problem started in 2014 when the HPIs in the HMS database were updated for the first time after *Eiendomsverdi* had taken over as producer of HPIs in the private sector partnership, and, instead of publishing constant-quality HPIs measured in 1000 kroner per m², *Eiendomsverdi* published HPIs which were normalized and set equal to 100 in January 2003. It is important here to recall that all constant-quality HPIs which had been produced and published by Econ/NEF had been reported in measures of 1000 kroner per m². In their report *Eiendomsverdi* published a table with HPIs expressed in 1000 kroner per m² measured as a crude average, but this was not comparable with their new constant-quality HPIs. Unfortunately this lapse was not detected before we started this evaluation in 2018.¹⁴

A revised version of the HPI spreadsheet in the HMS database was published in 2019, which separated more explicitly between the primary HPIs as they emerged from different sources. Each of the primary HPIs were presented using their original units of measurement. The composite HPIs are now only available in an index format, normalized and set equal to 100 in 1912, as was originally the case with the first vintage of HPIs in HMS I (2004). This underlines what we have already stated above that estimates of house prices in levels, say measured in 1000 kroner per m², have greater uncertainty attached to them than estimates of growth rates in constant-quality HPIs.

We do recognize the strong focus many people have on house prices reported in prices per square meter. There are also other novel and creative metrics, which, e.g., express the purchasing power in the housing market for different groups of workers, say, registered nurses, in a geographical dispersed housing market.¹⁵ We will provide a simple example below which illustrates how we may combine historical data for wages and housing prices to provide a historical perspective on how expensive housing capital has been in different time periods.

¹⁴ We have no good excuse for this lapse. A note had been included already in the 2014 House Price Report from NEF/Eiendomsverdi which explained this difference between the constant-quality HPIs and the crude average price calculations underlying assessment of house prices per square meter. This note was unfortunately overlooked.

¹⁵ Real Estate Norway have since 2018 published The Norwegian Registered Nurse Index, with estimates of the shares of houses traded in a given period (in percent) which would be affordable for a single registered nurse across the five largest cities, Oslo, Bergen, Trondheim, Stavanger and Tromsø. The most recent estimate for the South-Eastern part of the country around Oslo published January 2021 indicate that only 2-5 % of the houses are within reach for a registered nurse in this area.

11.6 A summary of real-time revisions in Norwegian HPIs

Figure 11.7 zoom in on the developments from 1985 onwards for a closer comparison between the national HPIs in the different HMS vintages 2004-2020. For this purpose we have calculated HPIs into the metrics of house prices per square meter (in 1000 kroner). We have chosen as benchmark levels for the HPIs the 2003-levels collected from the final vintage of HPIs produced by Econ/NEF, which was produced on a data sample ending in 2013. Figure 11.8 shows similar measures of regional HPIs across different HMS vintages 2004-2020. Figure 11.9 shows their respective growth rates (annual rate of change in percent) from 1985 onwards.

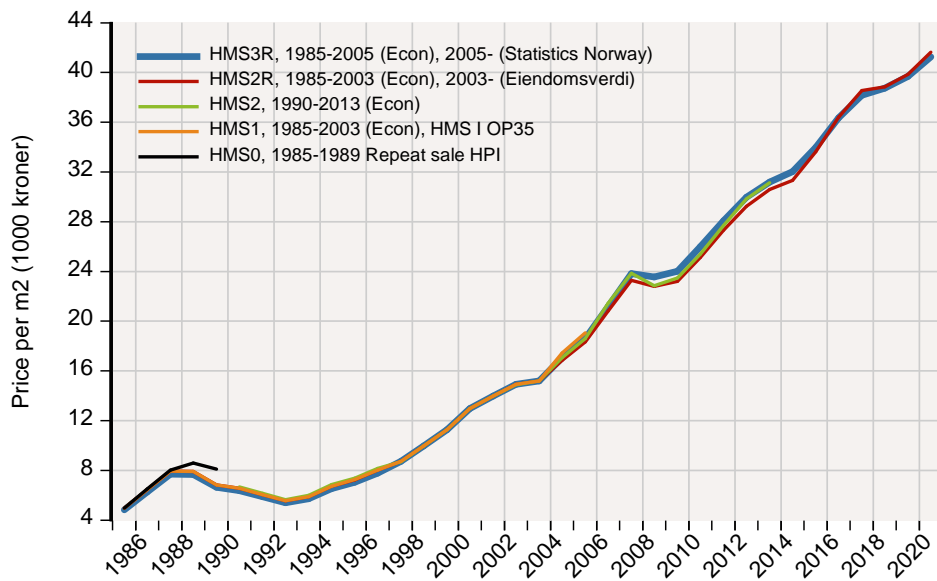
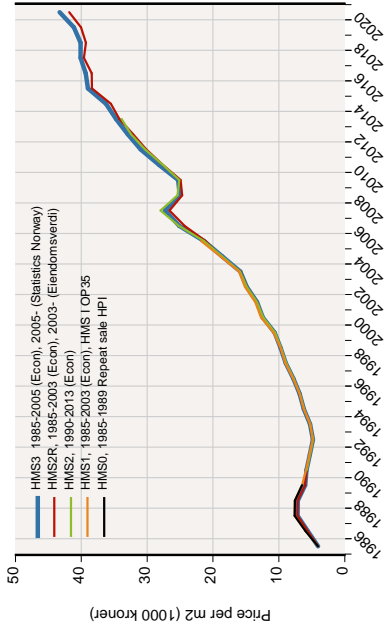
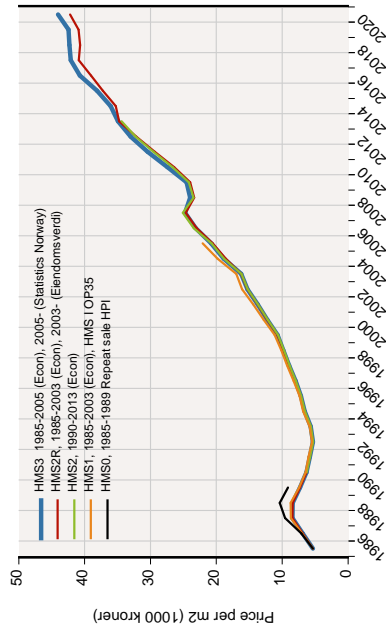


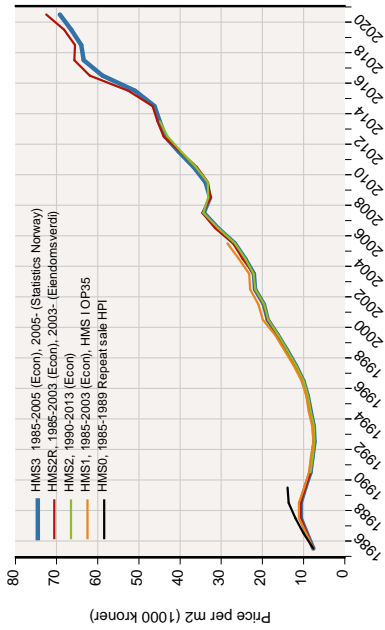
Figure 11.7 Estimated house prices per square meter (in 1000 kroner). Total House Price Indices (HPIs) in different HMS vintages 2004-2020. The composite historical HPIs are linked up against the benchmark house price levels reported for 2003 in the final vintage of HPIs produced by Econ (December 2013).



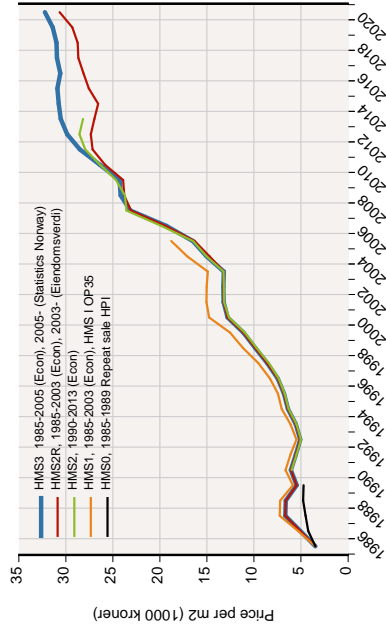
(a) Oslo



(b) Trondheim

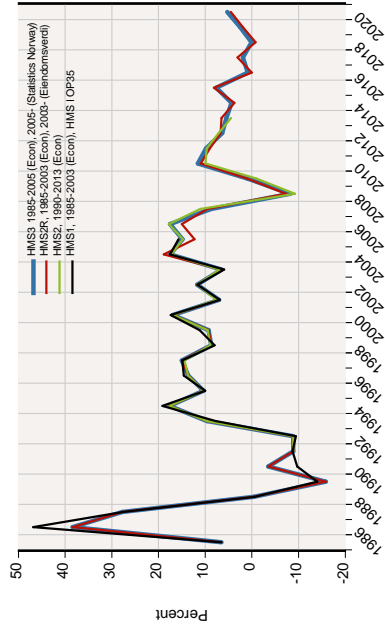


(c) Bergen

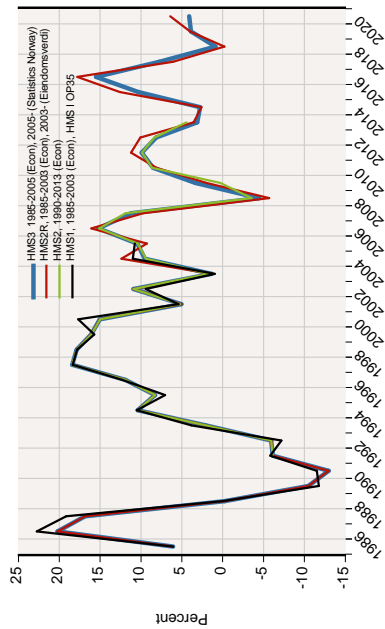


(d) Kristiansand

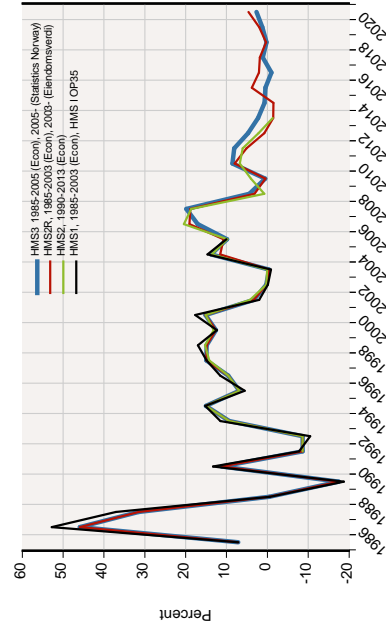
Figure 11.8 Estimated house prices per square meter (in 1000 kroner). Regional House Price Indices (HPIs) in different HMS vintages 2004–2020. The composite historical HPIs are linked up against the benchmark house price levels reported for 2003 in the final vintage of HPIs produced by Econ (December 2013).



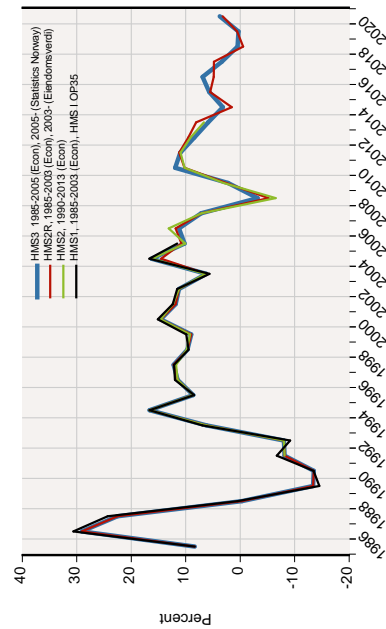
(a) Trondheim



(b) Bergen



(c) Oslo



(d) Kristiansand

Figure 11.9 Regional House Price Indices (HPIs) in different HMS vintages 2004–2020. Annual rate of change (in percent).

11.7 Two historical illustrations

The Kristiania crash

Figure 11.10 shows the developments in real housing prices in Norway across the past two centuries. The *Kristiania crash* in 1899 stands out as a pivotal point in time, the deep fall in real house prices in Norway's capital Kristiania would take a very long time to recuperate, and it was not until more than a century later in 2003 that the level of real house prices in Oslo had passed the previous peak level from 1899.

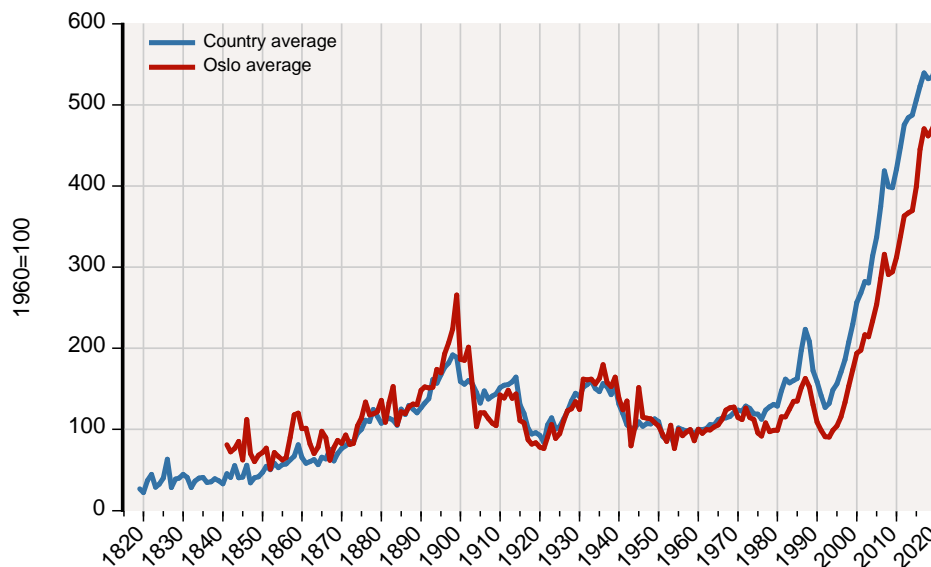


Figure 11.10 Real house price indices across two centuries. A comparison between Oslo (Kristiania until 1925) and the country average.

As the moniker suggests, the *Kristiania crash* was a homespun crisis. The core of the crisis was a property boom in the capital Kristiania, which had expanded rapidly and increased its population by 50 per cent to a quarter of a million inhabitants only during the course of the 1890s. The boom was broadly based and spread from real estate and related industries to banking, fueled by easy money and greatly helped by capital inflow from the increasingly integrated Scandinavian money markets, which had emerged under the Scandinavian Currency Union. In the course of 1897-99, six new banks were established in Kristiania, all heavily exposed to real estate.^{16 17}

In the summer of 1899, the failure of one of the main players, Chr. Christophersen, a highly

¹⁶ Eitrheim, Klovland and Øksendal (2016, Section 6.6, p. 237).

¹⁷ The *Kristiania crash* is included in the overview of historical asset price bubbles in Brunnermeier and Schnabel (2016), see also Gerdrup (2003, 2004) for additional details on this event.

11.7 Two historical illustrations

leveraged non-financial firm, triggered a chain reaction involving banks heavily exposed in real estate. At the critical point, Norges Bank stepped in and provided rediscounting facilities for the distressed banks, and later played a key role in managing the resolution of the crisis, through the restructuring and liquidation of insolvent banks. Norges Bank had graduated from a bank issue to a central bank acting as a lender of last resort.

We also note that Figure 11.10 shows significant increases in the real house price both for Oslo and the country average during the 1920s and early 1930s. We recall that the constant-quality HPIs only showed a moderate deflation during this period, in which the general price level followed a strongly negative deflationary trend.¹⁸

The purchasing power of wages in the housing market

This chapter ties together work on nominal consumer prices, wages and house prices and shows developments in these nominal variables over more than two centuries. Figure 11.11 relates the development in house prices to the average annual wage level. We get an idea of the developments in the purchasing power of the average wage level over this long period by dividing the wage level with the average level of house prices per square meter. Hence, we gauge the purchasing power in the housing market by estimates of the number of square meter housing which can be purchased at different points of time by an average wage.

It emerges clearly that houses were really expensive in the 1800s. Figure 11.11 shows that it was not until after World War 2 that the average wage sufficed to purchase more than 10 square meter in Oslo, and if we look at the country average house price the same holds on average although there were periodical exceptions like the deflation phase in the 1920s when real house prices increased since the general price level fell more than average house prices. The purchasing power increased rapidly during the post-war period until the housing and credit markets were deregulated in the early 1980s.

We have commented earlier in this chapter on the housing boom of the 1980s which burst in 1988. In Figure 11.11 these large swings in the house prices are captured in similar large swings in the number of square meter housing which could be purchased by the average wage. Between 1980 and 1990 these swings ranged between 15 and 27 square meter for Oslo and between 20 and 40 square meters for the country average.

The long period with strong growth in house prices over the past three decades since the early 1990s have eroded much of the purchasing power wages had accumulated during the 1950s, 1960s and 1970s. In 2020 we see that the purchasing power in Oslo is back at its pre-war level below 10 square meter, and similarly, for the country average at its pre-war level around 15 square meter.

¹⁸ See Chapter 10 and 14 for more information on data for historical Cost of Living/Consumer Price Indices (CLI-CPIs).

Revisions and break-adjustments in house price indices

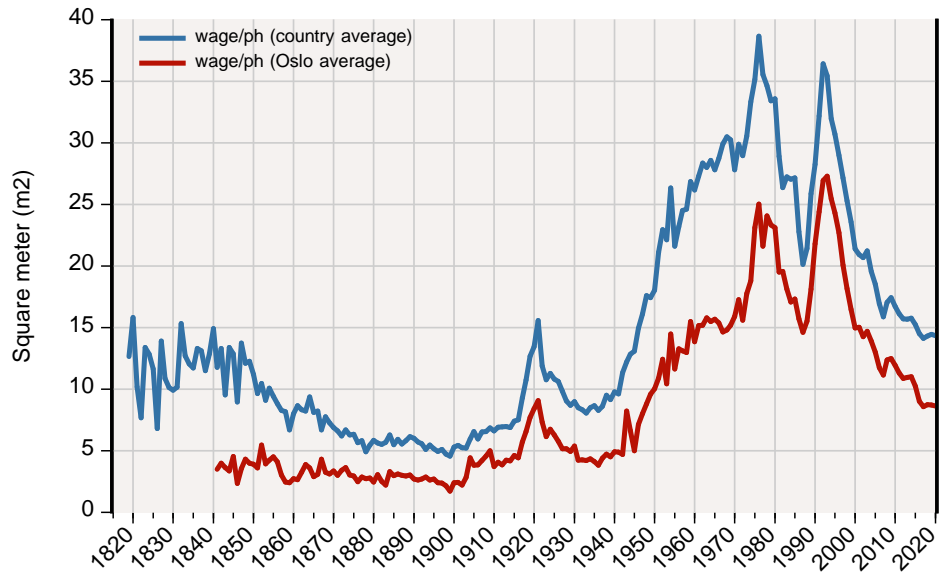


Figure 11.11 The purchasing power of average wages measured in number of square meter. A comparison between Oslo and the country average across two centuries.

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The movement of the population of Norway

Espen Søybye

The movement of the population of Norway

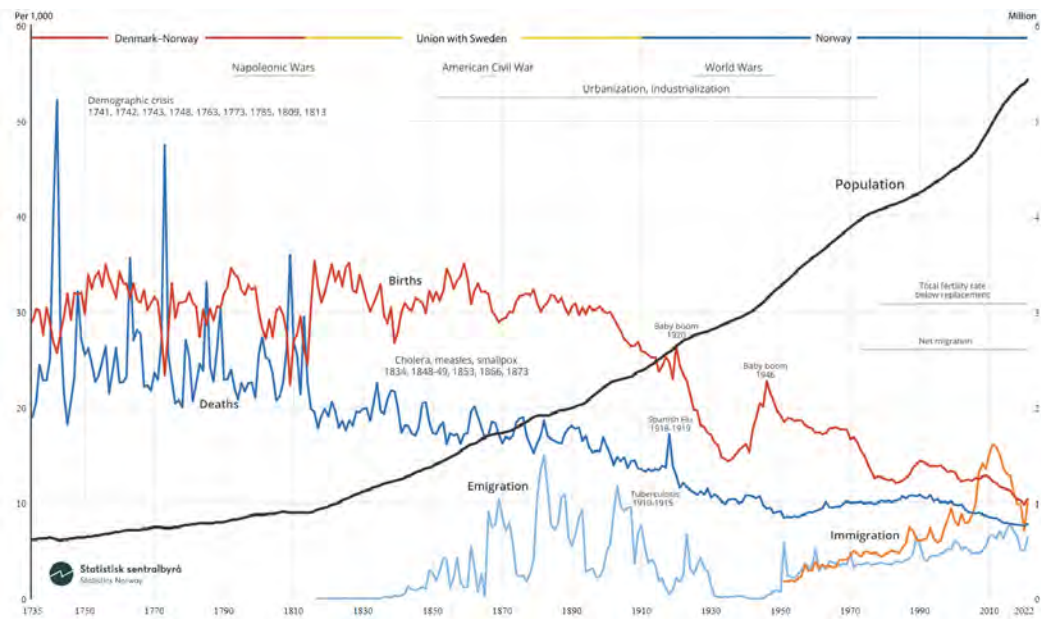


Figure 12.1 The Movement of the Population, Norway, 1735-2022. Poster from Statistics Norway.

12.1 Introduction

There are myriad ways to introduce the enormous and complex topic represented by the history of population statistics of Norway. These include the well-known (amongst demographers) census from 1801; the introduction of personal identification numbers, and the establishment of the Central Population Register in 1964 with far-reaching benefits for the generation of population statistics; the population forecasts compiled since 1969; the censuses of 1910, 1920 and 1930 which combined demographic and social statistics; or the introduction of punch cards, machines and electric counters in the 1900 census. Yet it is hard to find a better way than to point to the annual numbers of registered births and deaths in Norway since 1735, and the momentous graph *Population movement in Norway, 1735-2022* shown in Figure 12.1, compiled by using these rows of numbers down through the centuries and updated to the present day.¹

The graph provides a comprehensive overview of the development of the population of Norway over almost 300 years, and is a simplified distillation of an immense number of figures and calculations. It also testifies to all the hard work and effort invested in obtaining these figures over the centuries. It represents descriptive statistics at their best, and is the longest Norwegian time series that, with the necessary respect and reverence the word merits, can be classified as statistics. This time series has been called a Mecca for demographic historians (Drake, 1969). Furthermore, it is unique; no other country in the world has produced anything like this survey, dating from 1735 to

¹ Thanks for helpful comments from Helge Brunborg, Øyvind Eitheim, Jan Tore Klovland, Jan Fredrik Qvigstad and colleagues in Statistics Norway. Thanks to Ingrid Greenhow for helpful discussions and improvements of the text in the English translation.

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the present. The numbers of births and deaths that have made it possible to construct such a diagram are not only the jewel in the crown of the official statistics of Norway, but are also a landmark in the global history of population statistics.

The numbers of births and deaths and their movement over such a long period of time represent a least common denominator of the developments in habits and living conditions, economic development, and the ability to control and dominate nature. Population movement is therefore a leading indicator of almost everything, and is therefore also difficult to interpret and explain.

Whatever affects the number of births and deaths and the population development, it is important to bear in mind that demographic phenomena must first be explained by other demographic phenomena; for example, the number of births is a consequence of births 30 years ago, while the changing age structure of the population after 1814 is an effect of the decreasing mortality amongst infants and young children. Demographic changes such as variations in birth cohorts and changing age composition in the population affect economic, social and cultural development.

This leads to another notable feature of *Population movement in Norway, 1735-2017*. Simply by looking at it, hypotheses emerge, as do test conditions that might lead to the development of new knowledge. The potential for obtaining new insights from the graph is enormous. So far, most studies have zoomed in on specific sub-periods of the time series; the decrease in deaths after 1814 (Lunden, 1980; Herstad, 2000; Moseng, 2003), and the decrease in births from 1900 (Backer, 1961; Myrdal, 1936), to mention two examples. Studies of the entire time series are rare.

This vast collection of time series of the annual numbers of births and deaths, called the *population movement* or *vital statistics*, also testifies to the movement of the population through four centuries, and to the political stability of the Nordic countries. In order to be complete, the population movement must consist of annual figures for births, deaths, marriages, divorces, immigration and emigration. The core of the statistics is births and deaths, and numerical information about this exists since 1735.

The system for collecting, storing and improving the figures was maintained both throughout the crisis years 1741-1743 and throughout 1807-1814, when Denmark-Norway participated in the Napoleonic Wars on the French side, and communication between Norway and Denmark was blocked by the British navy. Prior to 1814, the collection of the data was organised from Copenhagen. Not even during Norway's first years of independence from Denmark after 1814, when a central administration barely existed in Norway, or during the turbulent years of the German occupation of Norway from April 1940 to May 1945, was the updating of the movement of the population forgotten or neglected. On the contrary, the newly-established central administration in Norway even implemented a census in 1815, so population statistics were apparently an important part of building the nation state.

The fact that data for the *population movement* have been compiled even in the most turbulent times is therefore also an affirmation of the admirable stamina demonstrated by a small central administration. Note that the country is sparsely-populated with difficult and unstable communications. People had settled in isolated valleys, small mountain villages, on islands and at the far ends of fjords

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along the coastline, and with few cities and densely-populated areas. How was it possible for a central body at the beginning of the 18th century to collect the numbers for births and deaths from every corner of this country? It is nothing less than a miracle. The mere existence of this time series must therefore be treated as more than just statistics, but rather as an object of wonder, a valuable heritage and a cultural treasure of the highest order.

Awareness of the cultural status and value of these population statistics, and in particular the movement of the population, has not always been as high and as widespread as one might expect. Norwegians have always been proud of the cathedral in Trondheim, Nidarosdomen, even though stone cathedrals in the neo-Gothic Romanesque style from the 11th century exist in their hundreds on the European continent. In a European context, therefore, Nidarosdomen is just one of many, and perhaps relatively ordinary and uninteresting. However, Norway is the only country with statistics for births and deaths from 1735 to the present. Large, wealthy nation states such as Great Britain, Germany, France and Italy, all rich in buildings and memorials from the past, lack such a valuable resource.

Compared to the unique Viking ships at Bygdøy, the population movement figures from 1735 to the present have an enormous advantage. The Viking ships are objects of awe and wonder in museums, but they tell us nothing about today's shipping patterns. Even though the time series for births and deaths is as unique and rare as the Viking ships, and might therefore deserve a place in a national museum, the series cannot be stowed away to gather dust, or to serve as a sensation for tourists. These statistics are indispensable for understanding the present, and of course also the past, not to mention how the past in part determines the present and the future. They provide knowledge which is not possible to obtain otherwise. Furthermore, the Norwegian figures for population movement from 1735 to the present day tell us what is going on in the world.

Studying this time series is therefore also key to understanding ourselves and our situation in the world. The Norwegian self-awareness and identity draw essential elements both directly and indirectly from the population statistics, as well as a broad understanding of what we are: a fairly large albeit sparsely-populated country with no big cities and considerable emigration, particularly in the second half of the 19th century until the outbreak of the First World War in 1914. This was due to the population increase before the two-child family was established as a norm from the beginning of the 20th century, and realised in full during the 1930s; low child mortality and high life expectancy.

Because Norway is alone in the world in having this time series of births and deaths, a great responsibility rests on the statistical authorities in the country to manage, restore and preserve it. Old numbers need to be looked at, examined and re-examined. This is necessary to preserve, update and expand knowledge about the statistics, and to develop the ability to interpret this unique time series at a current-day level. It has not always been the case that the important task of preserving the old numbers has been taken as seriously as it should. The level of awareness of the long history of these vital statistics, and the important source of knowledge they represent, has at times been low. Imagine the scandal there would have been if the roofs of our unique wooden stave churches from the 11th century had been repaired with plastic carrier-bags from the local grocery store. It is a

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fact that Statistics Norway² has treated the times series in a comparable way. There is a connection between the fall in the death rate and the fact that so few stave churches have survived. According to the Church Act of 1851, churches were required be large enough to accommodate 30% of the parish. This resulted in new churches being built and the old ones left to decay.

Before an examination and interpretation of the graph can be carried out in any detail, another question needs to be clarified. Is it true, as claimed above, that Norway is the only country to have such a time series? This is not entirely correct, but in another sense it is. From 1735, information about the annual numbers of births and deaths was collected from the royal government in Copenhagen for the whole Kingdom of Denmark-Norway, Iceland (as a part of Norway) and the German duchies of Schleswig and Holstein, Oldenburg and Delmenhorst. However at the very beginning of the 20th century, Danish statisticians did not regard the figures collected before 1800 as reliable enough to warrant the label 'official statistics' (Statistics Denmark, 1905). The inconsistent statistical treatment of illegitimate births and stillborn infants, and the fact that some regions did not manage to report at all, were the main reasons for this. The same weaknesses apply to the figures for Norway for the same period. Statistics Norway would very likely have agreed with the Danish assessment, had they known about it. However, there are no traces of a discussion in Statistics Norway at the beginning of the 20th century of the Danish criticism of the figures for births and deaths from before 1800.³ The effect of this ignorance was a stroke of luck, because it led to the publication of the figures from 1735 through to the 20th century by Statistics Norway in 1914, 1926, 1948, 1958, 1969, 1978 and 1995.

Statistics Norway published the figures for the first time in 1869. The figures were discussed and the conclusion was that they could be accepted. Even though this early evaluation did not go into depth, and many blunders were made in the repeated publication of the time series, knowledge about the figures and an awareness of their shortcomings increased over time. Therefore, it is unlikely that the Danish criticism from 1905 of the time series before 1800 would have been accepted by Statistics Norway if the Norwegian statisticians had known about it.

What about Sweden? It is commonly held that their population statistics are of first-rate quality and go further back than any others. The fact is, however, that their statistics for births and deaths only go back to 1749. The figures from 1735 to 1749 are simply estimates (Statistics Sweden, 1969, 1999; Heckscher, 1936).

Disregarding some earlier attempts by Statistics Norway from 1969, 1978 and 1995, together with some graphic representations of parts of the time series (Drake, 1969; Statistics Norway, 1995; Dyrvik, 1996, 2004; Moseng, 2003), the graph of the *population movement*, as shown here, has been

² For the sake of simplicity, Statistics Norway is used in this context as the name of the central office for producing and publishing official statistics, even though the institution has had several names since 1839. The same is the case for the central institutions for official statistics in Denmark and Sweden. In this context they are referred to as Statistics Denmark and Statistics Sweden. Where applicable in the list of references we have referred to the *Ministry of Finance* or *Ministry of the Interior* as producers of official statistics.

³ Julie Backer, a central demographer in Statistics Norway, claims in her two studies of births and deaths (Backer, 1961, 1965) that the figures before 1800 not could be regarded as official statistics, but nevertheless the time series were published as official statistics in 1914, 1926, 1948, 1958 and in 1968, so different meanings obvious existed in Statistics Norway on the evaluation of the figures from the 18th century.

continually developed and improved throughout the last 20 years by Statistics Norway. However, it should be mentioned that a very similar graph published by Statistics Sweden in 1999 inspired the development of *Population Movement in Norway 1735-2022* (Statistics Sweden, 1999; Statistics Norway, 2000, 2001, 2018; Sjøbye, 2012a,b, 2014).

12.2 The demographic transition - a significant discovery

When converted to graphics, the birth and death rates (births and deaths per 1,000 inhabitants, also called the crude birth and crude death rate) form a pattern in four distinctive phases, clearly visible in *Population Movement in Norway 1735-2022*. This movement has turned out to be the same for a number of countries and areas around the world. The discovery of the pattern, i.e. the change from high to low crude birth and death rates, evolved gradually from the beginning of the 1930s to the end of World War II, and was named *the demographic transition*. Explaining the change from high to low crude birth and death rates has, since this discovery, been a main research question for demographic science (Thompson, 1930; Landry [1933], 1987; Notestein, 1945; Davis, 1945; Casterline, 2003; Dyrvik, 2004; Dyson, 2010; Lee and Reher, 2011).

This conspicuous pattern was at first merely a description of the changes in the crude birth and death rates. Later, the demographic transition developed into a general theory of population development, which means that demographers could not only describe the movement of the population, but also explain how and why the population moved through the four phases. To be more precise; in order to develop the demographic transition from a description into a theory, it was necessary to explain how and why the birth and death rates affected each other, both in a short and a long-term context.

In phase 1 of the transition, both the birth and death rates are high, with major fluctuations from year to year. Phase 2 is characterised by a declining death rate, while the birth rate still remains at a high level. In phase 3, the birth rate falls and approaches the level of the death rate. Finally, in phase 4 the birth and death rates stabilize around a common low level. An illustration based on Norwegian data for births and deaths since 1735 is shown in Figure 12.2.

Migration from urban to rural areas, and between countries, was not part of the demographic transition at the beginning. Some demographers believed that when European emigration to America and other overseas areas decreased significantly at the end of the 1920s, the era of this kind of emigration, defined as the voluntary movement of people free to change their country of residence and their country of allegiance, was over (Myrdal, 1936; Hutchinson and Moore, 1945; Dyson, 2010).

Nevertheless, figures for emigration and immigration are essential ingredients in the descriptive vital statistics, and were included in the Norwegian statistics for population movement much later than 1735. While emigration was included on a regular annual basis beginning in 1836, the last element, immigration, was not included on an annual basis until 1951, and from the same year the emigration figures included all emigration, not only emigration overseas.

12.2 The demographic transition - a significant discovery

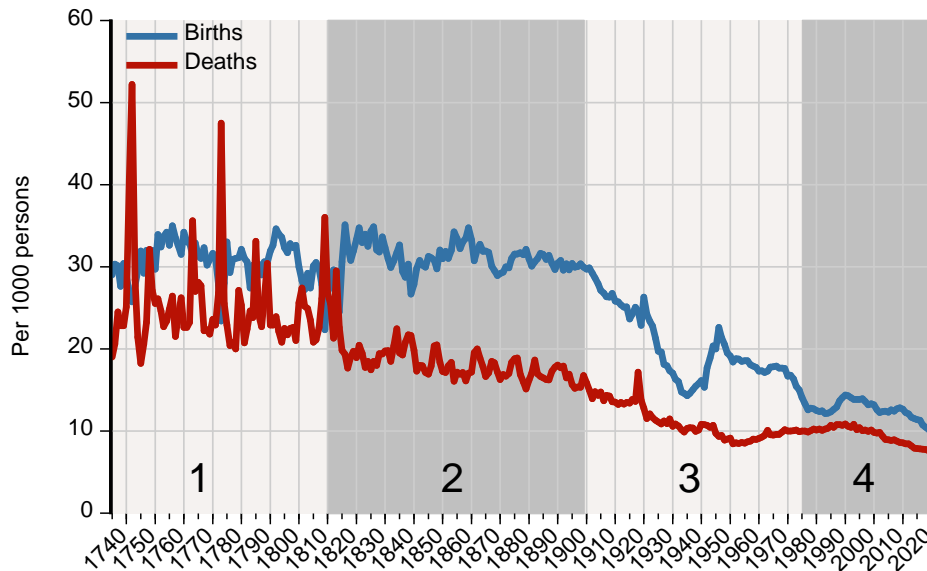


Figure 12.2 The four phases of the *Demographic Transition*. A stylistic representation based on Norwegian data 1735-2021.

Phase 1: 1735-1810 Both the birth and death rates are high, with major fluctuations from year to year

Phase 2: 1810-1900 Declining death rate, while the birth rate still remains unchanged and high

Phase 3: 1900-1975 The birth rate falls and approaches the level of the death rate

Phase 4: 1975-2021 The birth and the death rate become close to each other at a low level

Even though migration was not a part of the demographic transition from the beginning, demographers were aware of the influence migration could have on the crude birth rate. Migration from northwest Europe has been interpreted as a reason why the birth rate during the 19th century remained high and unchanged for such a long time. The surplus population had the opportunity to move to places where living conditions were better, and many emigrants were able to help their relatives in their country of origin by sending home money. It is suggested that both factors delayed the fall in the birth rate in north-western Europe (Notestein, 1945).⁴

It is clear and notable that throughout the four phases of the transition the wide annual fluctuations in the crude birth and death rates gradually become smaller and tend to disappear. The immigration rate from the latter half of the 1990s is an exception, however. Furthermore, the population increase is low or negative, at least according to the pure theory in phase 1 and phase 4. What the theory predicts is that the surplus of births in phase 4 is close to zero, unlike in phases 2 and 3, when the large surplus of births caused a high increase in the population. The reason for the pronounced increase in population in phase 4 in some countries such as Norway, Sweden and Denmark, is immigration.

⁴ To explain the feedback mechanism between the possibility of emigrating and a high birth rate is difficult at an individual level, and the validity of using functionalistic explanations in social sciences is therefore disputed.

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Other countries in the same phase, such as Poland, Lithuania and Croatia, experienced considerable emigration, with a constant or a decreasing population as the inevitable consequence. The massive emigration from Poland is to some degree replaced by Ukrainian immigration to Poland (Eurostat, 2019). Large, developed countries, like Germany and Japan - the first with, the second without immigration - have had an unchanged population since the beginning of the 1990s.

Migration was not considered to be part of the demographic transition when the theory was developed after 1945, but has since been included (Dyson, 2010; Population Reference Bureau, 2012). Omitting migration would be irrational; as can be seen in the graph *Population Movement 1735-2022* (Figure 12.1), since the turn of the century, emigration and immigration have contributed as much, and sometime even more, to the annual changes in the population as births and deaths do. While births and deaths vary little from year to year and therefore are easy to project, immigration and emigration fluctuate from year to year in a way that is very difficult to anticipate, and thus prevent population projections from being as accurate as one would like.

12.3 Substantial population increases before the industrialization

In the four phases of the transition, the composition of the population undergoes changes with consequences for social relations and the economy, such as changes in age composition, household size and settlement in urban and rural areas. When infant and child mortality decreases, the sibling groups increase, and consequently the proportion of young people in the population increases. The opposite occurs when the crude birth rate falls due to a reduction in the number of births per woman and the establishment of the norm of the two-child family. The family household becomes smaller, and the proportion of older people in the population increases.

The increase in the size of the household, in phase 2 of the transition, means that parents must provide more food, clothing and accommodation to feed and house the increasing sibling groups. The work to increase the family's production often leads to moves to another place where conditions are believed to be better. This is held to be the explanation why urbanisation happens more quickly after a fall in the death rate (Dyson, 2010). Urbanisation has major impacts on the division of labour in both rural and urban areas, and on the development of new industries in growing cities. This is the reason why some demographers consider population increase as a precondition for industrialisation and economic growth (Dyson, 2010). The graph *Population Movement in Norway 1735-2022* appears to support this point of view, i.e. the population started to increase immediately after the end of the Napoleonic Wars, and increased from about 885,000 in 1815 to 1,328,000 in 1845, an increase of almost 450,000 in just 30 years. The population in urban areas doubled during the same period, and this was before industrialisation began in Norway in the late 1840s. The population increase and urbanisation are often seen as a consequence of industrialisation, but in Norway, the population increase and urbanisation started long before the industrialisation of the country.

12.4 Demographic dividend and deficit

Demographic dividend and demographic deficit are economic concepts derived from the demographic transition. The standard definition of a demographic dividend is related to a situation when the population in working age (15 to 64), is sufficiently large to be an engine for economic growth. This will most often occur late in late phase 2 and in phase 3 of the transition. In phase 3, the proportion of the population under 15 years is decreasing and the proportion of the population aged 65 and above is still relatively small but may be slowly increasing, and therefore the proportion of the population in the work force may increase.

The standard definition of a demographic deficit is a situation when a reduction in the working-age population occurs absolutely and relatively, due to large, ageing cohorts and increasing life-expectancy in phase 4. This demographic situation is typical for countries in phase 4 of the demographic transition. It is common to attribute both low interest rates and low economic growth to the demographic deficit.

These concepts have been used to explain variations in economic growth in different periods and between nation states. For instance, it is obvious that a demographic dividend contributed to the growth in many countries after 1945. The growth in the Chinese economy since the late 1980s is also a result of an advantageous age composition of the population (Dyson, 2010, 2018).

Japan is the country most often characterised by a demographic deficit, Germany is another, but the economic development in the two countries has been quite different for the past 20 years even though the proportion of the working age population in both countries has been decreasing. It is a paradox, however, that low growth should be a necessary effect of a shrinking work force in relative and absolute terms. Industrialisation and manufacturing in general are characterised by new forms of organisation and the accumulating replacement of human labour by machinery through cultural and technological development. On the other hand, the reduced proportion of the working-age population has beyond doubt contributed to some of the fall in the unemployment rate in a number of European countries in recent years, because more individuals are leaving the working-age group 15-64 than entering it.

The concepts of demographic dividend and deficit are also useful in analysing the demographic preconditions for economic growth within countries. The age composition in the Norwegian census from 1900, a period of strong urbanisation, shows that close to 50% of the population in the cities were between the ages of 15 and 45. In rural areas, the proportion was close to 40%. The proportion of children and people aged over 45 was higher in rural areas than in urban areas. Demographic dividends and deficits occur in different areas in a country at the same time (Statistics Norway, 1906). In phases 2 and 3 of the transition, the distinction between demographic dividend and deficit followed the distinction between urban and rural areas. In phase 4 of the transition, this is not the case anymore. The difference between municipalities in the demographic dividend or deficit position does not follow the distinction between cities and rural areas. In 2018 for example, the composition of the population in Oslo was advantageous compared with almost any other municipality, while a

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town like Risør had more in common with a depopulated, rural municipality such as Hattfjelldal. A rural municipality such as Nesodden, which is part of the urban sprawl around the capital city, has an age composition that lies between that of Oslo and Risør (Table 12.1).

Table 12.1 *Population by age groups and municipalities, percent, 2018. Source: Statistics Norway*

Age groups	Norway	Oslo	Risør	Nesodden	Hattfjelldal
0-19	24	22	21	26	20
20-64	59	66	55	58	52
65+	17	12	23	16	28

The difference between areas with a demographic dividend and deficit may also be a result of internal migration. This has important economic consequences not only for the economy of the municipalities, but also for the economy of the households. Poor economy forces municipalities with a decreasing population to restrict services for older people as well. Some of them then move to areas with an increasing population and a better economy. Real estate accounts for much of private savings in Norway. The price of houses and apartments in an area with a decreasing population will also decrease, while prices will increase in cities and areas with an increasing population. Population movement from the periphery to the few central urban areas creates differences in the distribution of private wealth, due to the difference in prices of real estate.

12.5 Internal movement and emigration

The number of emigrants was very high at a time when the Norwegian population had a falling death rate and an unchanged birth rate in phase 2 of the transition. The pattern of emigration is also very clear in the graph *Population Movement 1735-2022*. It is easy to assume that the wave shaped curve is determined by different numbers of emigrants in each cohort, i.e. that the tendency to emigrate varies with the cohort, but this is not the case. Each cohort has more or less the same proportion of emigrants, so it is more likely that the pattern emerges because some cohorts postpone or accelerate their emigration (Thonstad et al., 2001). Unregistered emigration from Norway, sailors who escaped when their merchant ships arrived at New York and Quebec, occurred most frequently when registered emigration was low. When unregistered migration is taken into account, this contributes to a smoother pattern of registered emigration (Søbye, 2001; Lovoll, 2015).

When the population in an area increases, people start to move to another place in the country, to the nearest village or city, or to another country. This process has been observed in Norway and in most European countries, particularly in phases 2, 3 and 4 of the transition. In stage 4 of the transition, most countries in north-western, central and southern Europe have had immigration as the main reason for maintaining a stable population, or even for population increase. Some of the eastern European countries in the same stage of phase 4 experienced a decrease in their population, partly caused by the free labour market that they became a part of when they joined EU. Whether emigration or immigration contribute to a population decrease or increase in phase 4 of the transition

12.5 Internal movement and emigration

will also depend on many non-demographic factors such as war, the collapse of political regimes, political persecution and by restrictions on the definitions of refugees and immigrants and how these are implemented. The continuous increase in the Norwegian population is an effect of the unique, favourable financial situation which has led to a scarcity of labour, which has been counteracted by massive short and long-term immigration of Poles and Lithuanians.

It is hard to form a general theory that can explain movements from one part of a country to another, or to a foreign country using concepts of overpopulation and poverty. Resources are required to move within a country, or to emigrate. People with the fewest resources seldom have this option. It has been proven that the colonisation of the barren areas of inner Troms county, Bardu and Målselv municipalities, at the beginning of the 19th century, did not come from the most populated areas in the south of Norway, but from very densely-populated areas in the northern parts of the two great valleys of south-eastern Norway, Gudbrandsdalen and Østerdalen. Personal relationships played a major role in this movement, which led to chain migration (Thorvaldsen, 2004a). It is easy to observe the same in a global perspective. The closest we can get to a general theory is that migration both within and between countries speeds up in phase 2 of the transition.

Other changes and characteristics that the movement of the population undergoes in the four phases of the demographic transition are also easy to identify from the graph, such as the development in the first part of the observation period, which was completely determined by births and deaths. Even though the lack of figures for immigration in the 18th and 19th and the first half of the 20th centuries contributes to underestimating immigration, it is known from other sources that immigration was numerically low, but nevertheless important (Ministry of the Interior, 1869a; Dyrvik, 2004; Dyson, 2010; Sjøbye, 2012a; Brochmann and Kjeldstadli, 2014; Sjøbye, 2014).

Perhaps one of the most important messages from the graph *Population Movement in Norway 1735-2022*, is the indisputable, but counterintuitive fact that the population increase in Norway after the Napoleonic Wars was caused not by a rise in the birth rate, but a fall in the death rate. It is also notable that the birth rate in Norway remained unchanged from 1735 to 1900, i.e. for about 165 years, with about 30 births per 1,000 inhabitants, against 11 per 1,000 today. This indicates that the norms and habits of marital relationships remained more or less unchanged for 165 years. The fact that a population increase is caused by a fall in the death rate has been shown to be a global demographic phenomenon with no exceptions, and has been the main reason for population increases, apart from countries such as the USA, South Africa, Australia and New Zealand and some countries in South America, which were populated from Europe during the period of colonisation. This process, also called the whitening of the world, occurred when the European countries were in the middle of phases 2 and 3, with a population increase greater than their economies could absorb. It meant that such countries could benefit from the opportunity to emigrate to areas of the globe considered to be under-populated (Notestein, 1945; Dyson, 2010).

12.6 The first handwritten table for population movement

It is not known exactly from what point the annual figures for births and deaths for several years were compiled into a table after the figures were collected annually from the dioceses from 1735, such as the one Carsten Anker compiled in the late 1770s (Figure 12.3). Nor is it known exactly why the General-, Lands-, Økonomi- og Kommercekollegiet (hereafter Kommercekollegiet)⁵ began to collect the figures for births and deaths, but it must be seen in the context of the reorganisation of the department in 1735. At the beginning of the 18th century, a trade-based way of thinking dominated the state system in Copenhagen, and the population figures were regarded as important for the country's economy and as a military secret. The publication of population statistics was not possible before mercantilism was challenged by physiocratic economic thought in the ministries in Copenhagen in the 1760s.

The image shows a handwritten table titled "General Tabelle" with columns for "In Danmark" and "In Norge". Each of these main sections is further divided into "Fødsel" (Births) and "Dødsel" (Deaths). The table contains numerical data for each year from 1735 to 1775. On the far right, there is a "General Summa" column. The handwriting is in a cursive script, and the paper is aged and has some staining.

Figure 12.3 Handwritten "General Tabelle" for the population movement, signed by Carsten Anker. He was a friend of Prince Christian Frederik and one of his closest advisers, and played a significant role in the dramatic months between the peace negotiated in Kiel in January and the establishment of the Union with Sweden in August 1814. His home at the ironworks in Eidsvoll was also the meeting place for the constituent assembly which signed the Norwegian constitution on 17 May 1814. Anker was not present; he had been sent to London to ask Great Britain to guarantee the neutrality of an independent Norwegian state. The British refused to do that (Mykland, 2009)

⁵ Department of Commerce.

12.7 *The first publication of the population movement*

This first known hand-written table of births and deaths in the kingdom of Denmark-Norway and the German duchies of Schleswig and Holstein, Oldenburg and Delmenhorst, covers the years from 1735 to 1775 and was compiled by the Norwegian nobleman Carsten Anker (1747-1824). He worked as an official at Kommercekollegiet from 1774 to 1781. The text in the table is in German, the language of the state system in the Kingdom of Denmark-Norway at the time, and in the header of the table Anker uses the words *Geboren* and *Gestorben*, births and deaths. This phraseology signalled that the reported figures from the late 1770s were considered as a total count, and not just a register of those baptised and buried.

The two Icelandic dioceses of Holund and Skálholt appear in the header of the table, and are grouped under Norwegen (Norway) with the four dioceses of Trondheim, Bergen, Akershus and Kristiansand, and the column showing the total figures for Norway therefore also included births and deaths from Iceland. The reason was probably that Iceland was taxed by the Norwegian kings prior to 1537, when Norway came under Danish rule.

The reason why Carsten Anker compiled the table is not known. Nor is it known how the table came into the possession of Statistics Norway, but archives concerning Norway were transferred from Copenhagen to Christiania ⁶ at different times after 1814 when Norway came into a union with Sweden. Other tables in Carsten Anker's hand from the late 1770s, for example a table of the Norwegian merchant marine, still exist in the library of Statistics Norway, but the *General Tabelle* (Figure 12.3) is now in the National Archives of Norway. It is likely that the table first came in the possession of the National Archives of Norway in the 1830s, and then was given to the Table Office, a forerunner of Statistics Norway, and later deposited once again in the National Archives (Drake, 1969; Nakken, 2006; Søybye, 2014).

12.7 The first publication of the population movement

The first publication of a time series of births and deaths appeared some years later in 1786, and the table was probably compiled by Georg Christian Oeder (1728-1791). His table covered the years from 1735 to 1784. At that time, he was a trained collector of population statistics, and had constructed the forms, and organised and managed the first real census in Denmark-Norway in 1769 (Gaspari, 1786; Statistics Norway, 1980).

Anker's hand-written table was not used as a basis for a printed, published table for population movement. It is very likely that his *General Tabelle* was not known to Oeder. He compiled several tables covering births and deaths for the period from 1735 to 1784. These tables were published in three volumes entitled *Materialen zur Statistik der Dänischen Staaten*, by Adam Gaspari (1752-1830) in 1786 in Flensburg and Leipzig. There is some uncertainty about the author of both the book and the tables. Georg Christian Oeder very probably constructed the tables. The main reason for implementing this census was to find out how it would affect the king's ability to call up soldiers for

⁶ Oslo was known as Christiania from 1624 to 1877, then as Kristiania from 1877 to 1924 until the original name of Oslo was readopted from 1 January 1925.

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military service if the farmworkers' duty to live on the country estate where they worked (*corvée*) was suspended. Oeder believed that the right for everyone to move and settle wherever he wanted in the country would inhibit economic development.

Oeder had travelled in Norway between 1755 and 1760, and considered the living conditions for the Norwegian farmers to be better than those of Danish farmers, due to their obligation to stay on the estates of the major landowners.

Oeder knew Norway from his stays in the country. The purpose of his travels was originally to prepare a guide to flora for Denmark-Norway (Wagner, 2012), later known as *Flora Danica*, that was ultimately completed by others. Oeder's increasing interest in economic questions occupied more and more of his time. He knew Norway very well as far north as Rana. He also claimed that the population of Norway was the same as that of Denmark. This was not a widespread view prior to the census in 1769. According to this census, Denmark's population was 797,584, and Norway's was 723,618. The problem for Norway, in Oeder's opinion, was not a shortage of farmers but the lack of a bourgeoisie. His views represented early liberal economic thought, and he was given a central post in the Ministry of Finance, Kommercekollegiet, in Copenhagen, under the regime of Johann Friedrich Struensee 1769-1772, which was characterised by enlightenment and liberalism. When Struensee was arrested by his political opponents and sentenced to death, Oeder was banished to Oldenburg (Søbye, 2014).

The Norwegian farmers were highly respected by Oeder, but he observed that Norwegian farmers were overburdened as they had to cultivate the land, make and repair tools and build accommodation both for themselves and for their farm animals. Since the division of labour was little developed, farmers in Norway were not able to use all their time to develop their agricultural skills. The development of crafts also suffered from the lack of division of labour. When the farmer had to do everything, he became a jack of all trades, and master of none. According to Oeder, the reason for the poor development in the division of labour was the small, scattered towns and cities in Norway. He attributed the low urbanisation in Norway to conditions such as the monopoly given to wholesalers in Copenhagen to trade with parts of Norway. Oeder turned out to be a central spokesman for physiocratic economic thought, arguing against trade monopolies, and was an agent for free trade and the repeal of the Danish farmers' duty to stay on the big farms where they worked. Oeder's planning and completion of the census in 1769 was a tool for change in economic policy in a physiocratic direction (Gaspari, 1786; Øverland, 1913; Statistics Norway, 1980; Søbye, 2014).

The second publication of the population movement covered the 15 years after Oeder's table, from 1785 to 1799. Jean-Pierre Guillaume Catteau-Calleville (1759-1819) printed this table in his three-volume publication about the Danish state in 1802 (Catteau-Calleville, 1802). Catteau-Calleville was a Huguenot who lived in Stockholm from 1783 to 1810. He was a spokesman for the reformed (Calvinist) church, and published several books about Sweden, the Baltic area and Denmark-Norway.

A brief look at the table "*Balanz der Geborenen und Gestorbenen in allen Dänischen Staaten für 50 Jahre von 1735 bis 1784 inclus*" [The balance of births and deaths in all Danish states over the

12.7 *The first publication of the population movement*

50 years from 1735 to 1784] in Figure 12.4 shows that, in Denmark, there are more years when the number of deaths exceed the number of births than is the case in Norway. This imbalance occurred in 14 years in Denmark and only five years in Norway (including Iceland). However, the total surplus of deaths over births in these years was higher in Norway (with Iceland) than in Denmark (with 52,186 in Norway as opposed to 36,824 in Denmark). Overall, the net surplus of births was 187,959 in Norway (and Iceland) and 73,611 in Denmark. The reason for the surplus of births in these 50 years being greater in Norway than in Denmark has most likely nothing to do with the less-restricted position of Norwegian farmers, as Oeder believed, but was rather related to the different settlement patterns in the two countries. In Norway, towns and cities were few in number and small, and people in the countryside were much more scattered than in Denmark. The settlement pattern in Norway was an effective protection against the infectious diseases which claimed most lives at that time. According to the census in 1769, Copenhagen had 82,086 inhabitants, while Christiania only had 7,496 and Bergen 13,735.

The main tables for the population movement in the Kingdom of Denmark-Norway in Gaspari's book, and updated in Catteau-Calleville's publication, are referred to in Anton Martin Schweigaard's *Norges Statistik* (Norway's statistics) from 1840 (Schweigaard, 1840). However, it was not until 1869 that Anders Nicolai Kiær, the first director of Statistics Norway, tried to publish the time series as official Norwegian statistics from 1735 to 1865 in *Tabeller vedkommende Folkemængdens Bevægelse i Aarene 1856-1865* (Tables Concerning the Population Movement for the Years 1856-1865).

In between Oeder and Catteau-Calleville, Frederik Thaarup (1766-1845), professor of statistics at the University of Copenhagen from 1793 to 1797, published some figures for births and deaths from 1775 to 1784 in his *Veiledning til det Danske Monarkiets Statistic*, (Guidance to the statistics of the Danish monarchy) (Thaarup, 1794). These figures came to be of great importance since Thomas Robert Malthus bought Thaarup's book in Copenhagen, possibly in German (Drake, 1969), before he came to Norway in the summer of 1799, where he discussed population development in Norway with Thaarup. Malthus published the first edition of *An Essay on the Principle of Population* in 1798, and his journey to countries in the northwest part of Europe in 1799 was in order to collect more information about population development.

Thaarup had settled in Norway after a quarrel with another professor at the University of Copenhagen, Johan Frederik Vilhelm Schlegel. Schlegel had accused Thaarup of copying his work, and Thaarup then had to leave the university and took up a post as sheriff in Solør and Odalen. Malthus visited Thaarup on his tour because he wanted to know more about the population statistics. The meeting between the two is portrayed in detail in Malthus' diary from his travels. Malthus and his travelling companions were served a very good dinner with plenty of strawberries and cream, but he could not get much information out of the professor.

Since Thaarup did not speak French or English, and Malthus could not speak German, they had to use an interpreter. The interpreter was well-informed about topics that were of interest to Malthus,

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and could, for instance, explain the revenues of the clergy to him. The tithes were divided into three parts between the king, the church and the clergy (Malthus [1799], 1966).

XII. Tafel.
Balanz der Gebornen und Gestorbenen in allen Dänischen Staaten für 50 Jahre von 1735. bis 1784. incluf.

Jahre.	Dänemark.			Norwegen.			Deutsche Provinzen.			Hauptsumme.		
	Gebornen	Gestorbte	M. Gb. M. Gf.	Gebornen	Gestorbte	M. Gb. M. Gf.	Gebornen	Gestorbte	M. Gb. M. Gf.	Gebornen	Gestorbte	M. Gb. M. Gf.
1735	22602	17718	4884	19106	12788	6318	15014	11570	3344	56722	42176	14546
1736	23101	22435	666	20210	13668	6542	14607	13489	1118	57918	49592	8326
1737	22656	25310	2654	20275	16409	3866	14166	14604	438	57097	56323	774
1738	24125	22390	1735	19213	15676	3537	14953	12747	2206	58291	50813	7478
1739	24220	21656	2364	20829	16206	4620	15130	11954	3176	59976	49816	10160
1740	23725	24321	596	19932	17853	2079	14230	15745	1515	57887	57919	32
1741	22376	24739	2363	18740	24378	5638	13524	14647	1123	54640	63764	9124
1742	22714	23240	526	17732	44254	26522	14502	12920	1582	54948	80414	25466
1743	23873	21498	2375	18559	18616	57	15346	11691	3655	57778	51805	5973
1744	25281	18328	6953	19570	14426	5144	15360	10995	4365	60211	43749	16462
1745	25068	18960	6108	21388	12360	9028	15423	12568	2855	61879	43888	17991
1746	24579	21352	3227	18868	14142	4726	14479	13566	913	57926	49060	8866
1747	24306	22604	1702	21825	15850	5975	14228	14530	302	60359	52984	7375
1748	24967	26423	1456	21847	21494	353	14303	13840	463	61117	61757	640
1749	24946	23541	1405	22035	18317	3722	13215	12087	1128	60200	53945	6255
1750	24886	23154	1732	20595	18005	2590	13415	14639	1224	58896	57598	3089
1751	26116	22850	3266	23600	18274	5326	14321	13983	338	64037	55107	8930
1752	24789	20799	3987	22552	17228	4824	14013	14062	49	61351	52589	8762
1753	24597	20493	4204	23604	16427	7177	14221	14736	515	62522	51660	10866
1754	26431	23404	3028	24335	17082	7253	14520	13647	873	65286	54132	11154
1755	26676	24908	1768	23142	17834	5308	14823	12798	2025	64641	55540	9101
1756	26514	27543	1029	25213	19977	5236	14643	11220	3423	66370	58740	7630
1757	26018	24815	1203	23896	17060	6836	15192	14849	343	65106	56724	8382
1758	24356	27129	2773	23597	20064	3533	14717	13335	5718	62194	519912	2032
1759	23489	24535	1046	22885	14849	8036	14985	14638	347	66584	55986	10598
1760	26235	24546	1689	25364	16802	8562	14769	11610	159	65187	52615	12572
1761	25519	21079	4440	24899	16926	7973	15606	19051	3445	66285	62764	3521
1762	25597	25583	14	25082	18130	6952	14707	17658	2951	63500	78013	14513
1763	24588	33136	8548	24205	27219	3014	16311	14719	1592	67396	62158	5238
1764	25955	26987	1032	25130	20452	4678	16012	13684	2328	65778	59362	6416
1765	25417	24368	1049	24349	21310	3039	16724	17771	2953	67238	59138	8100
1766	26380	23845	2535	24134	21522	2612	16554	14045	2309	67810	55370	12440
1767	26427	23383	3044	25029	17942	7087	15947	13561	2378	65416	53327	12089
1768	25819	22213	3606	23650	17545	6105	16453	12889	3564	67802	54986	12816
1769	26823	24890	1933	24526	17207	7319	17822	15221	2580	68581	58893	9688
1770	27244	26045	1199	23515	17606	5909	16771	15305	1466	65686	58828	6858
1771	25590	26347	557	23325	17176	6149	16286	17660	1374	60461	66102	5641
1772	23239	28958	5729	20936	19474	1462	16748	17343	595	58496	83421	24925
1773	23341	30716	7375	18407	35362	16955	18148	14280	3868	65633	52199	13434
1774	26878	19135	7743	20607	18784	1823	18506	16483	668	70798	56723	14075
1775	27570	22987	4583	24722	17253	7469	17116	17784	534	65143	56799	9064
1776	26791	23025	3766	21236	15270	5966	18181	18715	668	68396	58642	9754
1777	26884	24272	2612	23331	15655	7676	18503	16820	2083	69795	55465	14330
1778	27405	23443	3982	23487	15222	8265	19005	15242	3763	70504	64584	5920
1779	27637	28574	937	22862	20768	2094	19012	15016	3996	72605	56979	15626
1780	28882	22440	6442	24711	19523	5188	18956	15690	3266	71037	56487	14550
1781	27928	24745	3183	24153	16052	8101	17753	17136	617	68196	59529	8667
1782	26499	24890	1609	23944	17505	6441	18143	15930	2213	65661	56824	8837
1783	25964	21537	4427	21554	19357	2197	17516	18052	536	66847	60366	6821
1784	25457	23488	1959	23874	18855	5045						
Summe	1268377	1194766	110432	1120581	932622	240145	787979	735654	73312	3177937	2863042	395236
Balance	1194766		31821	932622		52186	735654		20987	2863042		80341
Ueberschuß	73611		73611	187959		187959	52325		52325	314895		314895

Figure 12.4 Facsimile from 1786 (Gaspari, 1786) from the copy of his book in the library of Statistics Norway. Births and deaths for the Kingdom of Denmark-Norway and the German provinces of Schleswig and Holstein 1735-1784. The figure for Norway included the figures from the two Icelandic dioceses of Holund and Skálholt. Statistics Norway copied this table without realising that the figures from Iceland were included. Later it was noted in pencil that the figures for Norway also included Iceland, to prevent others from making the same mistake. Two tables prior to this give the figures by diocese, and here it is made clear that the two Icelandic dioceses were included in the total for Norway, Gaspari (1786)

12.8 Malthus - an important eyewitness, but a poor interpreter of statistics

Malthus was disappointed with his discussion with Thaarup about the developments in the Norwegian population. According to Malthus' diary, Thaarup was a good man, but he did not quite live up to his expectations of a professor. From the information Malthus collected from Thaarup's book, he deduced that even if the death rate was low and people were living long lives, the increase of the population was slow. Malthus explained the slow population increase through a low number of marriages and a high age at the time of marriage. The low number of marriages was attributed to the long period of military service required of all sons of farmers or labourers (Malthus [1803], 1958). In his diary from his Scandinavian tour, Malthus quotes Frederik Thaarup as an authority in the section "On the checks to population in Norway" (Malthus [1803], 1958).

Malthus also used the figures from Thaarup's book in his chapter about Norway in the 1803 expanded edition of *An essay on the Principle of Population*. Unfortunately, Thaarup had not told his English guest about Oeder's tables, even though he knew them very well and had referred to them in his own book. According to Drake (1969), the numbers Malthus used for births and deaths for the years 1775-1784 showed a death rate below normal, about 23 per 1,000 inhabitants. When Malthus generalised from this death rate, most of his reasoning about the population development in Norway was wrong, according to Drake. If Malthus had used Oeder's table, the low death rate for the years 1775-1784 could have been corrected (Drake, 1969). It is important here to mention that Malthus was in fact the first person to analyse the population development in Norway using the figures for births and deaths.

Thomas Malthus also interpreted some regional variances in the population development in Norway and thought that the population along the coast married early and more frequently, and had a lot of children when fishing was going well. All the children born under such prosperous times starved to death when the fishing failed; positive checks, according to Malthus' general theory. Malthus was given this explanation for population development among the fishing population along the coast resulting in a higher death rate than inland, by some upper-class people he met at a dinner party given by a Mr. Lysholm in Trondheim. For this reason, Malthus assumed that the death rate fluctuated more along the coastline than it did inland. Even though this turned out to be wrong, it was the first attempt to interpret regional differences in the population development in Norway (Malthus [1799], 1966; Drake, 1969).

Not everything Malthus wrote about the Norwegian population was wrong. He used the figures he obtained for births and deaths, and based his chapter on Norway in the second and considerably expanded 1803 edition of *An Essay on Population* on these figures. The main description he gave was correct. He was impressed by the high marriage age, in the late 20s for women. High marriage age kept the number of births inside marriage low. He also noted that the death rates in Norway were the lowest in Europe; life expectancy was therefore relatively high, but due to the high age at marriage, this did not lead to a high population growth with overpopulation as a result. For these reasons he regarded Norway as a very civilised country. This positive evaluation of the population

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situation in Norway was dependent on the false premise of generalising from the low death rates in the years 1775-1784. The reason for the high marriage age was not military service, but the fact that the sons of farmers or crofters had to wait to take over the farm before they could marry. A married couple was supposed to form an economic independent unit as a condition of marriage, and this raised the age of marriage (Drake, 1969; Sundt, 1855b). Malthus correctly observed that diseases were rare, but this was not related to the cold climate as he seemed to believe, but to a scattered settled population (Malthus [1803], 1958).

Other elements of Norwegian society did not impress Malthus as much as the population development. In the capital, he had great difficulty in buying a pound of beef, because there was no functioning commodity market in the town. He also complained that he could not buy a pound of fresh butter either (Malthus [1799], 1966). This is a very interesting observation, because it shows that households in the cities in Norway in the pre-transition area were self-sufficient, with produce from vegetable gardens and deliveries from relatives outside the city, so there was no need for a regular or permanent daily market (Figure 12.5).



Figure 12.5 Butcher's stall 1834, pen drawing on paper by unknown artist, Christiania, Kvadraturen, Dronningens gate

When Malthus travelled from Christiania to Trondheim, he noticed that in some places, the Norwegians were burning wood and digging the ashes into the soil. He also noticed that farmers moved their livestock from the valleys to pastures in the mountains in the summertime, and concluded that the Norwegians were not a nomadic people, but they lived in a pastoral era, and followed their livestock (Malthus [1803], 1958).

12.8 Malthus - an important eyewitness, but a poor interpreter of statistics

The population movement at the end of the 18th and the beginning of 19th century forms a fascinating study-object. A real change was happening to the country's population in these years, and Norway was fortunate in having Malthus as an eyewitness to this event.

When Robert Malthus was staying in Christiania, he was invited to a party at Johan Collett's farm at Ullevål, just outside the town. He had a conversation with his host's wife, Martine Collett, and noted what she told him in his diary. She explained that the workers at Ullevål were given black rye bread, salted butter or cheese for breakfast, boiled barley, herring or some other fish with beer for dinner, and once or twice a week fresh meat was served. Ordinary people lived in the same way, Martine Collett told Malthus, or not quite as well she added, instead of beer they had milk for dinner. She also said that the living conditions of ordinary people were improving; they were not as dirty as before and fewer children were dying (Malthus [1799], 1966).

This is a very interesting statement because it shows that Martine Collett linked the improved hygienic conditions with a decrease in child mortality. It is hard to overestimate the importance of this observation. The note of this conversation between Martine Collett and Malthus in his diary is of great help in addressing the reason behind the sudden fall in the death rate after 1814, and identifying it as being due to enlightenment. The fall in the crude death rate after 1814 has been a riddle for demographers and historians, and is still a subject under discussion. The death rate was low for some time in the 1790s, and in some years prior to 1807 when Denmark-Norway became involved in the Napoleonic Wars with the French. The high death rate between 1807 and 1814 was a result of special conditions during some of the war years. The high death rate in 1809 and 1812 masks or camouflages an already ongoing fall in the death rate. When peace was established, the events that had led to the high death rate were effectively removed, with the immediate result that the death rate fell below 20 per 1,000, and it would only reach that level again on a few occasions later on (Dyrvik, 2004; Sjøbye, 2014).

Some adherents to the theory of demographic transition, like Tim Dyson, professor of population studies at the London School of Economics and Political Science, argue that the only thing that needs an explanation, is the change from phase 1 to phase 2 of the transition, i.e. the fall in the death rate. Dyson regards phases 2, 3 and 4 as a chain reaction after the fall in the death rate (Dyson, 2010).

When more births resulted in children who survived infancy, the sibling groups became larger. Consequently, parents had to obtain more food, clothes and accommodation. In order to do that, many families moved to places where they believed this would be easier than their original abodes. This is why population increase is a main cause of internal migration and urbanisation. Urbanisation, defined as change of residence from the countryside to towns and cities, is also held to be a prerequisite for division of labour, both in the cities and in the countryside, and therefore also a prerequisite for economic growth. When internal migration and emigration and every other means are used as reasons for the increase in parents' ability to take care of the increasing sibling groups, they finally started to reduce the number of births. The reduction of births in Norway from about 1900 is therefore also seen as an answer to the fall in the death rate among infants and small children after 1814, even though it took close to 100 years from the fall in the death rate to the fall in the

birth rate. One reason for this slow development (Matthiessen, 1984) is to be found in the very slow decline in the death rate. This means that the increase in sibling groups is very slow, but in the late 1890s, almost every birth resulted in a child growing up. In order to improve the households' living conditions, a reduction in the number of births became an option. The short period between the fall in the death rate and the birth rate in some Asian countries has been explained by the rapid, steep fall in the death rate (Notestein, 1945; Dyson, 2010).

12.9 The first publication of vital statistics by the Norwegian authorities, and Eilert Sundt's studies

In 1839 the first publication of the population movement was issued by the statistical office in the Norwegian Ministry for Finance, Trade and Customs. This office also arranged the censuses and was the forerunner of Statistics Norway. The publication covered the years from 1801 to 1835 (Ministry of Finance, 1839). Catteau-Calleville's time series from 1802 ended with the year 1799. Figures for 1800 were therefore missing for a long time. The column in the table for population movement for 1800 was also empty in the editions of *Historical statistics* from 1914, 1926, 1948, 1958, 1968 and 1978. In *Historical Statistics* 1994, the figures for births and deaths were given for 1800 for the first time with a reference to Michael Drake, a British historian. In the 1960s he studied Norwegian population statistics in depth, and calculated the figure for 1800. However, Drake found it impossible to reconstruct the number of marriages and the number of children born outside marriage for the year 1800 (Drake, 1969).

The next publications by the Table Office devoted to the movement of the population were published in 1847 covering the years 1836-1845, and in 1857 covering the years 1846-1855 (Ministry of the Interior, 1847, 1857). It is important to mention these publications because they were the empirical foundation for Eilert Sundt's studies of mortality and of marriages. In his thesis Sundt used figures up to 1851 and must have had access to the figures from 1846 to 1851 before they were published in 1857.

Eilert Sundt (1817-1875), who was a theologian, used the time series for births and deaths in his two studies of population development in Norway from 1855. He noted that many civilised European states were unable to explain the development in mortality in their countries because they did not have statistics for births and deaths. Sundt was both proud and surprised that Norway had this statistical information. The reason for this, he explained, was that, as a precaution, information about births and deaths had been collected since 1735, when the priest had to report the figures from his part of the parish to the dean, and the dean had to report the figures from his parish to the bishop. Before 1814, the bishops sent the results to the Kommercekollegiet in Copenhagen, and after 1814 to the department in Kristiania. Sundt was full of praise for the existence of these statistics and declared that, from 1825 at least, the figures were correct, and that they also corresponded well with the results from the censuses. In his studies of deaths, marriages and births he analysed for the most part the development from the period 1825 to 1845 (Sundt, 1855a,b). Sundt did not examine the

12.9 The first publication of vital statistics by the Norwegian authorities, and Eilert Sundt's studies

figures for births and deaths from the 18th century in any detail, but he claimed that the reporting of figures from that period was unfortunately carried out without sufficient care; the reports from the bishops had not been thoroughly archived and many were missing (Sundt, 1855a).

In his thesis *On Marriages in Norway*, (Sundt, 1855a) the author seems to accept the figures from 1801 onwards as fairly reliable. Sundt's comment on the 1839 publication is still worth reading:

"Statistical Tables for the Kingdom of Norway, Christiania, 1839, is a most important collection of statistics for the present essay. It has therefore been all the more necessary to correct a mistake which occurs in it. The work contains details of marriages, births and deaths in the kingdom and dioceses year by year from 1801 to 1835. But in those for the year 1801, the totals for the Tromsø Diocese are counted twice, since firstly they are added to those for the Thronhjelm Diocese, which by that means has got too large a total, and then in the next place are given for the Tromsø Diocese. The mistake is occasioned by the fact that, at that time, these two dioceses were joined together. It is corrected in this way: one subtracts the totals given for the Tromsø Diocese from those of the Thronhjelm Diocese and the kingdom as a whole. I had long entertained a suspicion that this was the case, but I was first certain of it when, after the whole of this essay had been completed, I quite accidentally unearthed, in the Statistical Bureau's Archives, the original of the bishop's list. Since there was now no doubt about the matter, I was compelled to correct all the totals and calculations in which the details printed in the tables for 1801 had been used." Sundt (1855a), translation by Michael Drake.

In Sundt's two theses *On mortality in Norway* and *On marriages in Norway*, respectively, he clearly saw the registration of births and deaths from 1735 as an unbroken statistical line up to his own time, but the reliability of the figures improved from 1801, and again from 1821 when a common form for reporting was implemented. For 1838, Sundt changed the figures for births and deaths published by the statistical office. He believed that the office had not corrected the figures when the counting period was changed from the church year to the calendar year. Therefore 1838 covered 13 months, or so Sundt believed. In any case, Sundt claimed that the figures for births and deaths, the vital statistics, concurred well with the results from the six censuses - 1769, 1801, 1815, 1825, 1835 and 1845 - which were at his disposal, but that seems, as we will see in the following paragraph, to be an exaggeration.

Sundt was not the first Norwegian to analyse the population statistics. In 1840, Anton Martin Schweigaard (1808-1870) a professor and member of parliament, noted that from 1816 to 1825 a population increase like the Norwegian one was hard to find in any European country. Schweigaard deemed this increase to be an answer to the decrease in the population in the last years of the Napoleonic Wars. With the termination of the suffering that had led to a decrease of the population, the population tried to re-establish the population size. He explained the continued growth of the population between the censuses in 1825 and 1835 through better living conditions for the common people. He also noticed that the population in cities and towns increased faster than in the countryside, and that the reduction in mortality occurred among infants and children. The reason for this, according to Schweigaard, was vaccination.⁷ Schweigaard also found the discrepancies between the censuses and the annual figures for births and deaths to be highly significant. The discrepancy was detected by adding the births and subtracting the deaths between two consecutive censuses and

⁷ A method to protect against smallpox had been invented in the UK by Edward Jenner in 1796. Mandatory vaccination against smallpox appeared in Denmark-Norway from 1810 onwards.

The movement of the population of Norway

comparing the result with the reported population increase between them. His discussion of the discrepancies is interesting. Inaccurate statistics bear some of the responsibility, but the main reason was the lack of figures for migration (Schweigaard, 1840).

12.10 Michael Drake - revitaliser of historical demography in Norway

Another Englishman, Michael Drake, through his study *Population and Society in Norway 1735-1865* from 1969, has provided the most significant contribution not only to the understanding of the oldest parts of the time series, but by examining some of the primary data he was also able to correct miscalculations and find other errors. His corrections are now part of and have improved the official statistics.

One of the errors Drake corrected is of great importance because it also tells us something about the sources Statistics Norway drew on when they started to publish figures for the population movement in 1869. For 1743, the death rate was nearly 70 per 1,000 inhabitants, according to the figures published by Statistics Norway. This figure is much higher than in any other year, and it is significantly higher than in Sweden and Denmark. Drake examined the figures for this year and discovered that several errors occurred when the Kristiansand diocese reported the figures for this year to Copenhagen. In the state archive in Kristiansand, he found that the figures for the diocese this year only included seven of the ten deaneries. The figures for these were 1,411 births and 2,578 deaths. In Oeder's table, the figures for the dioceses are given as 2,580 births and 14,011 deaths. According to Drake, Oeder must obviously have confused the figures for births and deaths, and also mistakenly added a zero so that 1,411 became 14,011. In the same archive, Drake found figures for all the missing deaneries except Øvre Telemark. He assumed that the number of births and death for this area was according to that given for 1740 (figures for 1741 were also missing). With some adjustments, the results of these corrections were 2,520 births and 4,225 deaths for Kristiansand diocese in 1743. This resulted in a new death rate of 52 per 1,000. This is still the highest death rate in Norway, but at the same level as the highest death rates in Denmark and Sweden (Drake 1969).

In Carsten Anker's handwritten table, the figures for Kristiansand diocese for 1742 are 1,411 births and 2,578 deaths, exactly the same figures that Drake found as having been reported from Kristiansand to Copenhagen. It is possible therefore to conclude that, because Carsten Anker compiled his general table in the Kommercekollegiet, the figures were not corrected for the missing deaneries in Copenhagen. Probably this observation is also valid for years other than 1743 when parishes and deaneries failed to report births and deaths to their diocese. This of course makes the absolute figures for births and deaths too low, but whether the missing deaneries also affect the difference between the crude birth and death rate is another question. If the missing deaneries have a proportion of births to deaths similar to the average, the rates will not be affected.

Drake's studies in the 1960s of Norwegian population statistics and the basic material on which these were established, led to an increased understanding of the population statistics and to a long-lasting debate about the reliability of the oldest figures, of the relationship between the censuses and

12.11 Births and deaths in Scandinavia

the annual figures for births and deaths (Sogner, 1970; Herstad, 1970a, 1975; Thorvaldsen, 2004b), and about the explanation of the fall in the death rate in 1814 (Sogner, 1979; Lunden, 1980; Dyrvik, 2004; Thorvaldsen, 2004b). This latter issue, the explanation of the fall in the death rate, is still a key research question for understanding population development, not only in Norway, but in most countries in the world.

Drake thought that cultivating potatoes and vaccination against smallpox were the reasons for the fall in the death rates at the end of the Napoleonic Wars. He concurred with Schweigaard's explanations. This would have been the case if the population had previously been living close to the subsistence level, at which just a small food shortage would have triggered a famine. Today, few believe this to have been the case. The same argument can be used for vaccination: the high mortality rate prior to vaccination cannot be explained by a large number of deaths caused by smallpox, the disease the vaccination protected against (Drake, 1969; Engelsen, 1983; Moseng, 2003; Dyrvik, 2004).

Nonetheless, Drake's corrections to some of the figures, the construction of figures for 1800 and his mapping of reports from and to the dioceses in the archives have increased our knowledge and improved the interpretation of the time series. Drake's revised time series for 1735-1865 would later replace what had been the official figures for this period until he published his main study in 1969. Admittedly, this happened first 25 years later when Drake's revised figures were published by Statistics Norway in *Historical Statistics 1994* (Statistics Norway, 1995).

The main topic Drake wanted to study was the population development in a pre-industrial, north-western European country, and, more specifically what determined the age at marriage. The next question was whether the observed patterns of the age at marriage in rural areas carried over to industrial areas. His answer was positive: the birth rate did not change significantly in the four last decades of the 19th century; the death rate was falling but very slowly, and the most notable demographic feature of this period was migration to the cities and several waves of emigration (Drake, 1969).

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As demonstrated, this unique time series of births and deaths, converted into a graph and simple, descriptive statistics, inspires far-reaching interpretations and explanations which increase our knowledge about the past and how the past influences the present. The discussion of how the data were collected and what they were used for, is also a source of knowledge about the past; not only about demography but also about how the authorities worked and what kind of problems they wanted to solve with statistics. Also, the discussion of how trustworthy the data are provides valuable information about the past.

How well-founded the interpretations of the graph are depends of the quality of the figures. What opportunities exist for checking the reliability of the data, especially for the early years, say from 1735 and until the end of the Napoleonic Wars? Drake went to the archives to check the reports from

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the deans to the bishops. Such investigations were followed up by a large amount of archive work by the historian John Herstad (Herstad, 1970a,b, 1975, 2000), using the primary source material to check for missing reports, summary errors and so on. One main finding by Herstad was that the church books cannot be regarded as registers of births and deaths, as it was only baptisms and funerals that were entered in the church books. On the other hand, Herstad, despite finding a number of mistakes and miscalculations, concluded his investigation of the consistency between the church books and the deans' reports to the bishops by stating that his amendments would not change the overall picture of the time series (Herstad, 1975).

A simple, but effective method of checking the data is to compare the figures for births and deaths that are available for Sweden, Denmark and Norway from 1735 (Figure 12.6). The first person to check the figures by comparison was Andreas Nikolai Kiær (1838-1919), the first director of Statistics Norway. In 1869 he calculated the surplus of births from 1752 to 1865 for Norway and Sweden. He noted that there was a conspicuous similarity between these two rows of figures: when the surplus of births decreased in one of the countries, the same applied to the other. Years with a surplus of births in one of the countries corresponded with a high figure in the other. The difference was, according to Kiær, that the surplus of births over deaths was more positive for Norway than for Sweden. Kiær did not draw any decisive conclusion about the figures from the observation but he obviously looked at this similarity as justification for the correctness of the figures (Ministry of the Interior, 1869b).

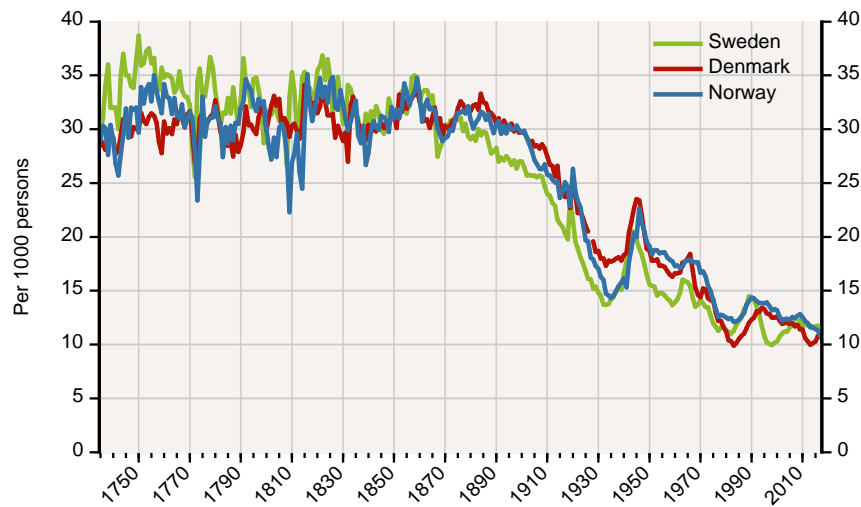
The first impression is the striking similarity we observe in Figure 12.6 when we compare birth and death rates for the three Scandinavian countries. This similarity indicates that the three countries largely share the same population patterns. However, if we had included the other Nordic countries, Finland and Iceland, this would have revealed different population patterns for these countries (Søbye, 2014).

Only one figure, the death rate for Norway for the year 1743, would indicate that Norway followed a different population pattern to those of Sweden and Denmark. A death rate of 70 per 1,000, if this figure is correct, would imply a catastrophe unlike anything seen in the three Scandinavian countries. The death rate for 1743, published by Statistics Norway until 1948, and not corrected until 1995, formed the basis for discussions about whether the situation in Norway was different to that in Sweden and Denmark.

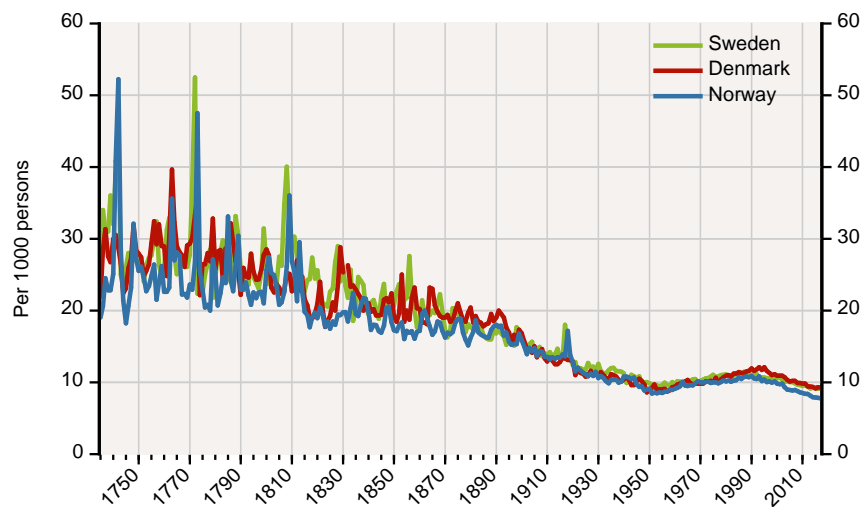
Another striking impression from the graphs is that the years before 1814 are characterised by major fluctuations, particularly for deaths. It could be claimed that such fluctuations were a result of a lack of reports one year, and double reports the following year. Since the movement in the death rate, including the major fluctuations from one year to the next in this period, are the same for the three countries, this could be a reason for assuming that the figures are reasonably accurate, i.e. reflect the real change and not only a lack of reports or double reports.

The graphical representation of the birth rates is astonishingly similar for the three countries, both in the short term and the long term, for the period before and after the Napoleonic Wars. The birth rate varies around 30 from 1735 until about 1900 and the major fluctuations from year to year start to

12.11 Births and deaths in Scandinavia



(a) Birth rates



(b) Death rates

Figure 12.6 Crude birth rates and death, Sweden, Denmark, Norway, 1735-2022

dissipate after the end of the Napoleonic Wars. It is also clear that, before the end of the Napoleonic Wars, the fluctuations in the birth rate vary less in Denmark than in Sweden and Norway. The birth rate in the countries falls from around 1900. In Sweden the fall begins about 20 years earlier than in Denmark and Norway. The fall of the birth rate from about 1900 to 1935 is greater in Sweden and Norway, than in Denmark, to about 14 against 17 in Denmark. The steep increase in the birth rate

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from 1934/35 is common to all three countries, but Sweden reached a peak in the birth rate in 1944 at a lower level than Denmark and Norway, where the birth rate peaked in 1946. From the middle of the 1940s, the birth rate again fell in all three countries to just above 10 at the end of the period.

A simple method to analyse the curves is to divide them into stages, and at least three, possibly four subdivisions are possible for the birth rate. The first shift in the birth rate happens around 1814 when the major fluctuations from year to year fade away. The second occurs around 1900 when the birth rate falls steeply for the first time in in 35 years, and the third period covers the years from the middle of the 1940s to the present day. It could also be argued that the birth rate flattened out from the beginning of the 1980s at least for Sweden and Denmark. The Norwegian birth rate has a somewhat different development than the corresponding Swedish and Danish birth rate throughout these years.

Another subdivision of the birth rate, into two, may be as relevant as dividing it into three. It is surprising that the birth rate remains at about 30 per 1,000 inhabitants from 1735 to about 1900, and after 1900 the rate declined, but not uninterruptedly, for about 120 years to about 10. On a more abstract level, the time series consist of two movements. The long, stable birth rate for about 165 years, through most of the 18th and the 19th centuries, is proof of how strong and therefore unchanged all the laws, norms and customs were for marital life throughout this period, while there were so many substantial changes in many other areas. The downward trend since the turn of the previous century is equally surprising. Even if the decline in the birth rate has abated from about the 1990s, it still shows a downward tendency. The fall in the birth rate occurred at the same time as the establishment of the welfare state just after the Second World War, and with improvements to the living conditions for the population. In the long run, and for the total population in the three countries, there seems to be a negative correlation between increasing wealth and a decreasing birth rate.

Figure 12.6(b), which shows historical death rates for the three countries, indicate that the peak of the death rate occurred in war-times. The incidences of big spikes in death rates, where some years show unusually large annual changes, become less frequent and show smaller spikes from around the end of the Napoleonic Wars, and a from the midst of the 19th century a significant decline in the death rates can be observed for all countries.

It has also been claimed that the volcanic eruptions on Iceland, the Laki and Grímsvötn eruptions between 1783-85, affected the European climate, with crop failure as a result, and one effect of this again was a high death rate in Sweden, Denmark and Norway in the middle of the 1780s (Dybdahl, 2014). This is also visible in Figure 12.6(b). Prior to 1814, the Norwegian birth rate has a more extreme downward manifestation than the Swedish and Danish birth rates. If these manifestations are not a result of lack of reports from parishes, but of real changes, how are they to be explained? Unfortunately, this and other research questions deserve more space for analysis than the format of this book allows. We will therefore refer the reader to other studies which dig deeper into these. Instead we will continue to describe the main sources behind these historical demographic data series.

12.12 Population development across dioceses

The main findings for the period prior to the end of the Napoleonic Wars are, first, a year with a very high death rate is followed by a year with a low death rate; second, a year with a very low birth rate is followed by a birth rate higher than the average. The development in the birth rate and the death rate is mirrored. Postponement of births, one way or the other, in years with a high death rate is the explanation for the low birth rate in the same year. This is an example of how the rates affect each other in the short term.

If the great variations in the figures were a consequence of incomplete and random reports from the parishes, it is hard to believe that this could result in the surprising regularity in the crude birth and death rates we observe for the three countries in Figure 12.6. This does not mean that the figures are without weaknesses, as particularly prior to 1760 there are lacunae due to vacancies amongst the clergy and late reporting.

12.12 Population development across dioceses

The result of the comparison of the birth and death rates from Sweden, Denmark and Norway is that the figures from 1735 to the end of the Napoleonic Wars can be regarded as reliable in indicating the main patterns of real births and deaths. Another way to check the figures is to split them into regional subdivisions. This can expose errors that it would not be possible to discover otherwise. Regionalising the crude birth and the death rate will also provide valuable knowledge about the developments in the four different dioceses from 1735 to 1865 (Figure 12.7). Will the main pattern for the whole country be repeated in the dioceses? And if not, what could be the explanation?

It is possible to check the information about births and deaths for some of the period by comparing the number of births and deaths from the population movement from 1769 to 1801 with the censuses for these years (Table 12.2). The figures correspond surprisingly well for the whole country. The population increase according to the censuses is the same as the surplus of births, according to the vital statistics, for the period between these two censuses. The counting day for this first census was 15 August, and this was an unfortunate choice because many men were absent (Drake, 1969; Statistics Norway, 1980).

Table 12.2 Population development by diocese, 1769-1801. Source: Drake (1969)

	Norway	Akershus	Kristiansand	Bergen	Trondheim
Census 1801	883 028	378 646	133 711	153 556	217 115
Census 1769	723 122	315 043	113 024	130 352	164 703
Increase 1769-1801	159 906	63 603	20 687	23 204	52 412
Excess of births 1769-1801	158 999	67 341	28 473	30 064	22 121
Emigration (-) or immigration (+)	+907	-3 738	-7 786	-6 860	+19 291

For the diocese of Trondheim, which covers Trøndelag and the three northernmost counties, the

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Figure 12.7 Dioceses before 1804, deaneries about 1850

12.12 Population development across dioceses

figures from 1735 to about 1745 are clearly too low due to both a lack of reports from the northernmost deaneries and to vacancies amongst the clergy. For this diocese, Gunnar Thorvaldsen, a historian who has specialised in population statistics, has, by studying the reports from parishes in Trondheim diocese, found many deviations from the figures published by Drake and Statistics Norway. However, his conclusion is that the differences to the official statistics were relatively marginal (Thorvaldsen, 2004b). In the Danish evaluation of the figures prior to 1800, specific attention is given to the fact that figures from these northernmost parishes were missing (Statistics Denmark, 1905) and this is most probably the reason for the low crude birth and death rates for the first three to four decades for this area of the country.

To sum up the result of the regional differences in the development of the birth and death rate, it is helpful to look at the effect of the volcanic eruptions in Iceland that ended in 1785, and to the end of the Napoleonic Wars in 1814.

In Bergen and Kristiansand dioceses, the population increased slowly but surely from year to year, even during the Napoleonic Wars (Figure 12.8).

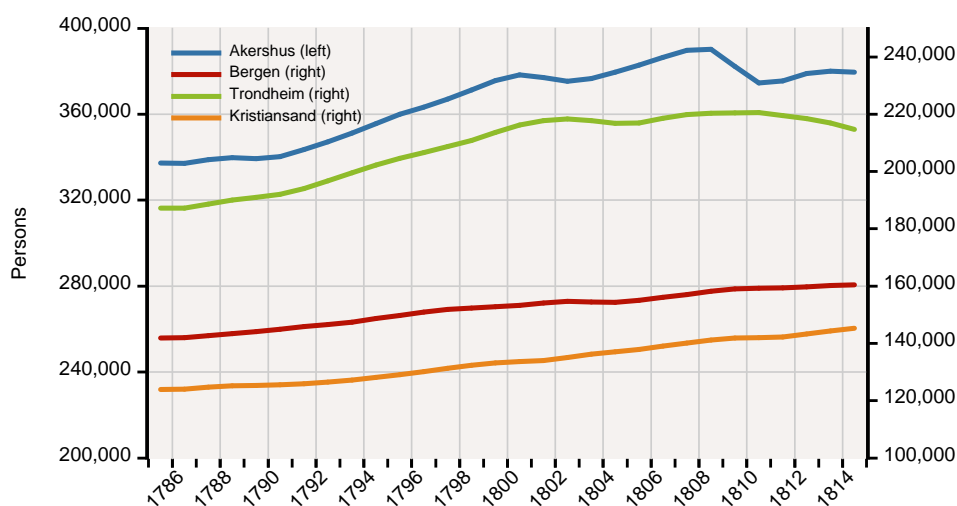


Figure 12.8 Population after diocese, 1785-1814

In Trøndelag diocese, the population increase stopped from the turn of the century and stayed at the same level before it decreased until 1814. The most dramatic changes in population development occurred in Akershus diocese. In the 1790s, the population increase was strong, but came to a halt in 1800, and in 1807 the same happened again before the strong decrease in the population after 1809. The result was that the population in this most densely-populated area with over 40% of the population in the country came to a standstill for about 15 years. The large surplus of deaths over births in 1809 is the cause of this.

The movement of the population of Norway

Because the high birth rate in Akershus during this period is related to the last years of the Napoleonic Wars, it is common wisdom that the excess mortality in this region of the country in this period masks or camouflages the fact that the fall in the death rate had started in the same region of the country. It has been suggested that the war between Norway-Denmark and Sweden in the spring of 1808 led to many being killed by enemy weapons, but in fact it was infectious diseases that claimed the majority of victims. Because of the size of this region's population, this fall in the death rate from the 1790s is masked in the main figures in *Population movement in Norway 1735-2022* (Figure 12.1).

12.13 A closer look at the historical data sources

The introduction of parish registers in 1685

The introduction of the registration of births and deaths was ordered by the King of Denmark on 30 December 1735 and applied to the bishops in Denmark-Norway. They were ordered to collect from the parishes the number of births and deaths at the end of the year and to send lists with a detailed explanation to the Kommercekollegiet. It was also a requirement that this should be done by the end of every year (Lassen, 1965). The directive did not contain any further definitions or instructions.

The precondition for ordering the bishops to collect such lists from their parishes was the introduction of the church book or parish register. This was done in Denmark in 1646 and in Norway from 1685 (Thorvaldsen, 1996; Backer, 1961). This modest beginning can be traced back to a letter from the government in Copenhagen to the bishop in the diocese of Zealand, dated 20 May 1645. This letter is the first-known initiative imposing upon the priests the duty to maintain church books. If they did not list births, marriages and deaths, the letter reminded them, they could lose their office. A similar letter was sent to the bishops in Skåne and Jutland the following year, 1646. It is likely that the injunction to keep parish registers also applied to Norway at the same time, but the first documented order for Norway, however, dates from the summer of 1685. The Church Ritual from the same year, valid for the whole kingdom, Chapter 2, Article 1, says: Nobody must neglect to baptise their children, but as soon as possible after the birth must ensure that the new-born child is baptised. The parents or other persons responsible for the new-born child must, the day before the baptism is to take place, inform the priest and let their names, the children's name and the name of the godparents be recorded in the church book. Chapter 9, about corpses and funerals, says: There shall be a book in every church for every death in the parish, and the priest himself is to keep it up to date with the name and age of the dead. It is worth noting that the Church Ritual from 1685 alternately use the words births and baptisms, deaths and funerals (Statistics Norway, 1890; Danmarks og Norges Kirke-ritual, 1685).

Maintaining a church book for each parish is one thing; listing births and deaths for every parish, diocese and whole countries is another, but one thing is certain: the church book is a necessary and sufficient condition for listing all births and deaths. For Denmark the listing of births and deaths, or

12.13 A closer look at the historical data sources

establishing of vital statistics, could have happened from 1687, but, apart from Copenhagen, these lists exist only for the year 1689. Listing and summation of all births and deaths in Norway was ordered in a letter to the bishops in 1720. The letter referred to an earlier letter with the same message that so far had not been properly executed. There may well have been initiatives to list all births (baptisms) and deaths (funerals) in Norway before 1735 as well. The oldest extant Norwegian church register is from 1634, and from before 1688 there are church books from about 40 parishes. The total number of parish registers from before 1700 is 127 (Digitalarkivet , 2018; Statistics Norway, 1890; Statistics Denmark, 1905; Lassen, 1965; Thorvaldsen, 2004b).

The main motivation for establishing parish registers in the middle of the 17th century was to check that the bishops and deans were performing their ecclesiastical duties and that the population followed the state religion. Earlier censuses for the adult male population, such as the one in 1666, were carried out to provide an indication of the size of a potential army. The reason given for establishing the parish registers was not to collect annual statistic based on the parish registers.

Reorganization of Kommerce-Kollegiet in Copenhagen 1735

The permanent use of parish registers for establishing vital statistics was an initiative from the reorganised General-, Lands-, Økonomi- og Kommercekollegiet in Copenhagen in 1735. A great depression occurred in the years prior to 1735, caused inter alia by the Great Northern War of 1700-1721, when Denmark lost at least 100,000 men, and falling grain prices led to a crisis in Danish agriculture and for the countryside. The typical Danish farmer, who worked for a landowner in the 1730s, has been compared with Ludvig Holberg's portrait of the main character of Jeppe på Bjerget in his comedy from 1722 (Thott [1735] 1966): "he works without desire, becomes lazy, lascivious, and spends all his money on liquor".

At that time, *corvée* - the duty of the farmer not only to work for, but also to live on the property of his landlord - was widespread in Denmark. The Danish farmer did not own the land he cultivated, and he was not free to leave. In Norway, the farmers owned their land, and even the crofters lived under better conditions than the Danish farmer or, more precisely, an agricultural labourer who was not free to sell his labour to whoever he wanted. The Norwegian crofter rented land for cultivation with a duty to work for an agreed number of days for the landowner, but he was free to terminate the contract. The population in the countryside in Denmark and Norway lived under very different social conditions.

The crisis for the Danish-Norwegian state at the beginning of the 18th century, and the attempts to remedy them, led to the state's sale of the Norwegian churches in 1820, most often to the congregations. This had some important consequences. When the churches were owned by the state, they had a depot for storing the tithes paid by the farmers as tax, often in the church loft. This tax was divided in three equal parts between the king, the vicar and the church. The king's and the church's shares were stored from one year to another to serve as a reserve for the people in the parishes. When it became obvious that there was no lack of seed corn or grain for food, the king's share was taken to the granaries at the fortresses. The new owners of the churches, priests, other officials or the

The movement of the population of Norway

congregations, had no interest in continuing this system, and it collapsed, even though the authorities in Copenhagen thought the arrangement should continue.

Because of the collapse, the farmer had to sell his grain and pay the tithes in cash. This was cumbersome, and the Norwegian-grown grain could hardly compete with the Danish grain in price and quality. To increase the price the Norwegian farmers could get for their grain, especially after the introduction of the Danish grain monopoly in the south-eastern parts of Norway from 1735, they used the grain to make spirits. The result was a torrent of spirits with negative effects on the population. Therefore, the production of spirits was banned from 1740 in south-eastern Norway. Earlier historians have claimed, exaggeratedly, that this led to food shortages that explained the high death rate at the beginning of the 1740s (Øverland, 1913).

There was no doubt, however, that the Kommercekollegiet in Copenhagen tried to establish grain storage after the sale of the churches. The head of the ministry from the summer of 1735, Otto Thott, drew up an economic programme, and in this both economic questions and population development play a significant role for handling the crises in Danish agriculture. The size of the population was, after all, the foundation for everything else, and in his programme, Thott presented thoughts about the state of the economy and how to improve it. His handwritten Pro Memoria, first published in 1966 (Thott, [1735], 1966), set out the spirit and mind-set that needed statistics not only for the movement of the population but also for several other areas concerning the state's affairs.

One of the reasons for the crisis in Danish agriculture was the lack of labour due to losses during the wars 1700-1720, and also because people living in the countryside moved to the cities. To solve these problems, Thott suggested encouraging young men to remain in the countryside. Another measure was to move poor, unemployed children from the cities to the countryside to work for the landowners. Another proposal was to import labour from abroad. Thott's argument was in line with the ruling mercantilism ideology, where a worker was considered as muscle-power, and the more men, the more muscle-power. To increase the population, he also considered promoting early marriage, but to do this needed further discussion, he wrote in his paper. He also considered granting tax exemption to fathers with seven living sons. This would undoubtedly lead to increasing the population, according to Thott, but also to decreasing income for the state, so he did not suggest it.

The ideological background for the interest in the population in the countryside was that Thott believed that the farmer's work, the citizen's industry and the merchant's trade formed the foundation of the wealth of a country. This main viewpoint was challenged but not threatened in a chapter he wrote about manufacturing. A country lost money, he argued, when it sold unprocessed raw materials to other countries. The best position for a country was to buy raw materials and sell the fabricated goods. The work force for such factories, according to Thott, could be poor people and beggars.

Holland had tried to establish factories for a long time, according to Thott, but these failed until France chased the Huguenots out of the country to the benefit of the Dutch who welcomed them in. The Huguenots went also to Britain, Sachsen and Brandenburg and established factories there. The Huguenots were Calvinists, and Max Weber has argued that their faith was a central explanation for the establishment of the capitalist spirit when austerity and puritanism moved out of the monas-

12.13 A closer look at the historical data sources

tic cloister and into the real world (Weber, 1904-5). When Thott described the Huguenots in such a positive way, and clearly saw the added value in manufacturing raw materials, this contradicted his mercantilist world views, but not in a way that made them disintegrate, because he saw manufacturing within the perspective of foreign trade. He did not doubt that the source of wealth was a positive foreign trade balance.

In general terms, Thott also commented on the population situation in Norway. Given the size of the country, it was, in his opinion, very sparsely-populated, and he could not understand why. He noted admittedly that the conditions for agriculture were poor, but the same was the case in Sweden, and according to Thott, that country was crowded with people. In order to explain the lack of people in Norway, Thott referred to the common assumption that many Norwegians drowned during the big fishing expeditions, and that many went abroad and did not return.

Thott also expressed his opinions on the population situation in the northernmost part of Norway, Finnmark. He noted that the monopoly of trade with this part of the country was given to companies in Copenhagen from 1729, but resulted in so little profit so that the trading houses wanted to withdraw, but no-one in Bergen or Trondheim wanted to take over. This opinion has later been contradicted by Norwegian historians who characterised the Copenhagen wholesalers as octopuses with strong arms and a big mouth (Øverland, 1913). Thott referred to the laziness of the inhabitants, and the existence of two kinds of people in Finnmark, to explain the slow development of this area. The first were the Sami people who lived in the inland with their reindeer. The climate was so cold that the laziness of the people was a congenital trait, according to Thott, but the people were nevertheless of a good type. According to Thott, the wolves took so many reindeers that many of the inhabitants were very poor.

The other people in Finnmark, the Norwegians, again according to Thott, lived along the coastline and were fishermen. They were lazy and drunkards. Thott suggested therefore populating the area with new, talented people but admitted that this would be very difficult, and it would cost a lot of money to get hard-working people to come to such an inhospitable area. Finnmark was much more inhospitable than Swedish and Russian Lapland because the poorness of the soil and the severe cold due to the sea that surrounded the county (Thott, [1735], 1966).

To increase the grain prices, Thott introduced a ban on foreign grain, i.e. a monopoly on Danish grain for Denmark and for the eastern and southern parts of Norway from 1735. This monopoly was first repealed in 1788. Earlier, this grain monopoly was assumed to be a cause of some of the demographic catastrophes in Norway, but any direct connection between the Danish grain monopoly and years with a high death rate before 1789 has been hard to prove. In periods when there was not sufficient Danish grain to meet the need in the south-eastern parts of Norway, the monopoly was temporarily lifted (Herstad, 2000).

The Danish grain monopoly for the eastern and southern parts of Norway was intended to stop grain imports from Britain. At this time, Britain was the main European producer of grain. According to Thott, imports to Norway were of a formidable size. However, this was not the case, but rather a result of the prevailing mercantilist economic idea in Thott's paper. However, the monopoly was

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also introduced to improve the sales prospects for Danish agriculture, and was an instrument for increasing the prices of Danish grain and thereby overcoming the crisis in Danish agriculture.

It was not reasonable, according to Thott, to cut down forests to grow grain in Norway. That would be just as idiotic as to planting forests on Danish agricultural land. The Norwegian forests should be cultivated. It worried Thott that Norway was importing grain but also many other commodities from Britain. He had heard that the Norwegians were so fond of goods from Britain that they were not satisfied with anything if it did not come from there. Ordinary things such as like shoes, tables, chairs and so on were imported, even though Norway, according to Thott, had enough leather and wood to produce these things. Thott wanted to stop these imports from Britain to Norway, and he may have regarded this trade as a threat to the relations between Denmark and Norway. The Norwegian trade with Britain was, however, a direct effect of the export of timber to Britain. A consequence of Thott's plans to increase the production of timber by cultivating the Norwegian forests would therefore increase trade relations with Britain. It was the south and eastern part of Norway, most of Akershus diocese, which made up the timber-exporting area with connections to Britain and Holland, while the fish-exporting west coast had connections to the south European countries like France, Spain, Portugal and Italy. The Danish trade policy harmed trade with Britain, and particularly the timber-exporting areas in Akershus diocese, and this formed a basis for the desire for political independence for Norway or, if necessary, a union with Sweden. This played an important part in the negotiations and discussions at Eidsvoll in 1814 when the Constitution and foreign policy were formed.

Thott's Pro Memoria for the reorganisation of the Kommercekollegiet also promoted the idea of enlightenment and the dissemination of knowledge of useful sciences such as mechanics and physics, and therefore he called in a professor in these topics from abroad. This would be to the benefit of agriculture and navigation, and for the establishment of factories. It was also a good thing for young people to learn to read and write, and learn geometry, mechanics and physics in their own language. The paper also encouraged the prevention of diseases by preventing infection. Thott also recommended faith in God, sobriety, thrift, diligence, fidelity and the law. These virtues are related to pietism as well as to mercantilism (Thott, [1735], 1966).

From granaries to local saving banks

After the demographic crises at the beginning of the 1740s, initiatives were taken in Copenhagen to establish granaries, and the first permanent granary was established at Ulvik, Hardanger, in 1775. Firstly in 1788, when the Danish grain monopoly for south-eastern Norway was repealed, a plan for the establishment of granaries in Norway was drawn up, and by 1833 there were 250 such granaries. The reason for setting these up was in order for grain for seed and food to be available in years with crop failure, because the authorities believed that high mortality in some years was caused by food shortages. This has later turned out to be a questionable truth. However, it was decided that the granaries should be located close to the churches (Figure 12.9). After the Napoleonic Wars, times improved, first and foremost because of a long period of peace, and it was no longer necessary to store grain. The value of the grain in many of the granaries was converted into start capital for

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local saving banks. The saving banks in Norway were established with the value of the grain in the granaries as the basic capital.



Figure 12.9 Norderhov Church, Ringerike, with the rectory and granary. Anonymous painting from between 1820 and 1840. The granary or arsenal was built in 1820 with five floors. It was moved to Helgelandsmoen, a military camp, in 1868 and used as a depot until 2004, then it was restored, and is now used partly as an art gallery

The idea of the saving bank was developed by a Scottish priest, Henry Duncan (1774-1846). Depositors were to elect the board; the surplus should be given to the depositors and used for beneficial purposes in the area. Both the location of the granaries next to the churches and the priestly (if not Christian) origin of the idea of the saving banks led to the saving banks being placed under the authority of the Church Department until 1851, when the Finance Department took over responsibility (Øverland, 1913; Schilbred, 1949; Martinsen, 1954; Kjølås, 1956).

The establishment of local saving banks before 1850 was of great importance for the accumulation of capital in the countryside, for instance, for financing dairies and other businesses connected with agriculture. All the small but important saving banks spread over the country can be seen as an unintended effect of an action that was not necessary, because food shortages and famine were never the main cause of the demographical crises. The effect of this action, on the other hand, turned out to be an indisputable and very useful benefit.

Instructions from Copenhagen 1735-1812

The letter of 30 December 1735 to the parish priests via the dioceses ordered them, with no further instructions, to report summary lists of births and deaths. It was implied that the counting period was the church year, from the first Sunday in Advent one year to the first Sunday of Advent the next year. In some regions the church year was defined otherwise, from summer to summer, and for the first years therefore, the use of the calendar year in the table is a deliberate misrepresentation.

In 1775, the parish priests were ordered to give figures for births for each sex and for births outside marriage, and deaths were to be given for each sex in 10-year age groups. From 1775, births were also to be given in four columns, male, female, births outside marriage and total births. This new form created huge problems for the parish priests and the dioceses, and later became the main reason for Statistics Denmark considering the figures to be unreliable.

In 1797, the parish priests were given instructions to report stillbirths, but not abortions or foetuses born before the seventh month. The instruction did not say whether stillbirths should be counted both as births and deaths, or only among the births or only among the deaths. In 1800, a new instruction ordered that stillbirths should be stated for each sex. In 1802, 1806 and 1807, circulars for registering stillbirths and deaths among new-born babies were mediated to the parish priests (Ministry of the Interior, 1869c).

The source for the reported lists of births and deaths was the church book or the parish register. It is therefore of interest to note that from the beginning the church books had blank pages. It was up to the parish priest to organise how he registered births, deaths, deaths by age, marriages and later, births outside marriage. This of course affected the quality of the listing and the statistics. Firstly in 1812, the pages of the church books were issued as pre-printed forms, and it is easy to assume that this contributed to improving the quality of the reported lists from the parishes.

The man with the hat

From a drawing purportedly from 1809 by Hieronymus Aschehoug (1790-1850), the son of Thorkild Aschehoug (1756-1838), the parish priest of Rakkestad in south-eastern Norway, it is possible to see what a parish priest's office looked like in the period before the parish register was equipped with pages with pre-printed forms for registration (Figure 12.10). It is important to be aware that Rakkestad was a large, wealthy parish in Norway. The main church was called Rakkestad Cathedral by local inhabitants, and a photograph of the church with the rectory to the left, partly hidden behind big trees, taken in 1875 before the reconstruction of the stone church, originally from about 1200, shows why that name was justified. The picture also shows the unusual, wide, rolling fields that make Rakkestad one of the most important agricultural municipalities in the country. The rich farmland with the slow-flowing river, the bridge and the road that winds up to the church make the landscape typically pastoral, park-like and English, rather than Norwegian.

The priest's office in the rectory looks, at least in the priest's son drawing, like a pleasant, cosy sitting room. There is no sign whatsoever that the kingdom of Denmark-Norway was at that time

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Figure 12.10 Rakkestad church with Bjørnstad bridge in the foreground. Photograph from around 1875. In the short war between Norway and Sweden in the late summer of 1814 from 26 July to 14 August, a battle took place next to the bridge on the last day of the war, 14 August. After the fall of Fredriksten fortress at Halden, the Norwegian forces withdrew to the west side of the Rakkestad river and tried to stop the Swedish forces there. Cannons were placed on either side of the bridge; the Norwegians were inferior in number and had to withdraw. During the battle Thorkild Aschehoug was safe in the rectory. The war resulted in the loss of 400 dead and wounded Norwegian soldiers

drawn into the European war on Napoleon's side after the second battle of Copenhagen Harbour in 1807. The first years of the Napoleonic War, from 1800 to 1807, were prosperous for Norway because neutrality made trade possible with both sides of the warring nations, and shipping enjoyed prosperous times with high freight rates. This came to an end from the late autumn of 1807, when Great Britain blockaded all shipping to and from Norway. This made it difficult to maintain the connection between Norway and Denmark. As a country dependent on the import of grain, the blockade led to hard times in Norway, but this gloomy background is hard to recognise in the drawing of the parish office at Rakkestad rectory (Figure 12.11).

It is easy, however, to see that the parish priest, Thorkild Aschehoug, is busy working at his desk. He has not even had time to take his hat off. Perhaps he has missed the deadline for submitting last year's list of births and deaths to his bishop. Note also the numerous books and protocols on the bookshelves. Some of them could be Bibles and other religious books, necessary to exercise a parish priest's profession, but the office is completely dominated by big protocols or records for the registration of births, marriages and deaths. There is of course a picture of the crucifixion over the bookshelves on the wall, but here are also tobacco pipes and binoculars on the wall, objects primarily related to secular activities. All in all, it is surprising how little the office is dominated by religious items. Even the parish priest is dressed like a civil servant or a contemporary business man.

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Figure 12.11 Drawing by Hieronymus Aschehoug. He did not follow in his father's footsteps but became an officer in the Danish-Norwegian fleet and stayed in the Danish navy after 1814. The drawing is purported to date from 1809 and at that time he was 14 years old (Vilborg Stubseid Hovet, *Den illustrerte boka, historia om norsk bokillustrasjon*, Oslo 2011). Another source (T. A. Topsøe-Jensen & Emil Marquard: *Officerer i den Dansk-Norske Søetat 1660-1814 og Den Danske Søetat 1814-1932*, Copenhagen 1935, Vol. I.) gives 1790 as the year Hieronymus was born, and in that case the drawing must date from 1804 if the information about his age, 14 years, when he did the drawing, is correct. According to this source, he was a cadet from 1802 and a lieutenant from 1808. He was second in command, or commander in chief, on many expeditions after 1814 to the West Indies and also to the Faeroes and the Mediterranean. He often was on leave for months at a time to visit Norway, and in 1841 he had a year's leave to travel in Britain, France and Italy. From Naples in April 1842 he had to ask for an extra month's leave because heavy snowfall made crossing the Alps impossible. In the census for officers in the Danish navy, it is also noted that he was a skilled portrait painter. A detailed drawing in his hand exists of Rakkestad church, the rectory and the landscape around

The actual church book from 1809 that Thorkild Aschehoug may be about to update in the very moment he was portrayed by his son, still exists. Figure 12.12 shows a page for baptisms or births for the end of 1808 and the beginning of 1809. It was from pages like these that the parish priests added up the numbers of baptisms and funerals and reported them to the diocese. The four Norwegian bishops did the same for their dioceses, and sent the lists to Copenhagen where they were kept together with the results from other parts of the kingdom of Norway-Denmark.

Döpte 1808 og 1809.		
83 1808	Am. 6 ^{te} Novbr. O. Anne Anneken Grotenud og St. Johana A. Grind ^{er} Son, Döbt. Søst. Lars Anns Pind, stor Anneken Grotenud, Mathyholden (Anst. K. Skole) Hoffersen, Gunild Tormentid: Søster og Helene Helgesd: ibid.	Erich.
84 1808	Am. 6 ^{te} Novbr. O. Amund Vendsen Sörsted og St. Ulrik Gulbaand ^{er} Søn, Döbt. Søst. Nils Anneken Thorsen, Ole Gulbrandsen Sörsted, Math's Olsen Sörsted, Leibeke Stralsd: ibid og Inger Beulsd: ibid.	Marte.
85 1808	Am. 6 ^{te} Novbr. R. Ole Andorsen Rugmadsen og St. Anne Torstens ^{er} Søn, Döbt. Søst. Jørgen Larsen Kiernd: St. Ole Olsen Nordbye, Maria Johanesd: Kiernd: St. Petre Gregoriusd: ibid og Anne Oden Mellegaard.	Maria.
86 1808	Am. 6 ^{te} Novbr. R. Anders Andersen, Søren og St. Elle Lars Søren Søn, Döbt. Søst. Tøllus Götbye, Augustinus Sørensen, Søren Søren, Ole Kristian Søren, Anne Mathsd: ibid og Anne Maria Söllersd: Götbye.	Lars.
87 1808	Am. 13 ^{de} Novbr. D. Anders Edersten Nakum og St. Inger Grind ^{er} Søn, Döbt. Søst. Henrik Mølle, Lars Kristensen ibid, Niels Svendsd: ibid, Inger Edersten ibid og Johane Minced: ibid.	Erich.
88 1808	Am. 13 ^{de} Novbr. D. Ole Edersten Grind ^{er} og St. Jøran Olsdatter Søn, Döbt. Søst. Ole Olsen Fied, Hans Pedersen, Inger Eng, Mark Hansd: Fied, Man Hansdatter og An Eng og Berthe Maria Tormentid og Grind ^{er} .	Peder.
89 1808	Am. 20 ^{de} Novbr. R. Peder Helgesen Dehle og St. Anne Andersen ^{er} Søn, Döbt. Søst. Gnarnus Helgesen, Eriksen og Mølle, Søren Andersen Hougsten, Larsen, Hansd: Dehle og Anne Helgesd: ibid.	Gunild Maria
90 1808	Am. 20 ^{de} Novbr. R. Anders Larsen Møller og St. Ole Johanesd ^{er} Søn, Döbt. Søst. Ole Eng, Kristian Johansen, Kløfver, Inger og Larsd: Eng, Houg Larsd: Møller og Helene Johanesd: Kløfver.	Hans
91 1808	Am. 27 ^{de} Novbr. R. Ole Andersen for Tronesta og St. Carine Nilsdatter Søn, Döbt. Søst. Johannes Andersen, Tronesta, Kristina Kierboe, Torvald Olsdatter Tronesta, Anne Oden Tronesta og St. Ole Johanesd: ibid.	Storve
92 1808	Am. 27 ^{de} Novbr. R. Simon Edersten Götbye og St. Anne Larsdatter Søn, Döbt. Søst. Frederik Götthard, Peder Høgen, P. Høgen, Gunild Larsd: Götthard, St. Ole, Olay Amundsd: Kløfver og Elle Götthard, P. Høgen.	Ola.
93 1808	Am. 27 ^{de} Novbr. R. Hennings Andersen, Hemme for St. Mari Olsdatter Søn, Döbt. Søst. Simon Andersen, Hemme, Søren Skolien, Kristian Skolien, Anne Torstensd: Søn og Anne Svends: Hemme, Søren Skolien, Søren Skolien, Søren Skolien, Søren Skolien.	Helene.
94 1808	Am. 27 ^{de} Decbr. R. Torer Tøftens Mølle og St. Ragnus Tormentid ^{er} Søn, Döbt. Søst. Anders Tøftens Mølle, Ole Tøftens ibid, Maria Torstensd: Mølle, Maria Andersen Mølle og St. Maria Andersen: ibid.	Tøger.
95 1808	Am. 18 ^{de} Decbr. O. Anders Edersten Smittie og St. Anne Mølle Søn, Döbt. Søst. Jens Smittie, Søren Tøftens Mølle og Søren, Christian Edersten ibid, Anne Nilsd: ibid og Helene Jensdatter Smittie.	Anne Maria
96 1808	Am. 18 ^{de} Decbr. R. Simon Andersen, Mølle og St. Maria Hansd ^{er} Søn, Döbt. Søst. Johannes Götthard for Mølle, Peder Thormann Mølle, Inger Amundsd: Mølle og Anne Gulbaand Mølle og Berthe Edersten: ibid.	Anders.
97 1808	Am. 26 ^{de} Decbr. R. Anders Blakken Gøtberg og St. Anne A. Amundsd ^{er} Søn, Döbt. Søst. Johannes Gøtberg, Anders Gøtberg, Gøtberg, Maria Mortensd: ibid, Olay Mølle: Gøtberg og Kristian Edersten: Gøtberg.	Aslak.
Döpte 1809.		
1 1809	Am. 1 ^{de} Jan. R. Simon Andersen, Hemme for St. Maria Evensd ^{er} Søn, Döbt. Søst. Simon Mølle, Søren Skolien, Søren Skolien, Søren Skolien, Søren Skolien, Hemme, Marte Mølle: ibid og Anne Svends: Skolien.	Else
2 1809	Am. 8 ^{de} Jan. D. Ole Hennings Gamlestad og St. Jøran Svends ^{er} Søn, Döbt. Søst. Kristian for Mølle, Math's Kler, Mari Hansd: Søn, Mølle, Olay Mølle: Kler og Marte Mathsd: Mølle.	Anders.

Figure 12.12 Parish register, Rakkestad 1808-1809

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Perhaps it was the registration of stillbirths in the parish register that is posing problems for Thorkild Aschehoug. In the drawing, it looks as though he is hesitating for a moment before he puts down numbers on the paper in front of him. Many parish priests counted stillbirths only as deaths and that, of course, affected the figures considerably. When reports from parishes came too late or not at all, the bishops used last year's reports, or as we have seen from Kristiansand diocese, simply dropped the missing parish. In 1839 it was decided that the registration should follow the civil calendar year, and not the church year (Ministry of the Interior, 1869c), but it is one thing to decide on such a change, and quite another to ensure that the new definitions were being used by the parish priests (Herstad, 1975).

The colour of the ink and the handwriting clearly indicate that Thorkild Aschehoug collected notes about births and deaths on slips of paper with births and deaths before he entered them the church book. This is also a source of error: information on loose sheets could easily get lost before it was written up in the church book. Also, the counting and summation of births and deaths represent an opportunity for errors both by the parish priests and the bishops (Herstad, 1975; Matthiessen, 1984).

In year 1809, as in 1742 and 1773, the biggest demographic crisis to hit the country occurred. In 1809 there were 20,172 births against 32,486 deaths. However, 1809 is unusual in another way as well, as almost all the surplus of deaths over births occurred in the diocese of Akershus, to which Rakkestad parish belonged. The number of births was 6,793 but the number of deaths was three times as high, at 21,391, i.e. a surplus of deaths over births of 14,598. The three other dioceses, Kristiansand, Bergen and Trondheim, had a surplus of births over deaths in this year, even if these were smaller than usual, and the new diocese, Hålogaland, the part of Norway north of Trøndelag, also had a small surplus of death over births (155) (Ministry of Finance, 1839). The year represents one of the worst demographical crises in the history of Norway, and the worst ever in Akershus diocese.

The answer to the question why this crisis in this diocese was so hard is very important. The explanation of the surplus of deaths over births cannot be explained by soldiers dying in the war between Norway-Denmark and Sweden, as fewer than 800 Norwegian soldiers died on the battlefields. The reason for the high death rate this year was that infectious diseases emerged and spread through military camps with dreadful hygiene conditions. When the soldiers went home, they brought the infection with them, and that is the reason why the surplus of deaths over births is nearly as high for woman and children as for men. The soldiers mustered for the most part in Akershus diocese, and this is the main explanation, rather than the lack of grain, for the demographic crisis of 1809 (Moseng, 2003).

Scattered settlement is the main reason for the death rate being lower in Norway than in Sweden and Denmark. However, this can also be used to explain the high death rate in Akershus diocese in 1809, because the areas along the coast in this diocese were more densely-populated than the rest of the country. The similarity of the demographic crises in Norway and Sweden has been interpreted as an argument for infectious diseases coming partly from the east, from Sweden.

It has been argued that general enlightenment improved people's ability to make do with simple

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means. Statistics are an important part of the enlightenment, and in particular the interest in steady improvements in the statistics for stillborn babies, infants and children under 10. This interest underpins the view that every child has a value, is a gift, and should be cared for. This was a new attitude, and it is closely linked to enlightenment, whereby death, illness and so on are not seen as pre-determined, but can be handled and avoided (Dyson, 2010).

Instructions on stillbirths and births outside marriage issued after 1814

There is no information to indicate that it was impossible to maintain the reporting system from the dioceses in Norway to the ministry in Copenhagen during the Napoleonic Wars, and for the period when the British navy blockaded the connection between Norway and Denmark from 1807 to 1814. It is also remarkable that the new authority in Christiania, the newly-established Ministry for Finance, Trade and Customs, could take over and continue the routine from one year to another, from 1813 to 1814. The responsibility for the population movement was handed over to the Ministry for the Interior in 1840 but the Ministry for the Church and Education also issued instructions about registration.

In 1820, the circular from 1812 regarding the pre-printed pages in the church books, parish register or ministerial book, was changed and new forms were issued. From now on, information about vaccinations was also to be given for those being confirmed. The change to the parish register was not to be made until the old protocols were used up, and it was also recommended that the new church book should have enough pages for about 10 years' use. It was also made clear that the cost of the protocols should be covered by the parish.

From 1839, the listing of births and deaths was to follow the calendar year, rather than the church year. In the same year, a special form was issued for registering stillbirths. Stillbirths were to be recorded in two columns, one for each sex, in between the columns for births and deaths. The columns for births outside marriage were also changed from the previous form from 1775. In this form, births outside marriage were also to be registered for each sex. Under the form there were questions such as numbers of deaths within 24 hours after the birth (these children were not to be counted as stillborn), number of children crushed to death by their mothers, death in the maternity bed within four weeks of the birth and the number of children vaccinated: these were all to be reported.

Furthermore, it was clarified that stillbirths should not be listed together with the births and deaths. This could be interpreted as an assumption by the authority which wrote the instruction that stillbirths had not previously been counted as either births or deaths. On the same form, the age boundaries for deaths in the first decade, 1-10 years, was divided into the following groups: under 1 year, 1 to 3 years, 3 to 5 years and 5 to 10 years. In the published tables for 1835 to 1855, the age groups below 10 years were reduced to two: below 5 years and above 5 years.

Another important change in 1839 was that the parish priest was required to provide information about births and deaths also for persons who were not members of the state church. The consequence was that the non-conformist churches had to report baptisms, funerals and marriages to the nearest parish priest (Ministry of the Interior, 1847, 1857, 1869c).

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Only three years later, in 1842, a new detailed circular ordered every trained or untrained midwife and every doctor who had assisted at a stillbirth, or where the child died within 24 hours, to fill in a form after the death and give it to the parish priest. In the form, the following information was to be given: the name of the parents, their address, date of the birth, number of months/weeks of the pregnancy when the birth happened, sex, reason for premature birth, whether it was necessary to use forceps, whether the birth was problematic, signs of life at birth, how long did the foetus show sign of life, was the foetus decayed, were attempts made to resuscitate the baby/how/if not, why not, and whether the mother had previously had a stillbirth. The form was to be filled in within eight days in the cities, and as soon as the circumstances allowed in the countryside. If the midwife was not able to write, the instructions ordered her to provide oral answers to the questions in the form for the parish priest. The midwives or doctors could be fined if they did not deliver the form, and if they did not fill it out satisfactorily, they were to be rebuked (Ministry of the Interior, 1869c).

In 1851, the bishops were ordered to inform parish priests that illegitimate births had been registered by some priests as legitimate if the parents married a short time after the birth, by the time of the baptism, or at the time of the registration. This was not correct, and the bishops were ordered to instruct that children of parents who were not married at the time of birth must be registered as births outside marriage (Ministry of the Interior, 1869c).

Stillbirths were a recurrent problem, and in 1862 a new circular was sent from the Ministry to the bishops. The Ministry had become aware that a number of parish priests registered children who died within 24 hours of birth as stillborn. This was a misunderstanding of the circular from 1842. Stillborn applied to babies who showed no sign of life after birth (Ministry of the Interior, 1869c). The habit of burying a stillborn child or an unbaptised child varied from district to district. If a stillborn baby was buried, it was registered as dead, but not necessarily registered as a birth, as a stillborn baby could not be baptised. The same was often the case for babies who died within a day or so after birth. Even though the circulars mentioned births and deaths, parish priests could still practice the old habit of registering baptisms and funerals.

Until 1865, parish priests submitted overall returns of births, and deaths to the diocese, but in a circular from 1867 they were directed to give nominal returns from the church book from 1866. It was argued in the circular that this was being done to bring the population movement in line with the census in 1866, the first nominative census since 1801. In this circular, a reminder was given that births, deaths and marriages of people outside the state church should be included in the church book. This was repeated in a circular in 1867, when the Ministry of the Interior argued in favour of using the new forms for 1866 as well, because this was the first year of the next five-year period, and therefore for statistical reasons it would not be helpful to use the old forms. This development and this reasoning clearly show that the obligation of the dioceses and the parish priests to report deaths, births and marriages was a civil part of their duty, and that it had only a weak connection to their ecclesiastical work.

The belief in predestination was widespread in Lutheran north-west Europe, and as a result some claimed that the introduction of the parish register and annual submission of births and deaths to

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the dioceses was blasphemous. It was God's task to keep account of the living and the dead (Sundt, 1861-64; Thorvaldsen, 1996, 2004b, 2008). The order for registration was therefore not well received by everyone. Even though the purpose of registration was to check that the clergy were doing their job, and the people's adherence to the state religion, it can also be regarded as a legacy of the enlightenment. In all cases, the very existence of the parish register was undoubtedly, a lever for enlightenment, even though the scope and aim was not primarily to count the population, establish population statistics and publish them.

It is notable that the source of information about infant mortality from the circular of 1842 was midwives and medical doctors. They gave such information to the parish priest. So, from this time on, the statistics for the population movement were no longer a task for the church alone. This also underpins a change in purpose for the statistics, which were no longer being collected to check up on the parish priests and the religious spirit among the population. The long-lasting attempts to register stillbirths and deaths immediately after birth indicate a new attitude, when every stillbirth and infant death should be investigated; every new-born child was valuable and should be cared for in the best possible way. Through investigating every case of stillbirth or early death, this attitude spread across the population. The purpose was to improve registration, but an unintended and important effect of the authority's interest was increased care for new-born babies among the population. It is hard to calculate the direct effect of this, but nevertheless it can be considered as an example of how collecting statistics affects the reality it quantifies. The detailed and exact statistical information about infant death and death among small children signalled that every new-born baby was valuable, and that it had a value, and furthermore that society had a duty to protect and care for it.

The variation in the numbers of births and deaths from year to year, however, must have led to an examination of the numbers, to find out whether they were correct or not. This in turn led to a call for improvements to the listing, not only in Copenhagen, but in the parishes, deaneries and dioceses. If the figures were correct, this must have led to discussions about the causes of the fluctuations. Questions like these were essential for both for Malthus and Sundt when demography was established as a part of political economy (Malthus [1803], 1958; Sundt, 1855b).

The discussion of vital statistics in Denmark and Norway 1735-1799

Denmark

The quality review of Danish vital statistics for the years 1735-1799 was carried out at the very beginning of the 20th century. The main problem was the form introduced in 1775. Births were to be reported in four columns: male, female, births outside marriage and then the total. Should births outside marriage also be registered together with the gender-divided births, or not? The lack of clarity in the form and the instructions made both double-counting and the omission of births outside marriage possible. This misleading form was the main reason why Statistics Denmark did not regard the figures from before 1800 as reliable enough to be treated as official statistics (Statistics Denmark, 1905).

The Danish conclusion is that, prior to 1800, it is impossible to find common principles for the

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registration of stillbirths and births outside marriage. Following a critical review, based on the original reports from the dioceses in the national archives, the conclusion was that the reports existed in a form that made it unclear what the figures meant. Another important result from the archival studies was that it was often common for figures from Iceland, the Faroes, Finnmark and Bornholm to be missing.

Another major problem was that before 1800 there were no instructions about how to register stillbirths. The result was that some dioceses counted them as births, others as deaths and some did not include them at all. It would also be wrong, however, to take comments from the bishop as an explanation of how the registration was done in his diocese; it was rather his point of view on how stillbirths should be registered.

The Danish historian, Gustav Bang, investigated the vital statistics prior to 1800 at the same time as the Danish statistician Adolph Jensen (Bang, 1906). Bang came to the same conclusion as Jensen about the registration of stillbirths. Extrapolating from parish books that had registered stillbirths as both births and deaths, he estimated that the total number of births should have been 4.8% higher and the number of deaths 5.5% higher (Johansen, 2002).

The reason for the Danish review in 1905 of the figures for births and deaths prior to 1800 was that the tables published in statistical works by Adam Christian Gaspari, Jean-Pierre Catteau-Calleville, Frederik Thaarup and J.F.W. Schlegel from the late 18th century were often reprinted. The figures in these works differed from each other and from the annual summary figures kept in the national archives in Copenhagen. This gives the figures a limited value, even though the figures for births and deaths were not completely without interest, as the figures could give a correct picture of the movement in births and deaths from year to year (Statistics Denmark, 1905).

Statistics Denmark made an alternative time series of births and deaths from 1735-1799 after checking the tables made by the Kommercekollegiet with the lists from the Danish dioceses kept in the Danish national archive (Statistics Denmark, 1905). The change in the new table was less than one percent from earlier published figures. Even though the difference was not considerable, the evaluation was still that the basic material for the statistics for births and deaths before 1800 was not good enough. The director of Statistics Norway came to the same conclusion when he worked on the time series for births and deaths from the 18th century in the late 1860s, but this was forgotten when the time series were rediscovered and published in 1914 (Statistics Norway, 1914).

That is why it is correct to say that the complete time series from 1735 survived in Norway as official statistics due to a lack of knowledge about previous investigations of the figures from 1735 to 1799, when the time series were published as official statistics in 1914, 1926, 1948, 1958, 1968, 1978 and 1994. In any case, it would be premature for this reason to discard the Norwegian figures for births and deaths prior to 1800 as Statistics Denmark did. This may seem a strange conclusion, but many arguments do in fact support this.

First, the repeated publication of the Norwegian time series led to an awareness of the figures and investigations into their background, even if none of these investigations were thorough. Second, there is no reason to believe that the quality of the figures reached the acceptable level for official

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statistics from 1801. The reason for choosing this year as the first one in the Danish official statistics is probably due to the order from the Kommercekollegiet to provide figures for stillbirths in 1797, and repeated in 1800. However, the improvement in the figures happened gradually, and this fact makes it almost impossible today to set a specific year as a divider for unreliable and reliable figures. If such a dividing year should be chosen for the movement of the population, a year somewhere between 1825 and 1850 would have been preferable. Third, the reason why 1801 was chosen as a starting point is easy to understand; the 1801-census was the first nominative census in the Kingdom of Denmark-Norway, and has a reputation that is seldom - perhaps too seldom - questioned. The combination of the population figures from this census with the annual figures for births and deaths made a good starting point for calculating annual population figures. This argument is understandable, but it cannot be used as a reason for why the figures prior to 1800 should not be treated as official statistics. Fourth, a continuous evaluation of the time series prior to 1800 can contribute to an understanding of the figures that made them useful after all. Fifth, if a comparison of the time series for birth and deaths for the Nordic countries before 1799 showed a similar development, this could indicate that the figures with all their weakness showed the real historical development, and not only incidents and errors.

Norway

The first Norwegian evaluation of the vital statistics before 1799 took place in 1869. This was around the time of the first publication of the time series from 1736 to 1866. The sources for the oldest part of the time series, before 1800, were two statistics books, *Materialen zur Statistik der Dänischen Staaten* (Gaspari, 1786) and *Tableau des États Danoise* (Catteau-Calleville, 1802), and the figures for the rest of the time series came from the official statistics (Statistics Norway 1839, 1847, 1857, 1869a). It was noted that stillbirths were probably included in the births and deaths for the years 1736 to 1799. For the years after 1801, stillbirths were not included in the births or the deaths. To make the time series consistent, the number of stillbirths, calculated from the years after 1800 as an annual average, was withdrawn from the annual figures for births and the deaths for the period 1736 to 1799 (Ministry of the Interior, 1869c). No reason was given for this reduction, which was undoubtedly risky because it was not known to what extent stillbirths had been counted among the births and the deaths or not, prior to 1800.

Statistics Norway used the censuses from 1801, and the number of births and deaths from the vital statistics, to calculate annual population figures. The method was announced at the beginning of the 1890s. The 1801 census was used as the starting year, and then the annual surplus of births was added until the next census year, 1815, was reached. The same method was used when calculating backwards to the census from 1769 and finally to the starting year 1735. The discrepancies that were found were explained by a lack of figures for immigration and emigration. The surplus of births from the 1769 census to the 1801 census should have been 160,500 according to the vital statistics for these years. According to the census figures, the increase in the population was only 155,800. The discrepancy of 4,700 was explained by the missing figures for migration, and it was deemed

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reasonable to assume that the surplus of emigration over immigration had been of that size. For the years 1735 to 1769, the surplus of births was about 119,000. It was estimated that emigration had been the same size as in the period 1769-1801. It was further assumed that the surplus of emigration was the same for every year. The total surplus was then divided in equal annual parts, and the surplus births were deducted. In this way the population for the year 1735 was calculated at 612,000, because it was assumed that the annual figures for births and deaths were not as accurate for the period 1735-1769 as they were for 1769-1801. The population figure for 1735 was set at 610,000 (Statistics Norway, 1890).

Another problem with the population figure from 1769 census is whether parts of the armed forces should be counted or not. In the evaluation from the last decades of the 19th century, Statistics Norway assumed that about 22,500 men were not included in the population figures for this reason (Ministry of the Interior, 1869b; Statistics Norway, 1890). It is not known whether this significant number was included in the 1769 population figure before the calculation of the population figures from 1735 to 1799 was carried out (Ministry of the Interior, 1869b).

The combination of the vital statistics and the censuses, particularly for the years between 1769 and 1801, and the calculation of annual population figures between these years, leaves an impression that the figures from both sources are not so bad after all. The same method of calculation was also used for annual figures up to 1865. The conclusion was that the census figure from 1815 missed 31,000 persons, and that the censuses in 1825, 1835, 1845 and 1855 missed between 11,000 and 15,000 persons. The missing figures were calculated with the help of the two nominative censuses in 1801 and 1865, which were deemed to be more accurate (Statistics Norway, 1890).

In the 1890s, Statistics Norway discovered some errors and misinterpretations in their previous work on the old figures. The first part of the time series was copied from a table in *Materialen zu Statistik der Dänischen Staaten*, but it had not been noted that the figures for Iceland were included in the Norwegian figures. The other correction related to the assumption that stillbirths had very probably had been counted both as births and deaths before 1800, and therefore the figures published in 1869 for the same period were too low. It was also stated that the earliest figures for births and deaths were about to be revised with the help of lists from the dioceses from the national archives, and from the archives of the dioceses in Bergen and Trondheim. Other sources would also be used, but the results were not ready for publication (Ministry of the Interior, 1869c). The results of this advertised investigation, however, were never published.

It is also important to note that the Icelandic figures were given together with the Norwegian, not just from 1735 to 1759, but up to and including 1770, and also in the publications of *Historical Statistics* from 1914, 1926 and 1948.

In brief: the government in Copenhagen introduced the parish book in the aftermath of the Reformation in the end of the 17th century. In 1735, the four Norwegian bishops were ordered to report

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baptisms and funerals, and births and deaths to the capital of the Danish-Norwegian kingdom, but many of the bishops' reports were lost.⁸

The reason for implementing the parish registers was to check that people were adhering to the state religion, and that the Protestant Lutheran church was doing its official job. The strict tone in the letter of 1645, whereby a priest could lose his post if he did not report, clearly underlines this aspect as a reason for compiling such lists. By 1735, the church books had been in use in most parishes in Norway for several decades, and the priests had been asked at least since 1730 to report lists of births and deaths to their dioceses. The priests and deans had maintained church books and had been reporting for some time prior to 1735. Utilising the parish registers resulted from national economic attempts to cope with the crisis in the aftermath of the Great Northern War.

When the reliability of the numbers is discussed, it is important to bear in mind that the parishes started reporting the nominative lists based on the church book from 1866, and from then on, deaths can be given for every age. This change also eliminates summation errors by the parish priests. Even though the transcripts from the parish register represented a source of error, the consequences of this were very probably less serious. The possibility of summation errors by the dioceses was, however, by no means eliminated.

From 1866, foreigners who died in Norway were not included in the number of deaths, but Norwegians who died abroad were included. Another improvement this year was a change from counting deaths reported during the year to the *de facto* deaths in the year. Another alteration to the registration from 1866 was that marriages, births and deaths among dissident congregations were to be reported to the nearest parish. There were 15 marriages in dissident congregations in 1866, eight in different evangelical Lutheran churches outside the state church, four Methodists, one Quaker, one Episcopalian and one Jewish marriage. This illustrates this how religiously homogeneous Norway was in 1866 (Ministry of the Interior, 1869c,a).

In her two central studies from 1961 and 1965 the demographer Julie Backer at Statistics Norway evaluated the basis for the statistics for births and deaths (Backer, 1961, 1965). She noted that the registration of deaths has been more or less correct with regard to persons who died and were buried in Norway, and from about 1850 also Norwegians who died abroad. The reporting of stillbirths, on the other hand, was not satisfactory. Since 1797 these had been reported to the parishes, but until the 1870s, registration was not satisfactory. The same was the case with deaths just after birth. Backer also comments on the reports of deaths by doctors. She compared the reports from the parishes with the medical districts and found that, in around 1860, doctors only reported about 40% of deaths. In 1920, the proportion had risen to 90%. In 1925 Statistics Norway took over the construction of the medical statistics, and this made it possible to carry out centralised processing of the statistics for causes of death from forms filled in by doctors for every death, and coordinate these with the information from the parishes. From now on, the place of residence was registered, rather than where the death occurred or the place where the funeral took place. The statistics were also improved by

⁸ Akershus diocese: 1744,1757,1760,1781, 1786,1787,1789,1790,1793,1795,1796, Kristiansand diocese: 1735-1761, Bergen diocese: 1735, 1746, 1760m 1762, 1766, 1768, 1769, 1771, 1772, 1773, 1774, Trondheim diocese: All bishop's lists missing (Drake, 1969).

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registering the births and deaths in the year they happened, and not in the year they were reported. Further improvements before the establishment of the Central Population Register in 1964 were linked to a more detailed list of causes of deaths (Backer, 1961, 1965).

The church book was a precursor of the civil municipality register, which was established after the Second World War in Norway. The civil municipality register was a forerunner to the national population register which was established between 1964 and 1966. The basis for the register was the population census from 1960. Every person registered in this census was given an 11-digit personal identification number. There were, of course, many minor steps and transitional forms from 1735, when the registration was done by the church alone, to a fully civil registration system from 1964, but this year nevertheless represents a very important milestone in the history of population statistics (Lie and Roll-Hansen, 2001; Soltvedt, 2005; Furseth and Ljones, 2015).

When the population register was established, the difference between the two main branches of the population statistics, the movement of the population, civil registration or vital statistics, which register the annual changes in the population, and the censuses which were held every ten years, on a given counting day, registering the total population, diminished. However, it took nearly 50 years before Statistics Norway in 2011 conducted a full population census using the population register alone.

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The different instructions issued over the years from 1735 to the dioceses and parishes are also a source for increasing our understanding of the figures, because they indicate what the central administration, first in Copenhagen and later in Christiania, believed to be necessary improvements of the reported data. Changing and clarifying the instructions also indicate what the relevant authority perceived to be the main problems with the collection of figures for births and deaths. The numbers for births and deaths, and the population, as shown in the main graph, *Population Movement 1735-2022* (Figure 12.1), are the result of a combination of the two main sources behind the population statistics, the vital statistics which underlies the estimation of population movement, and the census.

The population movement comprises annual figures for births and deaths, marriages and divorces (later also immigration and emigration) and registered the annual changes in the population. The census is a count of the total population on a given calendar date with an interval of around ten years. The censuses have registered the total size of the population and the subdivision of the population by sex, age, civil status, education and occupation. The censuses have also registered the geographical distribution of the population between rural and urban areas and subcategories which characterise living and housing conditions. For example, the 1960 census registered the number of car owners and households with a telephone. The censuses have two concepts of the population, the *resident* or *de jure* population and the *present* or *de facto* population.

It is not possible to know whether the population movement is calculated based on the *resident* or the *present* population. From a certain year, Norwegian citizens' deaths abroad and foreigners'

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deaths in Norway were to be included, but whether that did indeed occur according to the given instructions, nobody knows. The same is the case with births.

The population movement was from the beginning and for a long time up until the 1960s, reported by the Church to Statistics Norway, whereas the censuses were organised by the state. After 1814, the censuses were organised by a statistical office in the Ministry of the Interior. From 1839 onwards this office was also responsible for producing and publishing the vital statistics, but the figures were, as before, based on reports from the parishes.

The vital statistics were produced on an annual basis, while the censuses were held in the years 1769, 1801, 1815, 1825, 1835, 1845, 1855, 1866, 1876, 1885 (only for the cities and the border municipalities in Finnmark and Troms), 1891, 1900, 1910, 1920, 1930, 1946, 1950, 1960, 1970, 1980, 1990, 2000, 2011. Some main tables with results from the census in 1835 were the first to be published in detail (in 1838). From 1845, the results from the censuses were published, and at the beginning of the 20th century, the censuses were presented in large series of books, and the results analysed on the basis of the main demographic concepts such as sex, age, civil status, household, residence and place of birth, but also social statistical categories such as occupation and living conditions.

The vital statistics for the years 1801-1835 were published in 1839 and later updated when another ten years of data had been collected until 1865. The publications for the decades 1835-45 and 1845-55 were common to the censuses held in 1845 and 1855 and population movement for the years in between. From 1867, the population movement was published for the decade 1855-1865, and from 1866 in a specific, annual publication for these statistics, with exceptions for the years 1901-1910, when the publication appeared biannually, and for the period 1927-1932 when the vital statistics were not published due to difficult economic times. In these years, however, the main table for the population movement was, as usual, published in the statistical yearbook.

Annual statistics for marriages are available from 1770, with the exception of 1784-1794 and 1800; illegitimate births from 1770, with the exception of 1784-1800; stillbirths from 1801; infant mortality (under one year) from 1836; emigration for the years 1821 and 1823, and on an annual basis from 1836; divorces from 1886, and, finally, immigration from 1951 (see Statistics Norway's publications on Historical Statistics from 1869, 1914, 1926, 1948, 1958, 1968, 1978 and 1994, respectively, and Sjøbye (2014)).

The censuses have been organised by the statistical office since 1815. In the first years after the Napoleonic Wars, this office was not a permanent institution, but from 1827 it was decided that the regional governors' five-year reports about economic developments, one for each region, should have a standardised statistical appendix for the whole country, and this became the responsibility of the statistical office. The statistical office was established as a permanent unit from 1845 onwards, and in 1876 the office was separated from the Ministry of the Interior and established as an independent institution as the Central Bureau of Statistics (Statistics Norway).

Data collection for the censuses was different in rural and urban areas. Until 1950, census-takers or enumerators went from house to house in the rural areas and filled in the form together with the

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householder. From 1875, in the cities, the enumerators delivered the form to the households some days in advance, and collected it some days after the census date, so here the forms were filled in by the householder. If they wanted, they could be helped by the enumerator. The landlords in the tenements in the cities had to ensure that every household filled in the form (Statistics Norway 1879, 1955).

The Central Population Register (CPR), established in 1964, was based on the census of 1960 and is now the common source both for data for the population movement and the size of the population. The first census totally based on this register was held in 2011.

The CPR was originally organised as an office at Statistics Norway, which was later moved to the Tax Directorate in 1992. When this register was established in 1964, an 11-digit Personal Identification Number (PIN) was introduced for all residents, regardless of citizenship. The number is permanent and unique to each person.⁹ The PINs are issued immediately for every new-born baby by the tax authorities, which are responsible for updating the register, after they receive notification from the hospital. Statistics Norway receives updates from the Central Population Register every day, i.e. records with data on births, deaths, internal and external moves, marriages and divorces, name and address changes.

The Central Population Register (CPR) is used for a number of purposes essential for a modern state, such as electoral rolls and tax census. Population statistics are also used to transfer money from the state to the municipalities based on the age structure of the population. The accuracy of the register is therefore not only a matter of statistics, but of significant importance for the legitimacy of elections, tax burden and justice in the transfer of resources to the municipalities.

It is clearly visible from the graph *Population movement 1735-2022* (Figure 12.1) that at the beginning of the time series, deaths were the main determinant of the population movement and at the end of the time series, immigration has acquired a similar dominant position. The greatest uncertainty prevails with regard to the registration of deaths at the beginning, and net immigration at the end of the time series. The problem with net immigration statistics concerns the difficulty of registering the resident population and the present population, and short-term immigration and emigration after 2004.

The uncertainty at each end of the time series is, however, of a different kind. In 1735, there was no doubt that all births and deaths should be recorded in the parish register and reported to the diocese. The question is whether the clergy were able to do that. Baptisms and funerals were registered in the church book or the parish register, but these were not necessarily identical with births and deaths. Children who died before they were baptised were often put in the coffin of a dead adult. This habit of giving stillborn babies or babies who died shortly after birth an anonymous grave has existed up to the present day.

The counting of stillbirths and infant deaths in the first hours after birth was a major problem in the years immediately after 1735, and earlier commentators have alternated between regarding them

⁹ There is in fact one exception to this rule. The digit that indicates the sex, the 9th, is changed when a person changes sex. This makes it possible to be born as male, and to die as female, or the other way around.

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as included or not in the figures for births and deaths, or only among births, or only among deaths (Lassen, 1965; Drake, 1969; Dyrvik, 1983; Matthiessen, 1984).

Even though the creation of the Central Population Register in the 1960s marked an important milestone in the history of the population statistics of Norway, there are still serious challenges with the register. One problem concerns how to identify a person at a given address, when many have more than one place of residence. For instance, in the new, modernised population register, for children subject to shared parental responsibility, they will be registered with two addresses or places of residence. Another change is that the ninth digit in the personal ID-number, which indicates sex, will be dropped in the new design of the personal ID-number, and recognised as core information, but not as an identifier.

Registration of the student population faces some special problems. It is not compulsory for students to register as resident at the place where they are studying, or for their parents to do so on their behalf. There are almost 300,000 students in Norway, close to 6% of the total population, and many of them study in another city or place to where their parents are living. Some municipalities with education institutions try to encourage students to change their place of residence to the municipality where they are studying by offering free public transport, NOK 5,000 in cash, and free cinema tickets. This benefits the municipality because it receives NOK 30,000 from the state for each resident student.

Two of the main pillars for any democratic state - the tax census and the electoral roll - are dependent on an accurate person register (or something similar),¹⁰ whereby a person is registered where he or she is resident. The number of parliamentary candidates from the counties is calculated from the population size of the counties. Also, the state transfer of money to the municipalities is estimated based on the age structure, and this can be strongly influenced by the big difference between the *de facto* and the *de jure* population. Accurate population statistics are necessary to fulfil reasonable, common demands for justice.

Until the 1980s, the problem with registration of the *de jure* and *de facto* population related to the 60,000 or so men, mostly Norwegians, in the merchant navy, a figure as big as two birth cohorts of the male population. Therefore, in some censuses, count days were held on ships in foreign waters. The crew on Norwegian and foreign boats in Norwegian waters or at Norwegian quaysides were counted by the customs authority. In the 19th century, there was also a problem with men engaged in seasonal work in the big fishing industries and the forests. These men, according to the census instructions, were to be counted where they were resident even if they were absent. This was not always the case, however. Counting the resident and present population is still a problem, but is no longer linked to Norwegian sailors in the merchant fleet, or fishermen and lumberjacks away from home on seasonal work. The Norwegian-owned merchant fleet in foreign waters is now largely crewed by staff from the Philippines. Some years after the start of using foreign crews in the Norwegian-owned merchant navy, foreign crew members were given a special, 11-digit identification number, parallel

¹⁰ In the United States of America, the population has to register voluntarily in the electoral roll in order to get the right to vote.

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to the Norwegian personal identification number. The administrative system for paying tax required such a number. This number is still called a D-number because it was issued by the Directorate for Seamen. Foreign seamen with a D-number were classified as non-resident, because most of them never set foot on Norwegian soil. Persons with a D-number are not counted as a part of the Norwegian population. The first request for a D-number from the Central Population Register, then an office in Statistics Norway, happened on 30 June 1978 (Strand, 1996, p. 4).

This was seen to be both logical and reasonable in the years when virtually all the D-numbers were issued to sailors in the foreign Norwegian merchant navy. The problem was, however, that the Norwegian merchant fleet in foreign waters contributed to the Norwegian gross domestic product, but the sailors were not part of the Norwegian population.

Problems for population statistics occur because for some occupations there is an international labour market; some Norwegians work abroad in Norwegian-owned international companies; about 16,000 Norwegians are studying abroad, and, finally, some 47,000 retirees settle outside Norway. Of these about 29,000 have foreign citizenship, mostly Swedish, Danish, British, American or German. The greatest difficulty for the population statistics is, however, foreign citizens who have a work permit for up to six months in Norway. These persons are allocated a D-number, and are defined as non-resident even if they live in Norway, and are not included in the population figures (Norwegian Labour and Welfare Administration, 2017; Statistics Norway, 2017).

Many government agencies can issue D-numbers,¹¹ but when so many agencies can do so, there are often misunderstandings, time-lags and different implementation of the rules, all of which can affect the total number of persons with a D-number.

The volume of D-numbers, or non-residents, escalated after 2004 when the Eastern European countries became members of the EU. The demand for labour in Norway was high, whereas many countries in Europe were in a trough. This encouraged many foreigners to come to Norway for work in periods less than six months, and most of the D-numbers were issued to this group. An exception must also be made for persons who are employed by a foreign-registered staffing company, then he or she will get their salary in the country where the company is registered, and will not be given a D-number.

Table 12.3 provides a crude overview of the main groups of people who are included or not included, respectively, in the population statistics. The Personal Identification Number (PIN) is key to understand the difference between the groups. The PIN is issued by the The Norwegian Tax

¹¹ The tax office - for persons who are liable to pay tax or contributions; The tax office - when a foreign employee works in Norway for a foreign company and is exempt from the obligation to report in person for an ID check; NAV - for EEA jobseekers and recipients of national insurance benefits; Banks, financial institutions and insurance companies - for business relationships with Norwegian banks or other financial institutions; The Norwegian Central Securities Depository (VPS) - in connection with setting up a VPS account; The Brønnøysund Register Centre - for registration in the Register of Business Enterprises, the Register of Legal Entities or the Register of Mortgaged Movable Property; The Norwegian Mapping Authority - as the cadastral authority for the registration of real property; The Norwegian Health Economics Administration (HELFO) - for asylum-seekers and NATO personnel who need a general practitioner; The Directorate of Immigration, the Police Immigration Unit and the Norwegian Immigration Appeals Board - for asylum-seekers in connection with the registration of applications for protection and for other persons with a valid residence permit; The Ministry of Foreign Affairs - for foreign embassy staff or foreign citizens in international organizations and intergovernmental convention bodies with a registered office in Norway which have registered with and been accepted by the Ministry of Foreign Affairs under Sections 1-4 and 1-5 - first to third paragraphs - of the Immigration Regulations.

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Administration after it has received a notification of birth of a new citizen from the hospital. It is also issued to foreign-born persons the first time they immigrate to Norway if they have the intention to live in the country for six months or more, and have the legal right to do so. A PIN is also provided for Norwegian citizens born or residing abroad who need a national identity number in order to obtain a Norwegian passport. Asylum seekers, e.g., are normally only assigned a PIN after their application have been approved. Persons with a D-number is not included in the population statistics.

Table 12.3 *Registration of residents, non-residents and population statistics.*

Citizens of Norway get a PIN at birth	Included in the population statistics
Non-citizens with a PIN	Included in the population statistics
Persons with a D-number	Not included in the population statistics
Unregistered immigrants, persons employed by a foreign registered staffing company, persons in the asylum seekers centres	Not included in the population statistics

Note: Residents are registered with a Personal Identification Number (PIN), whereas non-residents are registered with a D-number. D-numbers were originally issued by the Directorate for Seamen and used for Norwegian citizens and foreign seamen who worked abroad in the Norwegian merchant fleet. The volume of D-numbers has increased with globalization and a mobile labour force.

While it could be taken for granted until the end of the 1960s that the population of Norway consisted almost exclusively of Norwegian citizens, this is not the case anymore, and the difference between citizens of Norway and inhabitants of Norway is growing. This distinction is not the same as the one between resident and present population, and this means increasing difficulties for both the Central Population Register and for the population statistics. One problem is that a not-insignificant part of the work force - and an important contributor to the gross national product - is not part of the population statistics. A consequence is that the GDP per capita becomes too high. Another problem is that when Statistics Norway makes sample surveys, the D-numbers are excluded.

In 1735, the main problem with the vital statistics was obtaining reports from all parishes, and problems with the definition of stillborn babies and illegitimate children. Furthermore, figures for immigration and emigration were missing. Other sources of errors were summation faults and errors in reading the handwritten reports from both the parishes and the dioceses. There was, however, no doubt that the aim was for all births and deaths to be registered. This is a general difficulty with the population statistics from the 18th, 19th and part of the 20th century, where it is impossible to know to what extent the instructions for registration were followed by the respondents.

The gap between the *de jure* and the *de facto* population has increased, and, for various reasons, the present population is the more interesting figure but is very difficult to register. This problem is related to, but not identical with the two kinds of identification numbers in the Central Population Register. Registering how many people with a D-number actually remain in the country, and how many Norwegian citizens, and non-citizens with a PIN, have emigrated is both a problem and a

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source of error for the population statistics. According to the regulations for the population register, a person is obliged to report their emigration from Norway, but many forget to do so. This was a problem and it can be seen in the graph, *Population Movement in Norway 1735-2022*. The diagram for emigration has peaks in 1950, 1960, 1970 and 1990, and the explanation for this is that the censuses for these years found persons who had left the country without registering their emigration with the population register. These persons were registered as having emigrated in the census years.

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Long run trends in demographic data, 1735-2021

Helge Brunborg

13.1 Introduction: Why are demographic time series relevant for monetary research?

This book on *Historical Monetary and Financial Statistics for Norway* includes two chapters on sources and methods which document historical statistics on demographic variables. These are variables which are important for the macroeconomic development in the long run. They are also of interest for research in areas of key importance for central banks, such as price stability and financial stability. This chapter presents available Norwegian demographic time series on population size and age structure, fertility, mortality, external and internal migration, household size and structure, urbanisation, as well as population development in a few selected cities. The most important data sources are presented, and graphs show examples of results. In the final section we present a few time series that are neither demographic nor economic, but which may also be relevant for the development of the Norwegian economy.¹

The first and most obvious use of demographic time series in monetary research is the need to *scale variables*, i.e., to study the development of a variable relative to the population size, such as GNP per capita and the stock of money per capita.

The second reason for including demographic time series is that several of them may serve as supplementary welfare indicators in addition to the GNP, such as life expectancy and infant mortality. Fertility may also be interpreted in this light: It may be seen as a sign of pessimism or lack of belief in the future if a population is not reproducing itself. There are also other demographic variables that may be given a normative interpretation, such as teenage fertility rate, marriage and divorce rates, and emigration.

A third reason is that the central bank, which is responsible for financial stability, needs to closely follow the development of variables such as credit and housing prices. An example of this is the housing bubble in Kristiania (now Oslo), which burst in 1899, partly due to strong population growth caused by migration from the rest of the country, which had serious economic consequences both short-term and long-term.

Moreover, population size and population growth play an important role in models of economic growth. In the simple growth model (Solow, 1956), output is a function of two input factors, capital (K) and labour (L), in addition to productivity. Given the close link between population growth and labour force growth, demographic variables play a key role in the neoclassical growth model that is used to determine, e.g., savings and investment behaviour and the long-run rate of interest (Ramsey, 1928).

Recent research shows that not only the growth of the population but also the *age structure* is important for economic growth (Bloom et al., 2003, 2007). The demographic transition (see Søybye in Chapter 12) initially leads to a *younger* population (due to declining infant mortality) and later to an *older* population (due to declining fertility and declining old-age mortality). In between, the

¹ I am grateful to Gunnar Thorvaldsen, Kåre Vassenden and Lars Østby for comments, Inger Texmon for comments and for updating the cohort mortality life tables, Lars Rogstad for advice on maps of Oslo, and editors Øyvind Eitrheim and Jan F. Qvigstad for advice, encouragement, comments and editing.

13.1 Introduction: Why are demographic time series relevant for monetary research?

proportion of people of working ages is high. The age composition of the population affects savings and the productive capacity of the population and the needs for public and private services. Norway has had a favourable age distribution for many years, but the projected future ageing of the population is now causing concern. Ageing also has an effect on *productivity* (Maestas et al., 2016; Skirbekk, 2003). Finally, global demographic trends are affecting the Norwegian economy. To mention a few:

- High migration of refugees and other migrants from poor to rich countries.
- Low fertility in rich (and many other) countries which contributes to the ageing of the population and affects the supply of labour.
- High population growth in some regions, especially in Africa, which affects development, including investment, infrastructure improvement, poverty and migration.

Besides economic effects, the Covid-19 pandemic also had serious demographic effects globally and in Norway. The most obvious are mortality and international migration, but fertility, marriage and divorce patterns may also have been affected.

A number of recent studies such as Goodhart and Pradhan (2017), find that demographic developments over the last 35 years are among the main drivers behind declining real interest rates, inflation and wages, and can also explain the rising inequality we have observed within many advanced economies as well as the downward shift in inequality observed between advanced economies and emerging market economies. They also argue that the demographic reversal to be expected in the global economy in the coming decades will reverse the decline in real interest rates and inflation, whereas inequality will fall.

The cohort perspective is presented in several areas, including population structure, fertility, mortality and emigration.² Contrary to ordinary population statistics, which gives a snapshot of the situation in a given year, this perspective means that birth cohorts are followed over their life cycle to see how they are developing, regarding size, cumulated births, length of life and other factors. One example is the life expectancy at birth, which for the 1900 birth cohort was 51.8 years, while the actual average length of life for this cohort turned out to be much longer, 56.5 years.

² In *demography*, a cohort is a group of persons who experience a certain event in a specified period of time, the most common being born in the same year. The term is also used about migration cohorts and marriage cohorts, etc. A cohort was originally a tenth of a Roman legion.

13.2 Sources of Norwegian population statistics

The main sources of historical population statistics are vital statistics³ and population censuses.⁴ These data sources have been used to establish exceptionally long series: Annual statistics for births and deaths since 1735, marriages and births outside marriages for most years since 1770, stillbirths since 1801, infant mortality since 1836, emigration since 1870, divorces since 1886, immigration since 1951, and internal migration since 1949.⁵

Municipal registers were gradually introduced in the period 1905-1939, based on the law on population registration of 1905, which was optional for each municipality. The cities Kristiania (Oslo) and Bergen were the first to do this. When the second world war started, population registers had been established in 81 (of 747) municipalities, covering half of the national population (Thorvaldsen, 2008).

In 1964, as one of the first countries in the world, Statistics Norway established a national Central Population Register (CPR).⁶ It was based on the Population and Housing Census 1960. At the same time a unique national personal identification number was introduced for all residents in Norway, regardless of citizenship.

The CPR was transferred from Statistics Norway to the Norwegian Tax Administration in 1991, as it was not considered appropriate for a statistical office to run an administrative register of a legal

³ Vital statistics include births, deaths, marriages and divorces but not internal and external migration (United Nations, 2014). Statistics on these events have been published in Vital Statistics and Migration Statistics (*Folkemengdens bevegelse*) for various periods 1800-1865, and annually for 1866-1984, see https://www.ssb.no/a/histstat/publikasjoner/histemne-02.html#P655_19975 and <https://www.ssb.no/a/histstat/publikasjoner/ereg77-96.html#02>. For the years 1986-1998 the name of the publication was *Befolkningsstatistikk*. Since 1999 population statistics are not published on paper anymore, only on Internet and in the Statistics bank of Statistics Norway, where the users can make their own tables. Analytical publications on population statistics are still published on paper as well as on www.ssb.no.

⁴ Population censuses were held in 1769, 1801, 1815, 1825, 1835, 1845, 1855, 1866, 1876, 1885 (only for the cities and the border municipalities in Finnmark), 1891, 1900, 1910, 1920, 1930, 1946, 1950, 1960, 1970, 1980, 1990 and 2001. The 1801 census was the first nominative census of Norway and the 1865 census was the second (Statistics Norway, 1906, 1980; Soltvedt, 2005). Incomplete censuses of parts of the country and of males only (*mannfall*) were held in 1664-66 and 1701. The 1990 census was only conducted for a sample of the population. The main purpose of the 2001 census was to collect data on the dwelling number of all households. The 2011 census was the first census based entirely on administrative registers without any data collection from the households. A list of publications for each census were introduced and extensively discussed by Søybye (2014) and Chapter 12 of this volume, see <https://www.ssb.no/historisk-statistikk/folketelling> for an overview.

⁵ Statistics Norway's publication Historical Statistics, which has been published eight times during the period 1875-1994, present and discuss historical time series for population and other areas. Links to these publications can be found at <https://www.ssb.no/a/histstat/>. Population statistics for Norway have also been presented and analysed by Backer (1947, 1948, 1961, 1965), Backer and Aagenes (1966), Ofstad (1949) and Drake (1969). Statistics Norway (1978b,c) has estimated population size by year of birth, sex and marital status for the years 1911-1976. Skiri (2015) recently published municipal statistics on births, deaths, marriages and overseas emigration for the years 1906-1968, based on handwritten tables in Statistics Norway. The numbers can be found at <https://www.ssb.no/statbank/table/10759>. In addition, historical series of indicators of demographic events have been assembled and/or estimated by Brunborg (1976): life expectancy and total fertility rate 1735-1974; Brunborg and Mamelund (1994): fertility 1820-1993; Mamelund and Borgan (1996): mortality 1846-1994; Mamelund et al. (1997): divorces 1886-1995; Riis and Thonstad (1989): emigration. Most of these publications have both a period and a cohort perspective.

⁶ Iceland in 1953, Norway in 1964, Sweden in 1967, Denmark in 1968, and Finland in 1969 (Poulain, Herm and Depledge, 2013; UNECE, 2007).

13.2 Sources of Norwegian population statistics

nature. This would have been in conflict with the fundamental principles of official statistics, which were adopted at the beginning of the 1990s.⁷

Statistics Norway maintains two versions of the population register: A true copy of the administrative register and a separate statistical population register (called BEREG), in which internal adjustments and amendments are made and saved (Brørs et al., 2000). This allows linking and use of individual data from other sources as well as assigning values to individuals if these values are missing and if the algorithms for doing this are sound. The assigned values are only used for statistics and are not transferred to the Central Population Register of the Tax Authority. An example of assignment of missing values is country of birth (Vassenden, 1989).

This statistical population register is now the major source of statistics both on population changes (flows) and the size and structure of the population (stock). Statistics Norway receives updates from the Central Population Register five days a week, i.e., records with data on new births, deaths, internal and external moves, marriages, divorces, name changes, address changes, etc.

Some events are registered too late to be included in the statistics for the actual year. Statistics Norway is now using a cut-off date of 1 February. Events that are registered after this date are not included in the statistics for the previous year but for the current year, i.e., one calendar year too late. The errors due to this are small because the number of such late events is relatively small and stable, and since under-registration of events in the previous calendar year is more or less compensated by over-registration in the current year.

The other Nordic countries have also introduced a CPR and a unique identification number, most of them in the 1960s. Denmark has had population registers covering the whole country since 1925 and Sweden introduced a unique ID number at the end of the 1940s. Many other countries have later done the same, but few countries use this to make statistics on the size and composition of the population. Large countries such as United Kingdom, France, Germany and the USA do not do this, primarily for political reasons.

In Norway, the Personal Identification Number (PIN) and the CPR are used for a variety of administrative, statistical and research purposes and it is possible to link information from many different sources. Examples include electoral rolls and the central calculation of taxes for the entire population, utilizing information from employers, banks, housing registers, etc. In statistics, conducting the population census using administrative records only is a major breakthrough - with huge savings.

The PIN is issued by the Norwegian Tax Administration after it has received a birth notification from a hospital. It is also issued to foreign-born persons the first time they immigrate to Norway if they have the intention to live in the country for six months or more, and have the legal right to do so. Asylum seekers, e.g., are normally only assigned a PIN after their application have been approved.

The ID number consists of 11 digits. The first six digits show the date of birth (ddmmyy), the next three is a serial number which includes information about the sex of the person and the century of birth, whereas the last two digits are control digits introduced to detect wrong or fake person

⁷ Principle 6: "Individual data collected by statistical agencies for statistical compilation, whether they refer to natural or legal persons, are to be strictly confidential and used exclusively for statistical purposes."
<https://unstats.un.org/unsd/dnss/gp/FP-Rev2013-E.pdf>

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numbers (Karlsen and Skaug, 1968).⁸ The PINs are only changed when there is an error or change of the date of birth or sex, for adopted persons, and a few others for whom it is important to hide the previous identity (Nielsen et al., 2014).

Persons with economic or other links to Norway, but who are not residents, are assigned so-called D-numbers.⁹ This includes people who work in Norway but live in another country, people owning property, paying taxes or opening a bank account, foreign sailors on Norwegian ships, and asylum seekers.

The population register was modernized in 2020, including a new Population Registration Act, where statistics is mentioned as one of the purposes of the population register.¹⁰ The modernised register will be extensively based on digital and automatic routines and include some additional information compared to the previous CPR.

The modernization of the register aims to digitize the more than two million yearly changes in the register, to substitute manual with automated transactions and finally to reduce the time from an event happens till it is registered from weeks to seconds (Skatteetaten, 2013).

The development of administrative registers has made it possible to produce almost all population statistics from administrative data, including population and housing censuses. The use of administrative records in censuses started as early as in 1970, with the introduction of address and the name and date of birth of the head of household. Other variables, such as marital status, educational attainment and income were included in later censuses. Household composition was the last variable to be covered by administrative registers. The 2011 census was the first census in Norway based on administrative data only. Norway has, together with the other Nordic countries, been at the international forefront of this development (UNECE, 2018).

Finally, we should mention another "modern" source of population statistics, sample surveys.¹¹ Some of these are primarily economic, such as the Labour Force Survey (annual or quarterly since 1972) and the Survey of Consumer Expenditure (first in 1988, annual since 1974). But there are also surveys focusing on demographic issues, such as the Fertility Survey (under different names in 1977, 1988 and 2007), the Time Use Survey (1970, 1980, 1990, 2000 and 2010), and the Living Conditions Survey (every 2-3 years 1968-2009, annual since 2011).

The sources of migration statistics are presented in section 13.6.

⁸ It has later become clear that it was unfortunate not including the century of birth (to save space), as the system is soon running out of numbers, in particular because immigrants with unknown date of birth were often assigned 1 January.

⁹ The counting of seamen in the Norwegian merchant fleet outside Norwegian waters led to the establishment of D-numbers for foreign seamen in the Norwegian merchant fleet, including labor immigrants for a period of up to 6 months. So far 2.3 million D-numbers have been issued. The quality of the D-numbers is quite poor, probably too poor to use them to produce for statistics, including many D-numbers that are not any longer in use, e.g., because the persons they were assigned to have been allocated "real" PINs.

¹⁰ https://lovdata.no/dokument/NL/lov/2018-06-15-38/*#*

¹¹ The first director of Statistics Norway, Anders Nicolai Kiær, was a pioneer in the use of sample surveys to collect information about the total population. In 1895 he presented "Den representative Undersøgelsesmethode" at the Congress of the International Statistical Institute in Bern (Kiær, 1897). The method was criticized both internationally and in Norway (Lie and Roll-Hansen, 2001).

13.3 Population size and age structure

Introduction

As mentioned in section 13.1, the population size is necessary for computing many economic indicators, such as the Gross National Product per capita. It is also required for calculating the population growth. The level of population growth has many economic effects, including the demand for public and private services and the proportion of the national product that can be invested in production and in education, health and other infrastructure.

The age structure of a population, which is shaped by births, deaths and migrations, may also have strong economic effects. One example is the distribution of the population by productive and non-productive age groups, which can be illustrated by indicators such as the dependency ratio or its inverse, the potential support ratio. Some age structure changes are temporary, caused by sudden changes in births, deaths or migrations. However, the trend towards a gradual ageing of the population, which is caused by the demographic transition, i.e., declining death and birth rates as discussed in Chapter 12, results in a development towards fewer children and more old persons. In the initial stages of the demographic transition, before the elderly population has started to grow, the proportion in working-age (between approximately 15-18 and 65-70 years of age) increased, which increased the production capacity of the economy. This is described by the term "demographic dividend" (Lee and Mason, 2011).¹²

Data

The main sources for statistics on the population by age and sex for Norway are population censuses and the Central Population Register (CPR). Since the first full count census was taken in 1769, a census has been conducted every ten or more years. The age groups reported in census statistics have varied, initially 8-year groups, 0-7, 8-15 ... 48+ (Statistics Norway, 1980). The reference date has also varied; for census years it was the census day. For non-census years the end of the year was used for a long time, but this was changed to the *beginning* of the year in 1986 (Statistics Norway, 1980).¹³ The average mid-year population is also a frequently used denominator, including in calculations of crude birth and death rates (births/deaths per 1000 persons of the mid-year population).

Parish registers do not provide any data on the population composition, only on population changes, i.e., the vital events births, deaths and marriages. But statistics on these events may be used to estimate the composition by age and sex for intercensal years by combining census statistics with annual deaths by age and sex (and births), if migrations are negligible or can be distributed over the

¹² UNFPA defines demographic dividend as the situation when the share of the working-age population (15 to 64) is larger than the non-working-age share of the population (14 and younger, and 65 and older) (<https://www.unfpa.org/demographic-dividend>). However, these age ranges are more appropriate for current developing countries than for a country like Norway. In fact, age group 15-64 has constituted more than 50 per cent of the Norwegian population for as long as we have annual age data, which is since 1846.

¹³ The total population is exactly the same at the end of one year and the beginning of the next year, except for municipalities and other regional units with border that changes at the turn of the year.

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intercensal years.¹⁴ Statistics Norway used this method to estimate the age and sex distribution for intercensal years 1846-1959.¹⁵ ¹⁶ For the years 1961-1964, the statistics were estimated by updating the 1960 census results with annual data on births, deaths, in- and out-migrants by age and sex, according to the publication *Folkemengdens bevegelse* (Vital Statistics and Migration Statistics) for each year.¹⁷ Since 31.12.1965 population statistics by age and sex have been based on data from the CPR (see Section 13.2).

Another set of tables on detailed age statistics are contained in a publication from 1978, which presents the population by sex, year of birth and marital status at the end of the calendar year for 1911-1976 (Statistics Norway, 1978b), with a documentation of the methodology (Statistics Norway, 1978c). Interestingly, these tables are organized by cohort (year of birth), and not by age at the end or beginning of the year, with the oldest person born in 1806.

Norwegian population statistics are based on the *de jure* definition, i.e., the population by usual residence. This implies that:

- People with legal residence in Norway are included regardless of their citizenship.
- Norwegian citizens and other former residents living abroad for more than six months are not included, provided that they have registered the migration. Emigrations are often reported late, which implies that the population statistics include some persons who have already left the country. Some of these are identified several years after the departure.
- An unknown number of people who live in Norway are not included, such as asylum seekers (including rejected asylum seekers who have not left the country), except for some years in the 1990s, and persons on short-term or temporary work, in addition to illegal or undocumented immigrants.¹⁸

Selected results

Figure 13.1 shows the population size since 1665. The population growth was particularly rapid in the mid 1800s and early 2000s, but for different reasons (high birth rates vs. high net immigration), see Figure 13.1(b). The large volatility we observe in the population growth rates in the 18th and 19th century is due to both varying data quality and a relatively high frequency of extreme events in this period. This is the case for major events such as the death spikes in 1742, 1773 and 1809, and the birth spikes in 1920 and 1946. The death spikes were typically due to wars and epidemics (e.g., the Napoleonic wars in 1807-1814 and the Spanish flu in 1918), whereas migration spikes reflect the waves of overseas emigration between 1860 and 1910 and the immigration in the early 2000s. The

¹⁴ In- and outmigration by age and sex are only available since 1951.

¹⁵ This was first done by Anders Nicolai Kiær, the first director of Central Bureau of Statistics [Det Statistiske Centralbyrå], see Statistics Norway (1910).

¹⁶ The complete updated series is available at <https://www.ssb.no/en/statbank/table/10211/>.

¹⁷ A list of these publications is given at https://www.ssb.no/a/histstat/publikasjoner/histemne-02.html#P655_19975.

¹⁸ According to Zhang (2008): "The expected total irregular residents population with non-EU origins is estimated to be 18196 by 1.1.2006. This constituted 0.39 % of the official residents populations in Norway in 2005. The estimated lower and upper bounds of a 95% confidence interval are 10460 and 31917, respectively."

13.3 Population size and age structure

growth rate of the population in the 1800s would have been significantly higher if there had been no emigration to North America. On the other hand, without emigration the living conditions would probably have suffered, perhaps with a detrimental effect on mortality.

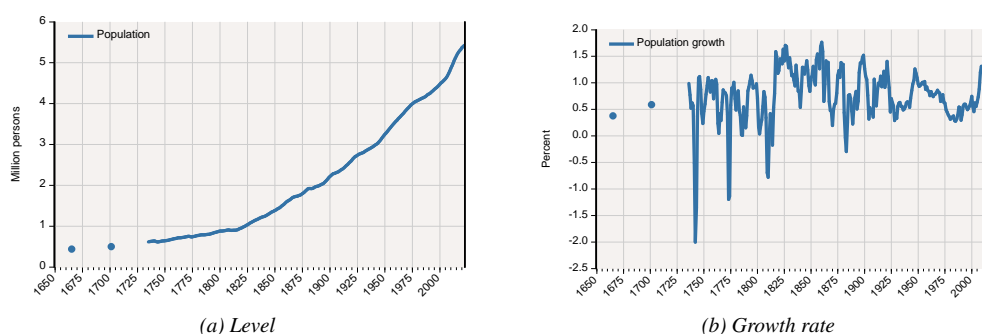


Figure 13.1 Population size, 1665-2020.

Sources: 1665 and 1701: Statistics Norway (1995), 1735-2022: <https://www.ssb.no/statbank/table/05803/>.

Ageing has received a lot of attention in recent years, not only in Norway but also internationally. The term "ageing" is normally used to describe the development of the age structure of the population, not the lengthening of the life span.

In this section we present a few results on the development of the age structure of the Norwegian population. We focus on three common functional age groups, adjusted to Norwegian conditions:

- 0-18: Children and youth, most of them not in the labour force¹⁹
- 19-66: People in the most common working ages, most of them in the labour force
- 67+: Elderly, most of them retired and not in the labour force

One of the most common ageing indicators is the *dependency ratio* (DR), which is the ratio of young and old people per 100 in labour force active ages, see Table 13.1. An alternative measure is the *potential support ratio* (PSR), which is a measure of the average number of persons that people in working ages have to support. It is the inverse of the dependency ratio.²⁰ Since the PSR has a more intuitive interpretation than the DR, its use has become more common. An advantage of using the total dependency ratio is that it emerges as the simple sum of the ratios for the young (DR_y) and the old (DR_o), respectively, i.e. $DR = DR_y + DR_o$.

¹⁹ Note that it was common to start working much earlier, often at age 15 or before, during much of the period we are looking at.

²⁰ The effective support ratio (SR), on the other hand, is the ratio of the *effective* number of producers to the *effective* number of consumers, i.e., "a summary measure of the population age structure that incorporates how production and consumption vary by age" (Lee and Mason, 2011, p. 13).

Table 13.1 Ageing terms and indicators.

Acronym	Term	Definition
	Ageing index	# persons 67 years old or over per hundred persons 0 to 18 years
DR	Dependency ratio (total)	# persons 0 to 18 years plus persons aged 67 or older per one hundred persons 19 to 66
DR _y	Dependency ratio (young)	# persons 0 to 18 years per one hundred persons 19 to 66 year
DR _o	Dependency ratio (old)	# persons 67 years and over per one hundred persons 19 to 66 years
PSR	Potential support ratio (total)	# persons aged 19 to 66 per every person aged 18 or younger and 67 or older
PSR _y	Potential support ratio (young)	# persons aged 19 to 66 per every person aged 18 or younger
PSR _o	Potential support ratio (old)	# persons aged 19 to 66 per every person 67 or older

International studies report age ranges that may differ from those considered here, depending on the socio-economic situation of countries, including their schooling and pensions ages, cf. for example World Population Ageing (WPO) 1950-2050, <http://globalag.igc.org/ruralaging/world/ageingo.htm>. This chapter defines the potential support ratio as the number of persons aged 15 to 64 per every person aged 65, but other age groups may be used.

From 1900 to 2000 the population of Norway doubled (Figure 13.1(a)). However, the growth of the various age groups was very uneven, having different effects on the economy. The number of people in working ages grew by fully 47 per cent and the number of children by only 16 percent, which undoubtedly contributed to economic growth. On the other hand, the number of old persons tripled (grew by 318 per cent), although the absolute number was still relatively small in 2000. The changing age composition becomes clearer if we look at the relative sizes of these groups, as in Figure 13.2.

The indicators PSR and DR are shown in Figure 13.3 and are tabulated in Table 13.A.2. Besides the development of these age structure indicators, Table 13.A.2 shows that males now constitute the majority of the Norwegian population. This is due both to declining mortality and to labour migration and is new to most western countries.

We see from Figure 13.3(a) that in 1846 there were about 12 persons of working age for every old person (red line). In 2018 this ratio had declined to only 4 persons. We also notice the significant reduction in the PSR during the second half of the previous century, which contributed to the strong economic growth in this period. The small increase in the PSR_o at the beginning of the current century turned around in 2009 and we may expect a further strong decline in the support ratio in the coming decades, according to population projections from Statistics Norway. However, Figure 13.3(a) also shows that the PSR is strongly modified if children and youth are included (green line), with almost no change since the Second World War.

13.3 Population size and age structure

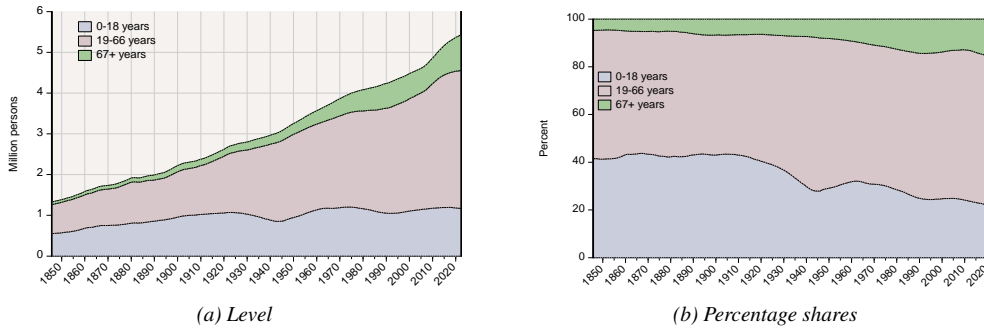


Figure 13.2 Decomposition of the population into three functional age groups, aged 0 to 18 years, 19 to 66 years, and 67+ years, per 1 January 1846-2022. The left panel shows the number of persons in each group stacked on top of each other. The right panel shows the relative sizes of the three functional age groups stacked in percentage shares of the total population.

Source: <https://www.ssb.no/en/statbank/table/10211/>.

In 1846 there were only about 1.5 persons of working age for each member of the young age group, whereas this number around 2020 had doubled to around 3 persons.²¹

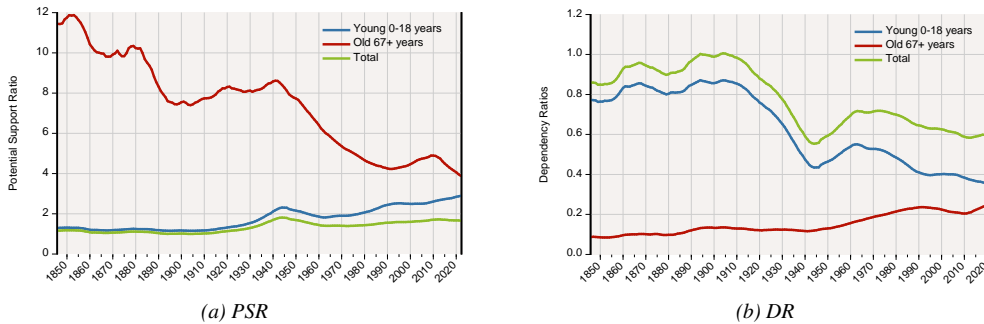


Figure 13.3 Potential Support Ratio (PSR) and Dependency Ratio (DR), 1846-2022.

Source: <https://www.ssb.no/en/statbank/table/10211/>.

The population pyramids in Figure 13.4 illustrate changes over the past two centuries in population size and sex and age distribution. The oldest population pyramid we can draw for one-year age groups is for 1846 (based on the census on 31 December 1845), which is soon after the mortality decline started. In the pyramid for 1900, it is clearly visible that the mortality decline of infants and children has led to an increasing number of persons in young ages, since fertility had not yet declined much. The effect of the emigration to North America is also visible, especially among men. The two first pyramids are similar to those of many developing countries today. In the 1950 pyramid, the low

²¹ This leads to an interesting and difficult question: Who are the most resource demanding, children or old people? An important issue is whether the resources required for children and old people are mostly private (family based) or mostly public. Lee and Mason (2011, 2019) show that generational transfers are important for the economic effects of ageing, and that the transfer systems vary significantly between countries, especially the role of public vs. family transfers.

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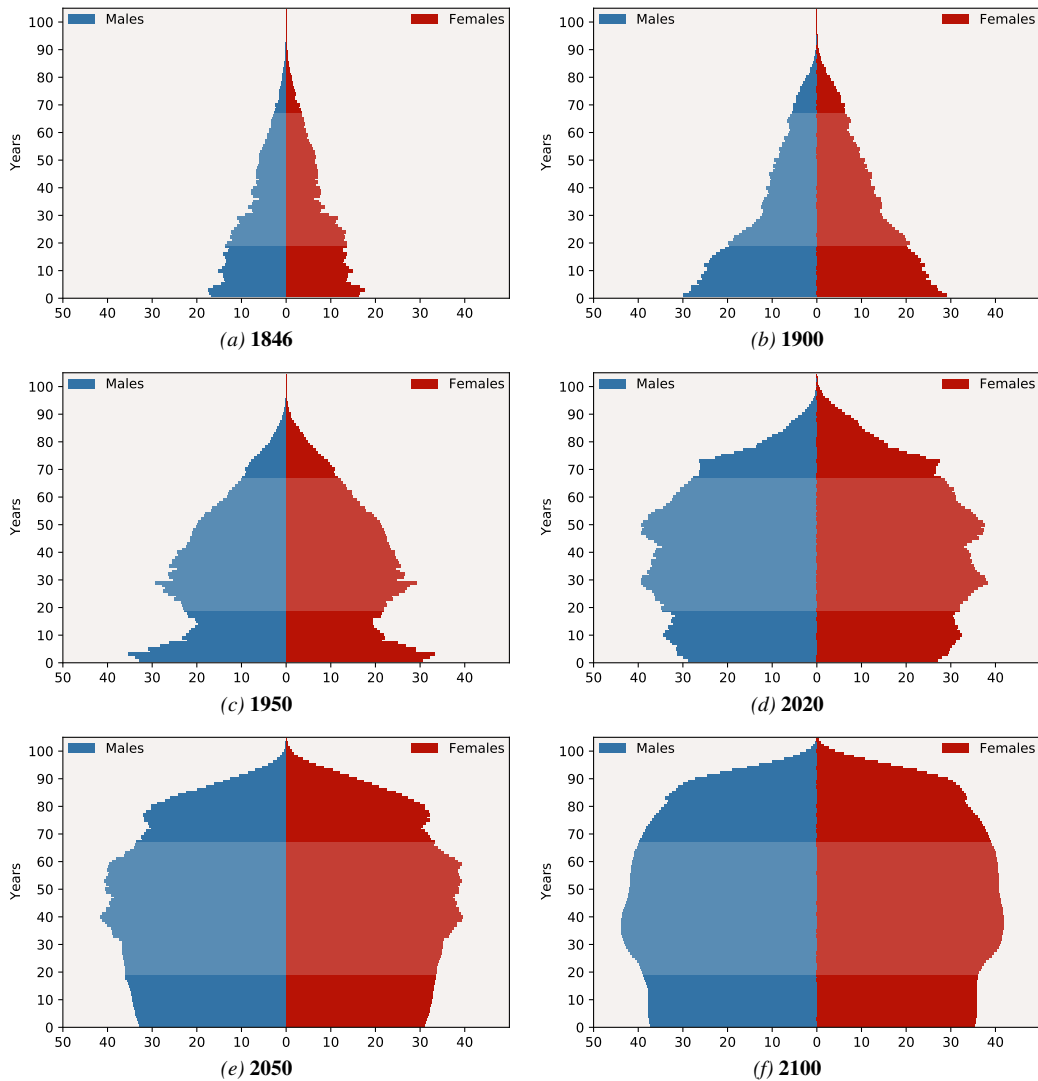


Figure 13.4 Population pyramids for 1946, 1900, 1950, 2020, and projected for 2050 and 2100 (Medium series, 2018-2100, Leknes et al. (2018)). Population in 1000 persons. Persons 19 to 66 years old are shown in lightly shaded areas.

fertility during the economic depression in the 1930s is seen in the dent around age 15. The all-time birth peak in 1946 is also clear, together with the declining births thereafter. The population pyramid based on register data for 1 January 2020 shows a top-heavy population affected by more than one hundred years of declining fertility and two hundred years of decreasing mortality in all ages.²² The 1946 peak is now barely visible (at age 73), but the echo effects of the peak can still be seen, together with the low number of births in the 1980s and in recent years (see Section 13.4).

²² Note that fertility was relatively high both before and after 1946 and that April 1945 was the month with the lowest number of conceptions based on the 1950 census, according to Professor Gunnar Thorvaldsen.

13.3 Population size and age structure

We have also included two population pyramids for future years, 2050 and 2100, to illustrate that the aging of the population will continue, although a large part of the aging has already been completed.

Normally, the size of a birth cohort declines as it grows older, due to mortality. For example, 56 per cent of the 1846-1850 cohort survived to age 50, according to cohort life tables (Mamelund and Borgan, 1996). Today 97 percent of a birth cohort will survive to age 50, if they experience the mortality observed in 2018 throughout their life. However, migration may change this. In the 1800s and early 1900s, many people emigrated overseas, mostly as young adults. This affected the age structure of the remaining population. Of the 1846-1850 cohort, only 46 per cent still lived in Norway at age 50, compared to 56 per cent due to mortality only, as mentioned above, i.e., a loss of about 10 percentage points due to migration. Around 1970, the emigration surplus to Norway changed to an *immigration* surplus. The immigration was particularly large among young males. The 1969 cohort, for example, had grown by 13 per cent at age 50, and the 1977 cohort by 36 per cent at the end of 2019 (or beginning of 2020), when it was 42 years old. At that age deaths had reduced the cohort by only 2 per cent, according to the 2019 life table. Note that these cohorts were born in many other countries in addition to Norway.

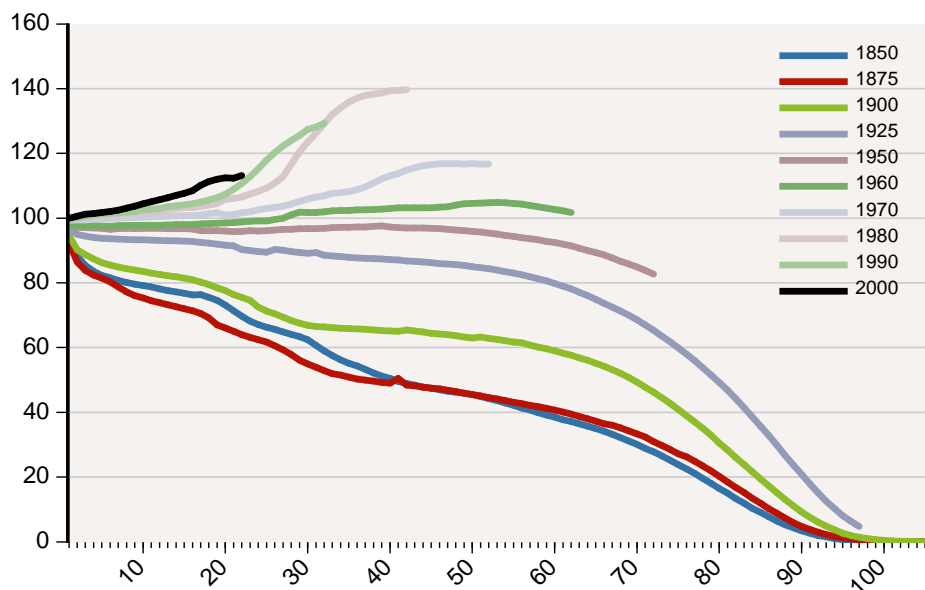


Figure 13.5 Size of a birth cohort over the life cycle in per cent of the initial size of the cohort (number of live births) at the end of 2021, for selected cohorts 1850-2000.

Sources: <https://www.ssb.no/en/statbank/table/05839/> and <https://www.ssb.no/en/statbank/table/07459/>

Figure 13.5 shows the development of selected birth cohorts from birth until it is almost "empty" around age 105, or until the most recent available observation (1 January 2022). We notice the cross-

over of the curves for the 1850 and 1875 cohorts. Net emigration seems to have been stronger for young people born in 1850 than for those born in 1875. Above age 50 deaths reduced the size of the 1850 cohort faster than the 1875 cohort, since the mortality transition had not yet strongly affected earlier cohorts.

The largest cohort ever born in Norway, 70 727 in 1946, has been surpassed by many cohorts born later due to immigration. The largest one-year age group ever registered in Norway is 76 937 persons at age 46 in 2016. This cohort was born in 1970 and has grown from 64 551 births (in Norway), which implies a net increase of 17 per cent. But it is the 1983 cohort that has grown most of all cohorts, by fully 43 per cent from birth to age 38.

After the EU expanded with eight new countries in Eastern Europe in 2004, labour migration to Norway increased rapidly. This immigration, with an overweight of young men, has more or less compensated for the low numbers of births in the 1980s (Brunborg and Tønnesen, 2012, p.10).

13.4 Fertility

Introduction

Births are usually the most important driver of the population growth of a country. The number of births affect the age and household composition of the population, and therefore, the demand for housing and other goods and services. Moreover, births determine the labour supply. Historically, high numbers of births contributed to the high emigration from Norway, especially in the 19th century.

Another birth-size effect is that it may be disadvantageous to be born in a cohort that is large relative to preceding and succeeding cohorts, as its members face more competition in education and the labour market throughout the life cycle, and vice versa for small cohorts (the Easterlin hypothesis, see Lee (1976)).

For comparing births over time or between countries, we standardize for the sex and age structure of the population to obtain indicators of the number of live births per woman, called fertility in demography, see Table 13.2. The most common is the total fertility rate (TFR). This is the average number of children that would be born to a woman over her lifetime if she were to experience the age-specific fertility rates (ASFRs) observed in a given year, and if all women survive from birth until the end of the reproductive period. It is obtained by summing the single-year age-specific rates (or the sum of five-year rates for a period multiplied by five), usually for one or more calendar years (periods).²³

The period TFR is a synthetic (or hypothetical) rate, since it is not based on the fertility over the lifetime of an actual group of women (cohort) but is the sum of age-specific fertility rates (ASFRs) over ages 15-49, usually for one year, which represent women born in different calendar years. But we may also follow a birth cohort from the beginning to the end of its reproductive period and

²³ The existence of a good population register makes it possible to estimate fertility indicators for men as well, see, for example, <https://www.ssb.no/en/statbank/list/fodte> for the total fertility rate for men since 2000.

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Table 13.2 *Fertility terms and indicators.*

Acronym	Term	Definition
ASFR	Age Specific Fertility Rate	Live births per women of a given age
	Birth Cohort	Persons born in the same year
CEB	Children Ever Born	Total number of ever children born to a group of women
CBR	Crude Birth Rate	Live births per population * 1000
CFS	Completed Family Size	Total lifetime number of births at age 49
CFTR	Cohort TFR	Number of births per woman for a given cohort (completed family size)
GFR	General Fertility Rate	Live births per women 15-49 years of age * 1000
GRR	Gross Reproduction Rate	Number of girls per woman
NRR	Net Reproduction Rate	GRR adjusted for mortality before age 50
	Parity	The order of a live birth of a woman (0,1,2,3,...) or the birth order of a child
TFR	Total Fertility Rate	Number of births per woman 15-49 years

accumulate the rates at each age (observed for different calendar years) to arrive at the *cohort* TFR. A drawback of this TFR is that its estimation demands long and consistent time series of period ASFRs. The period TFR is useful because it measures the current fertility, whereas the cohort TFR relates to the lifetime experience and gives a more comprehensive picture.²⁴ In short, the period TFR measures the *tempo* and the cohort TFR the *quantum* of childbearing. Both are useful indicators, depending on the kind of analysis and the questions to be addressed.

Data and methods related to fertility indicators

As mentioned above, the TFR is the sum of age-specific fertility rates for a given year. To estimate these, we need to know both the numerator and the denominator of these rates, i.e., the number of births by age of mother at delivery and the total number of women at each age 15-49 (the fertile age range). Ideally, we would like to have these data both for single calendar years and single years of age at birth. As mentioned in Chapter 12, *church (parish) records* (kirkebøker) are the main source for historical data on births, but these records did not provide data on the age of the mother before 1845.

To locate data on live births and the female population by age, I went through relevant publications and unpublished tables in Statistics Norway (Brunborg, 1975, 1988). No long series were found, only a patchwork of statistics including births for some years and birth rates for other years, for single or five-year calendar years. For some years, only the total number of births was available, such as for years before 1874, 1877-1880, and 1906-1909. For other years only, the *distribution* of births and/or rates for five-year age groups were published.

²⁴ For more details on methodology and concepts, see the webpages on Population Analysis for Policies & Programmes (PAPP) by the International Union for the Scientific Study of Population (IUSSP), http://papp.iussp.org/sessions/papp101_s04/PAPP101_s04_080_140.html.

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Another complication is that two different age definitions are used by Statistics Norway: The mother's age at the *end of the year* (before 1967) and the mother's age at the *delivery* (1967 onwards). The advantage of using age at the end of the year is that there is an exact relationship between age x at the end of year t and the year of birth n where $n = t - x$. To construct cohort fertility rates, data on births by age at the end of the year is preferable, although it is possible to approximate such rates from rates by age at the delivery. Since the end of the 1960s data on births are available by both age definitions, but vital rates are now usually published only by the age at the *event*, such as births, deaths, migrations and marriages.²⁵

To arrive at a set of age-specific fertility rates by single years of age (by the end of the year) and for single calendar years, I used various estimation and approximation methods, including interpolation, extrapolation, and disaggregation. This approach seems to have provided reasonably reliable and consistent estimates for every single calendar year since 1845. The previously published indicators (Brunborg, 1975, 1988) were further updated by Brunborg and Mamelund (1994) and by me for the present publication.

The cohort TFRs were constructed by piecing together period fertility rates at ages from 15 and upwards, for a number of calendar years. To arrive at longer time series, the rates were extrapolated backwards and forwards for the youngest and oldest ages, respectively, which contribute modestly to the TFR. For the oldest cohorts, born in 1820-1829, it was assumed that the fertility rates from age 15 (born in 1835) to 24 (born in 1844) were the same as those estimated for ages 15-24 for 1845. For the youngest cohorts, which were born before they could have completed their reproductive career in 2018 (year of the most recent observations), a similar extrapolation was done. For example, for the 1990 cohort, which was 28 years of age in 2018, we used the 2018 observations for the single ages 29-49. Obviously, the estimate of the cohort TFR is less reliable the further into the future we go (as for all projections), but for cohorts born before approximately 1980 the completed family size is quite reliable, as there are few births after age 38 (only 10 per cent in 2018). The available observations and estimates were imported into a large worksheet, which was used to produce the tables and graphs in this chapter.

Selected results

The sources and methods behind Norway's long time series of births since 1735 is documented in Chapter 12 by Espen Sjøbye. Standardized birth and death rates per thousand persons are shown in Figure 12.1 in that chapter. Figure 13.6 below shows the actual number of births and deaths since 1735 measured in absolute numbers. The numbers are tabulated in Table 13.A.1.

Generally, the number of births has declined since the end of the 1800s, as discussed in Chapter 12, but with significant spikes (1900-1902, 1920, 1946, end of 1960s) and troughs (1930s, 1980s, 2010s). However, since the number of births is affected by the number and age distribution of women, we also show the TFR since 1845 in Figure 13.7.

²⁵ The population projections of Statistics Norway use rates by age at the end of the year, i.e., the cohort approach.

13.4 Fertility

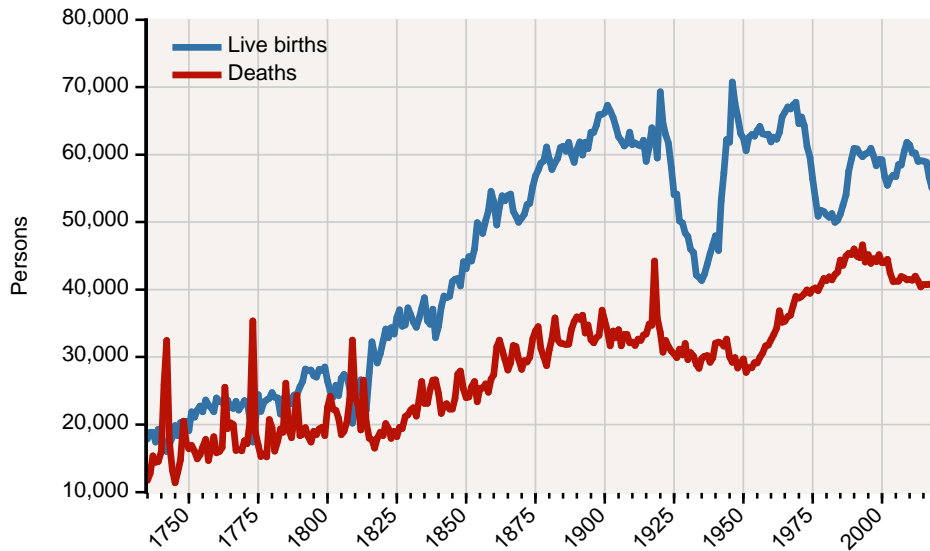


Figure 13.6 Natural population change, 1735-2021.

The red graph in Figure 13.7 shows the period TFR for the calendar years 1845-2021. It clearly illustrates the historical fertility transition, which started in Norway around 1900. Later, the fertility rate was particularly low during the economic depression in the 1930s, which was primarily caused by postponement of marriage, as fertility in marriage did not decline significantly (Backer, 1965). The fertility level recovered fast from the end of the 1930s and during the occupation 1940-1945, peaking in 1946, with the highest number of births ever in Norwegian history. However, the TFR in 1946 was "only" 2.7 children per woman, which was surpassed in the middle of the 1960s by more than 2.9 children per woman (3.0 in 1964), before the rapid modern fertility decline began, which may be considered an element of the *second* demographic transition (van de Kaa, 1987). This is usually explained by increasing education and labour force participation among women, which was facilitated by the emergence of modern methods of contraception. The subsequent fertility increase from 1986 to 2009, when the Norwegian TFR was one of the highest in Europe, is often explained by the introduction of family-friendly policies, such as long and paid maternity and paternity leaves and the provision of subsidized childcare for all children. The decline since 2009 may be related to the continued and strong postponement of first birth and a decline in the proportion of women having three or more children (Lappegård and Dommermuth, 2015), which may be affected by economic uncertainty (Dommermuth and Lappegård, 2017).

The TFR has to be higher than the reproduction level, which is about 2.1 children per woman, to avoid population decline in the long run, assuming no net immigration. Figure 13.7 shows that TFR has been below this level in the 1930s and since 1974. There are no indications that the fertility is going to increase again, but we cannot be absolutely certain about this. Internationally, there are

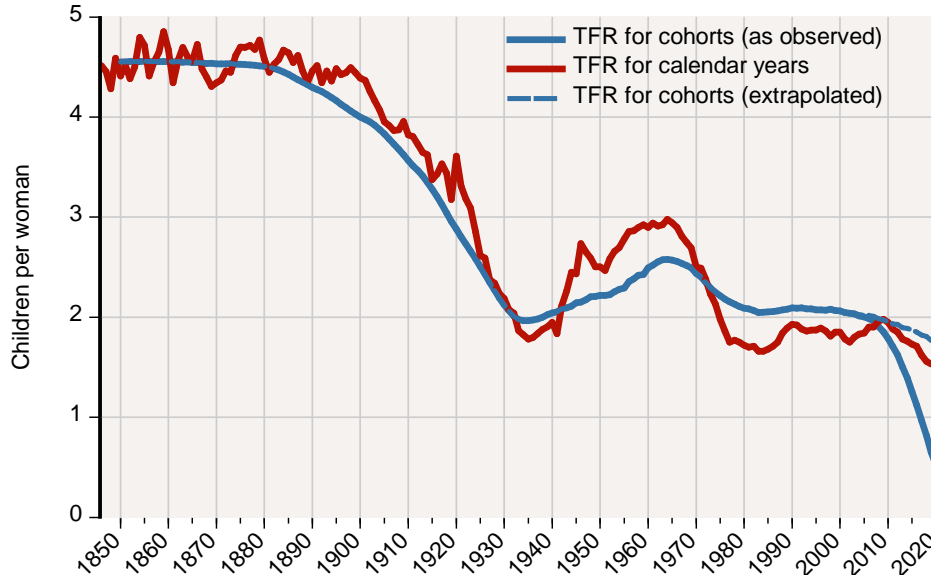


Figure 13.7 Total Fertility Rate for calendar years 1845-2021 (red line) and cohorts 1820-1990. The cohort fertility curve (blue line) has been moved 30 years (the approximate mean age childbearing) forward (to the right) relative to the period fertility curve, to facilitate comparison. TFR for 1968-2021 is downloaded from <https://www.ssb.no/statbank/table/04232>. TFR for other years is taken from an update of Brunborg and Mamelund (1994).

no examples of a permanent return to a TFR above the reproduction level after a decline to below 2.0. Nevertheless, the size of the Norwegian population is likely going to increase throughout this century, mainly due to the high immigration surplus (Tønnessen, Leknes and Syse, 2016).

The blue line in Figure 13.7 shows the cumulated lifetime fertility of birth cohorts since 1820, denoted the cohort TFR. To facilitate comparison with the period fertility, we have moved the cohort TFR curve 30 years forward relative to the curve for the period TFR. For example, the curve for the calendar year TFR begins in 1850 whereas the curve for the cohort TFR begins in 1820. The reason for this is that the mean age at delivery is about 30 years and that a large part of the births of a cohort will occur around this age, i.e., 30 years after the birth of the cohort. We notice that the cohort TFR fluctuates much less than the period TFR, because births may be postponed or moved forward in life, with little effect on the total number of children over the lifetime.

We also notice how the TFR increased for each successive cohort born at the beginning of the last century (1905-1934) to compensate for the low fertility during the depression due to postponed marriages. In fact, the age with the highest fertility rate for the 1910 cohort was 36, i.e., in the year 1946. The same is the case for the 1911-1918 cohorts, which all experienced their highest age-specific fertility rate in 1946. This illustrates how cohorts can change the fertility pattern over their

13.4 Fertility

life cycle to obtain approximately the same number of children as they would have had without low fertility in young ages.

For all cohorts that have completed their reproductive life at age 49 so far, the TFR has been greater than reproduction level of about 2.1.²⁶ However, unless the period fertility rates soon start to increase, the cohort TFR is going to decline below this level for future cohorts, probably beginning with the 1971 cohort, see the dotted graph in Figure 13.7. The data are tabulated in Table 13.A.3.

The fertility development in Norway is not unique, as shown in Figure 13.8. All five Nordic countries started the fertility transition around 1900, had low fertility in the 1930s, relatively high levels in the 1960s, a rapid decline in the 1970s, a relatively stable level slightly below 2 from about 1990 until 2015, and a decline to low levels since then. In 2019 the average TFR for the Nordic countries was 1.61, ranging from 1.35 in Finland to 1.75 in Iceland. Iceland was for several years, together with Ireland, an outlier in Western Europe with relatively high fertility, but the level has declined to well below 2 in recent years. Sweden has had large fertility fluctuations since the 1970s, which were mostly due to changing public policies, especially rules for maternity leave (Hoem, 1993, 2005). The fertility trends in the Nordic countries are remarkably similar. Nordic fertility used to be significantly higher than in most of the rest of Europe, but this is not the case any longer. The average TFR for the 28 EU countries was 1.56 in 2018, which was exactly the same as in Norway, ranging from 1.23 in Malta to 1.88 in France.²⁷

Figures 13.7-13.8 show the development of the total fertility rate. It is also interesting to look at the age composition of the TFR, which has changed dramatically over the past two hundred years. The age-specific fertility rates (ASFRs) in Figure 13.9 show the development of both the pattern and the level of fertility.²⁸ We notice the high similarity between the curves for 1850 and 1900 but with a small decline in the fertility of "older" women (over age 30) and a small increase for younger women. This indicates the beginning of the fertility transition, with women reducing high-parity births. The mean age of childbearing had started to decline, from 32.8 in 1850 to 32.1 years in 1900. In 1950, fertility had declined for all except the very youngest age groups (below 22), and the mean age of childbearing had declined to 29.4 years. After 1950 the mean age of childbearing started to increase again, to 31.0 years in 2017. The curves illustrate the strong postponement of births that have occurred since the end of the war.

As mentioned above, the age-specific fertility rates for a calendar year represent the fertility experience of women born in about 35 different years. The long fertility time series make it possible to follow birth cohorts over their life cycle. For example, the 1950 cohort started to have children in

²⁶ The reproduction level is the fertility level that must be achieved in a population to avoid population decline in the long run, disregarding migration. This level is usually assumed to be about 2.1 children per woman, corresponding to a net reproduction rate (NRR) of 1.0, and is affected by the mortality of the female population. With the current low mortality level in Norway, almost all girls and women survive to age 50 (98.2 per cent according to the life table for 2019). An NRR of 1.0 corresponds to a TFR of about 2.06 (with a sex ratio of birth at about 2.05). Thus, although the TFR was above 2.06 for cohorts born in the early 1950s, the NRR for these cohorts was below 1.0 due to the lower survival probabilities for these cohorts.

²⁷ Source: Eurostat at <https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00199&plugin=1>.

²⁸ The area under each curve is the sum of age-specific rates and equals the total fertility rate. The figure clearly shows the large decline in the TFR in the previous century and the continuation of this in the current century.

Long run trends in demographic data, 1735-2021

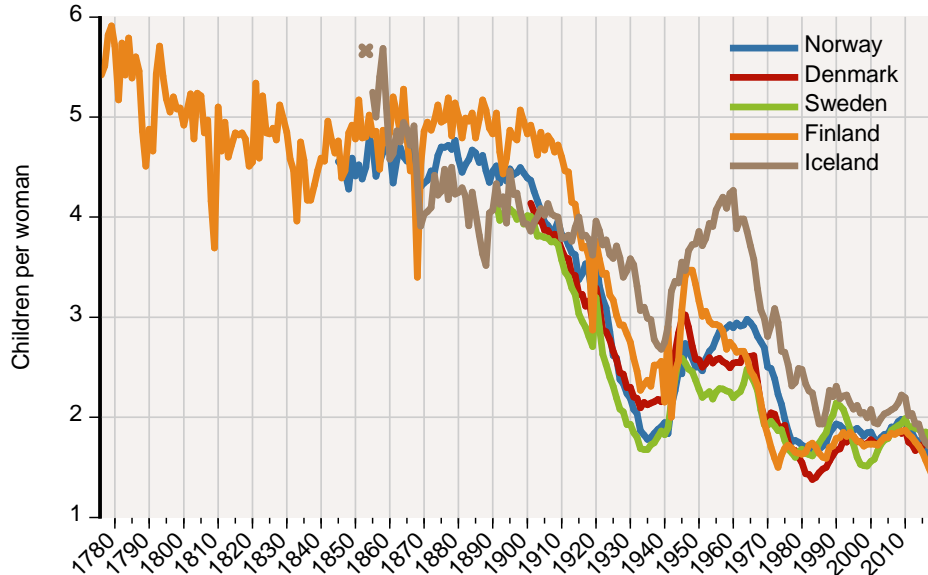


Figure 13.8 Total Fertility Rate for the Nordic countries.

Sources:

Norway 1845-1967 Brunborg and Mamelund (1994)

Norway 1968-2019 <https://www.ssb.no/statbank/table/04232/?rxid=e2098948-9342-4999-a8bb-97c07e4596e0>

Denmark 1901-1960 <http://www.dst.dk/Site/Dst/Udgivelses/GetPubFile.aspx?id=19335&sid=befund>

Denmark 1961-1972 Statistisk årbog 1975, <https://www.dst.dk/Site/Dst/Udgivelses/GetPubFile.aspx?id=13350&sid=areal>

Denmark 1973-2019 <https://www.statistikbanken.dk/statbank5a/selectvarval/define.asp?PLanguage=0&subword=tabel&MainTable=FOD33-&PXSID=174868&tablestyle=&ST=SD&buttons=0>

Finland 1776-2019 http://pxnet2.stat.fi/PXWeb/pxweb/en/StatFin/StatFin_vrm...synt/statfin_synt_pxt_008.px/table/tableViewLayout2/?rxid=ebc3e1d7-7930-46ab-b5cb-d30bf5cc765e

Iceland 1853-2019 <http://px.hagstofa.is/pxen/pxweb/en/lbuar/lbuar...Faeddirdanir...faeddir...faedingar/MAN05202.px/table/tableViewLayout1/?rxid=315fef16-c45d-4b4b-8d7c-26ef25706c3d>

Sweden 1891-1949 <http://www.humanfertility.org/cgi-bin/country.php?country=SWE&tab=si>

Sweden 1950-1999 Recent demographic developments in Europe 1998 AND 2000, Council of Europe Publishing, Strasbourg, 1998 and 2000

Sweden 2000-2019 <https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START...BE...BE0101H/FruksamhetSum/table/tableViewLayout1/>

Other good sources of international fertility statistics are Eurostat, Human Fertility Database and United Nations Population Division.

1965 and finished in 1999.²⁹ The 1980 cohort, on the other hand, which was 39 years old at the end of 2019, has not quite finished childbearing yet and will still have children, although not so many on average. If we cumulate the *ASFRs* over age, we get the average number of children ever born at each age. Figure 13.10 shows such curves for a few selected cohorts, including some that have not yet completed their childbearing (1980 and 1990). Each cohort has to have about 2.1 children each on average to reproduce itself, which all of the 1950-1976 cohorts have done. The 1960 cohort, which had a much slower childbearing start than the 1950 cohort, caught up with the 1950 cohort by having more children after age 26. It is possible that the 1980 and 1990 cohorts will reproduce

²⁹ In some years a few women have children before age 15 or after age 49, but this is rare and insignificant.

13.4 Fertility

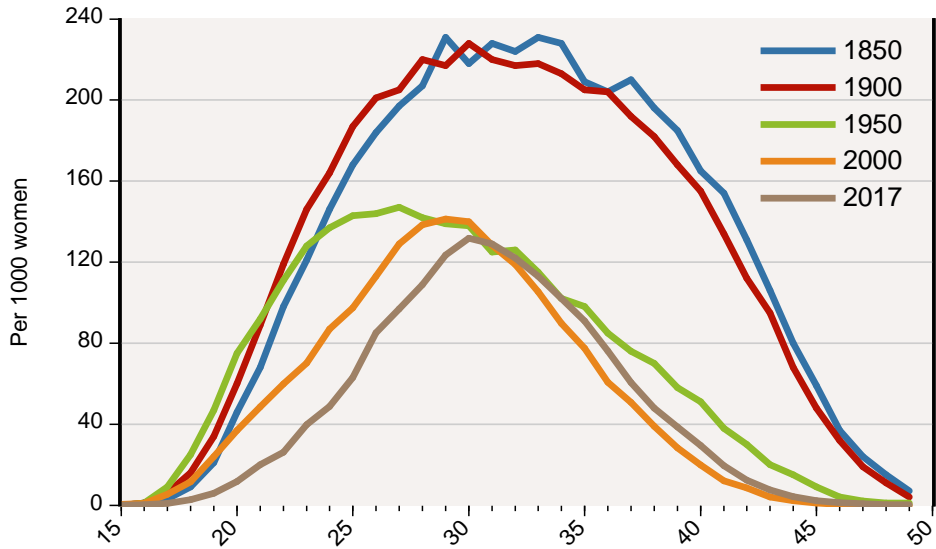


Figure 13.9 Age-specific Fertility Rates for selected years, 1850-2017.

themselves by having 2.1 or more children, but this is not very likely as it would require quite high fertility among "older" women, reversing the current trends.³⁰

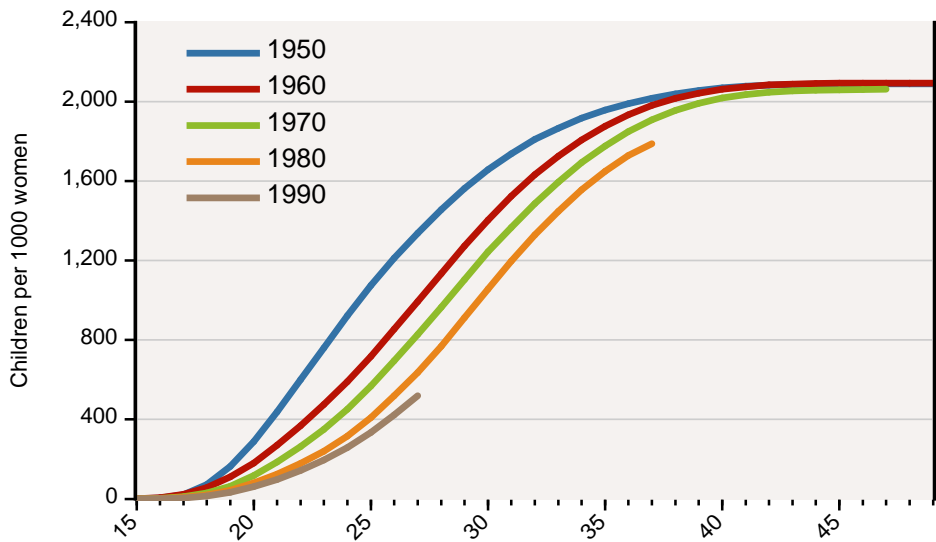


Figure 13.10 Cumulated fertility rates by age for selected recent birth cohorts, 1950-1990.

³⁰ At the end of 2019, the 1980 cohort had 1.88 children and the 1990 cohort 0.7 children on average. Extrapolating with the observed 2019 rates, they will have 1.96 and 1.72 children, respectively, at the end of their reproductive period.

13.5 Mortality

Introduction

Deaths are highly influenced by economic and social factors, in addition to weather and climate, and it is almost impossible to analyse the development of the modern Norwegian society without including a discussion of the development of mortality and its causes and effects. Declining mortality started the demographic transition in Norway about 200 years ago and economic factors played an important role in this.

Deaths are affected by the age structure of the population much more than births, making the simple measure, the crude death rate, inappropriate for refined studies of trends and differentials. Instead, several age- and sex-adjusted indicators are used, see Table 13.3. Most of these are based on the *life table*, which is a classical and essential tool in demography.³¹ The most commonly used indicator is the *life expectancy at birth*.

A common problem when studying mortality is that it is difficult to measure deaths well. There is significant underregistration of deaths and misreporting of age is common. This is particularly the case in poor countries but was less of a problem in the early period of Norwegian population history, due to the recording of funerals in parish registers and the almost universal membership in the state Lutheran church of Norway.³² One important exception is underregistration of infants who died before they were baptised (Høgset, 1990).

To monitor the development of disease and death in a country, it is not sufficient to record the deaths, it is also necessary to register the *cause* of death. The parish registers were at the beginning only required to register causes of death due to accidents and infectious diseases (Dyrvik, 1983). This is a much greater challenge, which requires professional standards (such as the International Classification of Disease (ICD), developed by the WHO) and skilled personnel. For these reasons, there are not any long, comprehensive and reliable time series on causes of deaths for Norway.³³ This chapter will not discuss cause of death statistics, although the recent Covid-19 pandemic has underscored the importance of this issue.

The expected remaining lifetime at age x for year, e_x , is not based on the mortality experience over the life time of any actual population group, but is estimated from observations of deaths for ages 0-105+ for one or more calendar years, representing persons born in different years. However, just as for fertility, a life table may not only be estimated for calendar years but also for birth cohorts, based on the combination of data on deaths across age groups and years. Cohort life tables require very long and consistent time series of age-specific death rates, much longer than for estimating cohort

³¹ For an explanation of methodology and concepts, see http://papp.iussp.org/sessions/papp101_s07/PAPP101_s07_020_010.html

³² In 1839 the parish priest was required to provide information about births and deaths also for persons who were not members of the state church, based on reports from non-conformist churches, according to Søybe in Chapter 12. In 1866, for example, there were only 66 reported deaths outside the state church (Ministry of the Interior, 1869b).

³³ Some statistics have been published on violent death, including for the years 1861-1866. In 1866, for example, there were 1 230 violent deaths, with drowning as the most common cause (66 %). The other reported causes were other accidents (23 %), infanticide (1 %), murder (0.3 %) and suicide (10 %). However, there is no information about the cause of death for the remaining 28 876 deaths (Ministry of the Interior, 1869a, p. XIII).

13.5 Mortality

Table 13.3 *Mortality terms and indicators.*

Acronym	Term	Definition
CDR	Crude Death Rate	Death births per population * 1 000
e_x	Life expectancy at age x	Expected remaining years of life at age x
IMR	Infant Mortality Rate	Deaths under age 1 per 1 000 live births
l_x	Proportion surviving at age x	Number of survivors at age x of 100 000 live born
d_x	Number of deaths at age x	Number of deaths at age x of 100 000 live born
q_x	Probability of death at age x	Probability of dying between exact age x and x+1
p_x	Probability of survival at age x	Probability of surviving from exact age x to x+1
SCDR	Standardized Crude Death Rate	Death births per population * 1 000 for a given age structure
U5MR	Under 5 Mortality Rate	Mortality rate for children under age 5

fertility indicators and are often not available. Fortunately, Norway has long time series of mortality that have been utilized to estimate time series of cohort mortality.

Data and methods

The universal reporting of the number of burials in each parish started in 1735.³⁴

Deaths were initially reported without specifying neither age nor sex of the diseased. Age groups were gradually introduced and have varied over time, especially for children under 10. Reporting in ten-year age groups by sex was established in 1775 and in four age groups under age 10 in 1839 (Ministry of the Interior, 1869b, p. XX). The reporting of deaths rather than burials, and births rather than baptisms, was introduced in 1867.

As for births, different age definitions have been used by Statistics Norway: Deaths by age groups for 1846-1870 and by year of birth or groups for year of birth since 1871 (Statistics Norway, 1910). The grouped data were split into single years by year of birth or age at death, according to methods presented in Ministry of the Interior (1872). Borgan (1983) provides more information about the availability and quality of historical statistics on deaths by age.

The reported numbers of deaths by age and sex mentioned above were used to estimate deaths by one-year age groups and the population size by age and sex for 1846-1901 in 1909 (Statistics Norway, 1910). The denominators, i.e., the population by age and sex, which are required to calculate death probabilities, were for years before 1970 estimated from the population censuses and registered numbers of births, deaths, immigrations and emigrations (Mamelund and Borgan, 1996).

A complete set of mortality indicators for a year would consist of a *life table* for each sex, with at

³⁴ "Statistics relating to marriages, births, and deaths were, up to the end of the 1960s, based on return from the clergy responsible for the clerical registers on births, marriages and deaths. The first general directive to the effect that the clergy should maintain a record of marriages, births, and deaths is contained in the church ritual of 25 July 1685 and in King Christian V's Laws of Norway of 15 April 1687. It is not quite clear when the church registers were first employed as a basis for vital statistics, but reports submitted by the clergy did not assume a regular character until 1735. In that year the bishops were directed to obtain from the local clergy at the end of each year returns detailing all births and deaths in the diocese and to forward a full report thereon to the College of Commerce in Copenhagen. In 1775 a special form was drawn up on which to submit these annual reports. Up to 1865 the clergy submitted overall returns of births, marriages, and deaths, but in 1866 they were directed to submit nominative returns in the form of extracts from the church registers." (Statistics Norway, 1978a).

least five columns and one line for each age. Including all of these for each year and cohort would be far beyond the scope of this publication. The most important life table variables can be found in (Mamelund and Borgan, 1996) for the years 1846-1994. The Statbank of Statistics Norway includes the four most commonly used life table measures (ℓ_x , d_x , q_x and e_x) for every year since 1966 for men, women and both sexes for single ages 0-105+.

All mortality indicators in Table 13.3, including those for cohorts, are taken from the life tables made by Borgan (1983) based on observations for 1846-1980, extended (and slightly revised) until 1994 by Mamelund and Borgan (1996) and for more recent years by Statistics Norway, most recently in March 2018. The methods for estimating these are explained by Borgan (1983), Mamelund and Borgan (1996) and Foss (1998).³⁵

Life tables are usually made for each sex separately since males have substantially higher mortality than females at all ages. However, the new gender-neutral public pension system for Norway, which was introduced in 2011, required life tables for both sexes combined. Statistics Norway has estimated such life tables for all years since 1966.

Selected results

The mortality development in Norway has been extensively presented and discussed.³⁶ There is also a large international literature on the historical and modern development of mortality.³⁷

Norway has, like all western and many other countries, seen a strong mortality decline, which has lasted for about two hundred years. Life expectancy at birth increased by more than 35 years for both men and women from 1846 to 2021, and for a long time, from the 1890s to the 1950s, this increase occurred at an amazingly constant rate, see Figure 13.11. The life expectancies in this figure have been taken from life tables for each calendar year from 1846 to 2021. For each year the life expectancy is calculated from data on the number of deaths at each age and the number of persons at each age, 0-105+, *for that year only*.³⁸

The main mortality peaks in the previous century were due to the Spanish flu in 1918-1919 and the Second World War in 1940-1944 (mostly affecting men). Moreover, male life expectancy *declined* slightly from the late 1950s to the late 1960s, which is usually explained by increasing smoking

³⁵ The cohort mortality indicators were updated by Brunborg, Fredriksen, Stølen and Texmon (2008) as part of the planning of the new pension system and by Inger Texmon in 2019 for this publication. Statistics Norway may include time series of both period and cohort mortality indicators in its StatBank.

³⁶ See Backer (1961), Mamelund and Borgan (1996), Brunborg (2012a), Folkehelseinstituttet (2018), Keilman et al. (2018) and Thomas and Pham (2020).

³⁷ See, for example, McKeown (1978), Omran (1971), Oeppen and Vaupel (2002), Pampel (2002), Schofield et al. (1991), and Riley (2005).

³⁸ Although this may be interpreted as an average age at death it is not exactly the same as that. For example, the life expectancy at birth was 81.2 years for males and 84.7 years for females according to the life table for 2019. The average age at death, however, was lower, 76.0 and 81.7 years, respectively. The reason for this are variations in the age structure of the population, which are affected not only by deaths but also by births and migrations. If the number of births had been exactly the same in each of the past 105+ years and if there had been no net migration in any of the age groups, the life expectancy at birth and the average age at death would have been the same.

For higher ages, for example at age 70, as in Figure 13.15, only data on deaths and population size over age 70 are used to calculate the remaining life expectancy, e_{70} . The mean age at death over age 70 in 2019 was 13.0 years for males and 16.2 years for females, whereas e_{70} was 15.6 and 17.6, respectively, according to the life table for 2019.

13.5 Mortality

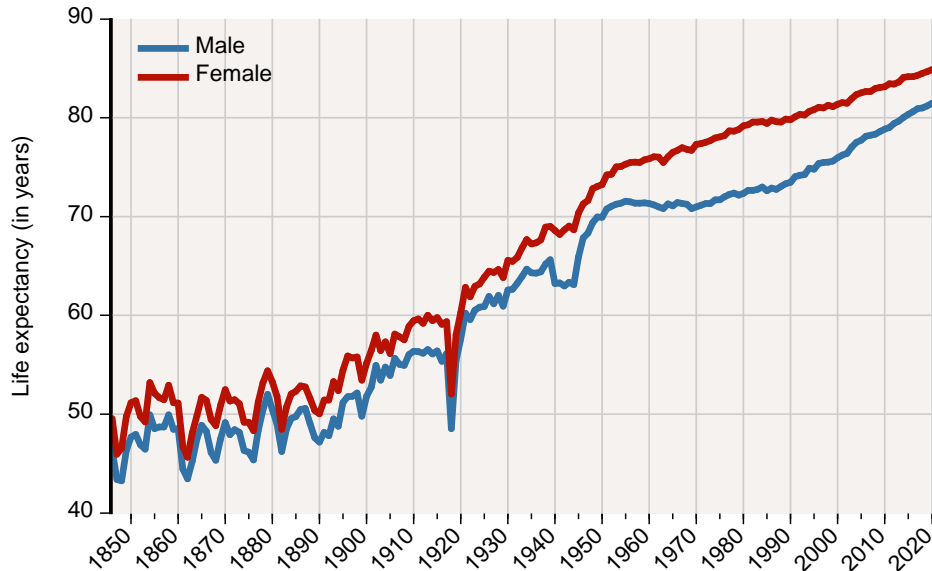


Figure 13.11 Life expectancy at birth, 1846-2021.

Sources: 1846-1985 Mamelund and Borgan (1996), 1986-2021 <https://www.ssb.no/statbank/table/07902/>.

among men. Changing smoking habits also seem to explain the rapidly growing excess female life expectancy after the war until the beginning of the 1980s, and the following decline (Figure 13.13), as men started to reduce daily smoking before women (Pampel, 2002).

In addition to the series since 1846, there exist scattered older estimates of the life expectancy at birth for 5- or 10-year periods. Statistics Norway has published life expectancy for males and females for 1821-1830 and later periods. I have used the inverse projection method developed by Lee (1974) to estimate *life table* measures for five-year periods for 1736-1970 from annual data on births and deaths and population data from censuses (Brunborg, 1976). Figure 13.12 combines these two sets of estimates with "modern" estimates for single calendar years. The inverse projection estimates correspond well with the official Statistics Norway numbers. Before 1820 the life expectancy fluctuated at a low level, mostly between 30 and 40 years.

Another important mortality indicator is the infant mortality rate (IMR). For a long period, a major part of the mortality decline occurred among infants, especially in the previous century, as shown in Figure 13.14. From 1900 to 2000 the IMR declined from 90.5 to 3.8 (per 1000 live births), or by fully 96 per cent. The IMR is now so low (1.8 in 2021) that even if it declined to zero, which is impossible, the life expectancy at birth (e_0) would increase by only 0.2 years. Even if all mortality before age 50 were eliminated, e_0 would increase by only one year (1.2 for men and 0.9 for women). The IMR may have stabilized at a low level, since further declines may be difficult to achieve. Currently, almost all infant deaths are due to internal causes and not to infections, etc. The IMR is usually lower for females than for males (19 per cent on average for 1976-2019).

Long run trends in demographic data, 1735-2021

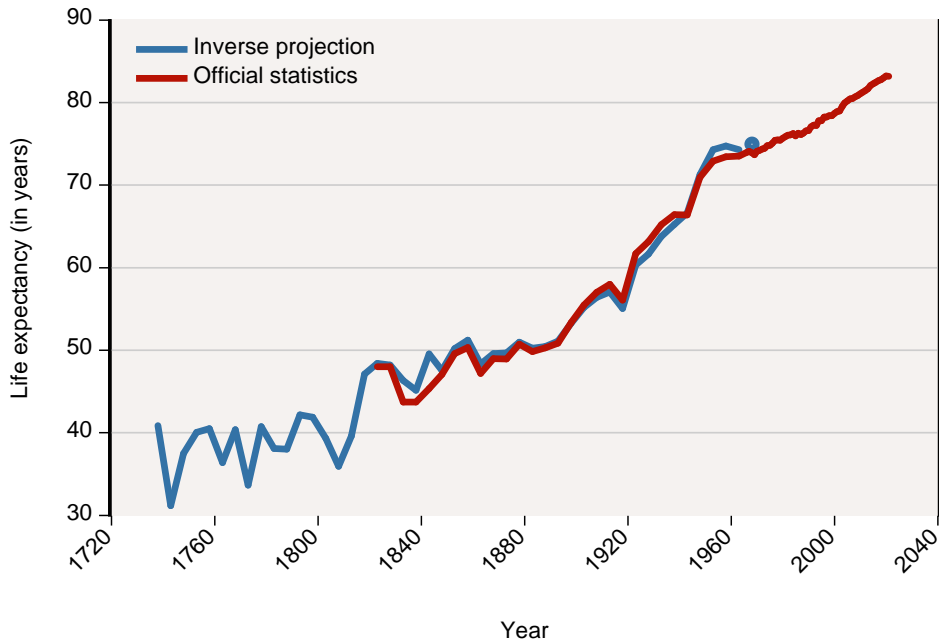


Figure 13.12 Life expectancy at birth for both sexes, 1736-2021.
 Sources: Inverse projection 1736-1970: (Brunborg, 1976, 1992); Official statistics 1821-2021:
 1821-1965: <https://www.ssb.no/statbank/table/05862/>. The life expectancy for both sexes has been set equal
 to the average of the male and female values.
 1966-2021: Values for single years have been obtained from <https://www.ssb.no/statbank/table/07902/>.
 Methodology according to Foss (1998). For 1821-2021 official statistics on the life expectancy have also
 been published for each sex for periods of varying length.

The implication of this is that to achieve further increases in the life expectancy, it is the mortality of *older* ages that need to decline. This is indeed happening, but at a slower speed than previously (Figure 13.15). We notice that the remaining life expectancy is increasing more slowly for the oldest old than for the youngest "old". From 1900 to 2000, e_{90} increased by 0.6 years for men and 0.9 years for women, whereas e_{60} increased by 4 years for men and 7 years for women. When the public universal pension scheme in Norway (*Folketrygden*) was established in 1967, a person who retired at age 70 could expect to live for 12 more years. In 2019 a retiree could expect to live another 17.6 years, see Table 13.A.4. The increasing life expectancy of the elderly has many social and economic implications, particularly for public expenditures on pensions, care and medical services.

So far, we have only looked at mortality indicators for calendar years. As mentioned at the beginning, we may also combine mortality data for many years to estimate mortality indicators for birth cohorts. An example of this is the ℓ_x series, which shows the remaining number of survivors of a birth cohort due to mortality. We may start at, say 100,000, and estimate the remaining number at each age from the probabilities of dying (q_x). Around age 106 there is normally nobody left in the

13.5 Mortality

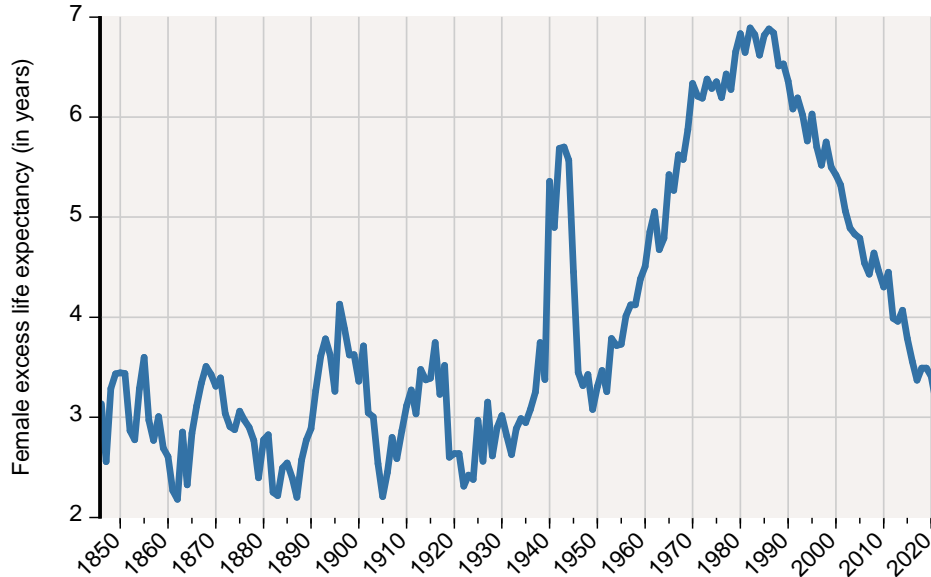


Figure 13.13 Female excess life expectancy at birth, 1846-2021.

Sources: 1846-1985 Mamelund and Borgan (1996),
1986-2021 <https://www.ssb.no/en/statbank/table/05375/>.

cohort. In Figures 13.16 and 13.17 the survival curves for men and women are shown for selected cohorts since 1846. The youngest cohort that had completed the life cycle in 2018 is the 1912 cohort. For younger cohorts we do not know the future mortality development, as shown in the two figures. We could have used the mortality projections of Statistics Norway for these cohorts, but this would have introduced an element of uncertainty, although this uncertainty is smaller the older the cohorts are. We notice how there generally is an increasing number of survivors at a given age over time, with a few exceptions.³⁹

The median age at death, i.e., where half of a cohort has died, has increased from 56 years for the 1846 cohort to 80 years for the 1938 cohort, which has a life expectancy at birth of 72.4 years.

Table 13.A.5 shows estimates of the life expectancy at birth for cohorts 1846-1993 and periods 1846-2021. To see how it may develop for cohorts born after 1912, we have assumed that the death probabilities (q_x) for cohorts with incomplete life cycles are the same as in the population projections for Norway for 2018-2100 (Leknes et al., 2018). Four alternative sets of assumptions were used for future mortality: high, medium, low and constant life expectancy. Since mortality at the end of life has little impact on the life expectancy at birth, we have assumed that the life expectancy at birth

³⁹ The survival curves are becoming more and more horizontal for a large part of the life cycle and then drops steeply. This is called rectangularization of the survival curve (Wilmoth and Horiuchi, 1999), which is due to increased survival and concentration of deaths around the mean age at death. However, there is no strong tendency at an increasing *maximum* age at death, in spite of more and more centenarians.

Long run trends in demographic data, 1735-2021

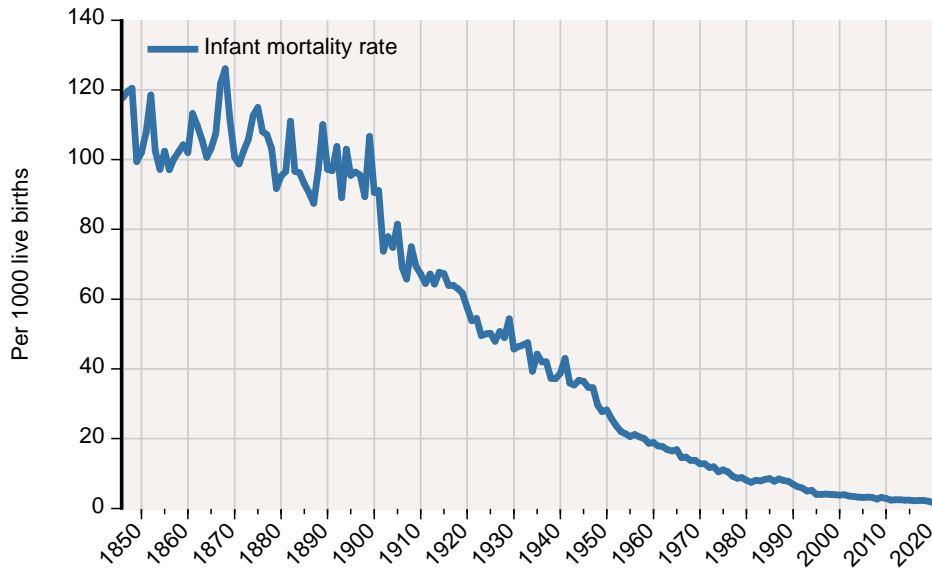


Figure 13.14 Infant mortality rate, 1836-2021.
Source: 1836-1975 <https://www.ssb.no/a/histstat/tabeller/3-13.html>,
1976-2021 <https://www.ssb.no/en/statbank/table/08393/>.

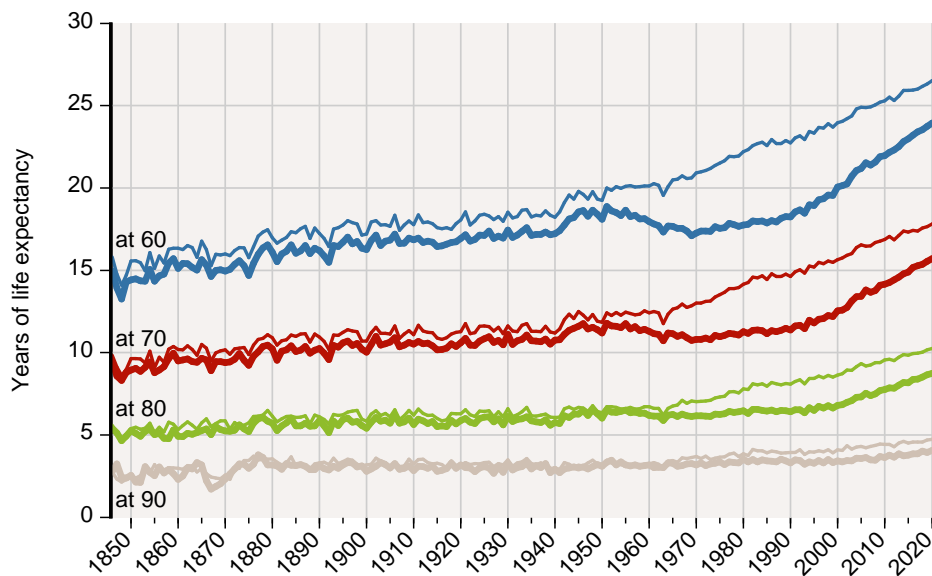


Figure 13.15 Life expectancy for men and women at ages 60, 70, 80 and 90, 1846-2021.
Sources: 1846-1985 Mamelund and Borgan (1996), 1986-2018 Inger Texmon (unpublished tables), 2019-2021, <https://www.ssb.no/statbank/table/07902/>.

13.5 Mortality

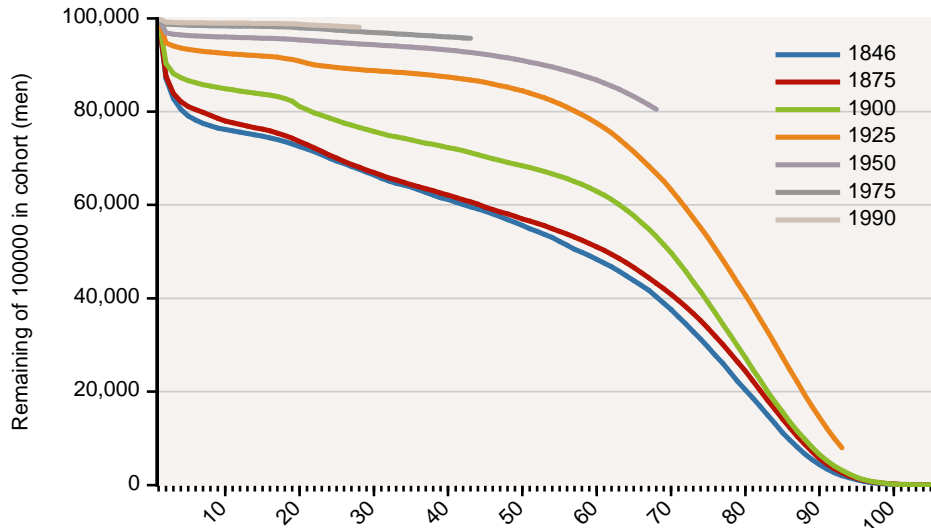


Figure 13.16 Number of survivors at age x of 100,000 live born for selected cohorts of men born 1846-1990.

Source: Mamelund and Borgan (1996), updated by Inger Texmon for 2007-2020.

can be considered as more or less complete for cohorts 1913-1931 in Figure 13.18.⁴⁰ We notice the continued and steep increase of the life expectancy at birth, and the continuation of the declining difference between female and male life expectancy.

Except for a few years in the middle of the 1800s, all cohorts have lived longer than "expected" by the period indicator, as shown in Table 13.A.5, on average 5.4 years for men and 6.3 years for women. The largest difference is for 1918, the year of the Spanish flu, when the period life expectancy at birth was fully 15.2 and 19.4 years *less* than the actual length of life of those born in 1918, for men and women, respectively (Figure 13.19). The effects of the World War II are also significant at the period level (about 11 years lower period than cohort life expectancy), but with little effect on the life expectancy of cohorts born during the occupation. The number of deaths in Norway due to World War II was relatively small compared to other countries at war, both battle and civilian deaths. The reason for the small cohort effects of mortality crises is that crisis deaths occur over many ages.

Table 13.A.5 shows that the *period life expectancy* for a male person born in 1900 is 51.8 years if we base the estimation on all age groups for that year alone. The *cohort life expectancy* for a male person from the 1900 cohort, on the other hand, is almost 10 percent larger, 56.5 years. The reason for this increase is that the cohort life expectancy takes into account that mortality has declined throughout the 20th century and into the 21st century. As medical science, economic conditions, nutrition and other general living conditions went through huge improvements during this period, so

⁴⁰ This approximation implies less than a 0.2-year difference in the projected life expectancies.

Long run trends in demographic data, 1735-2021

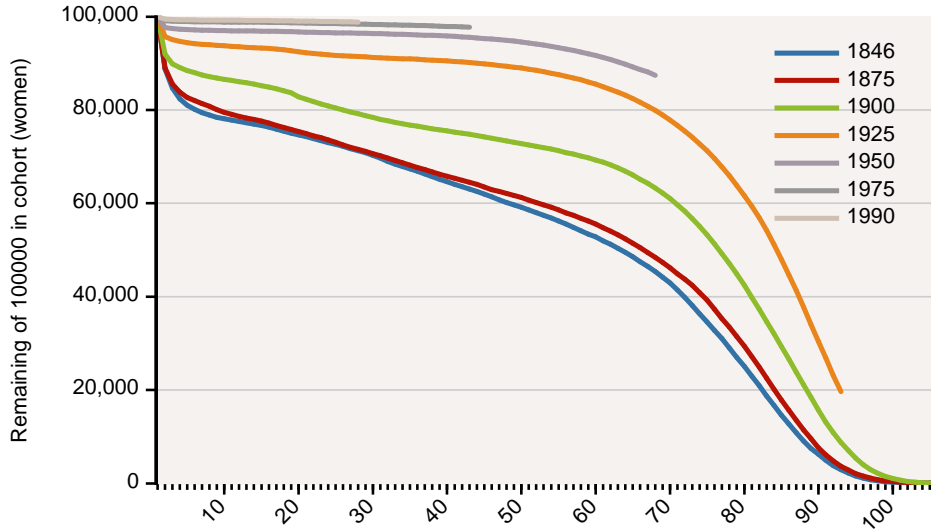


Figure 13.17 Number of survivors at age x of 100,000 live born for selected cohorts of women born 1846-1990.

Source: Mamelund and Borgan (1996), updated by Inger Texmon for 2007-2020.

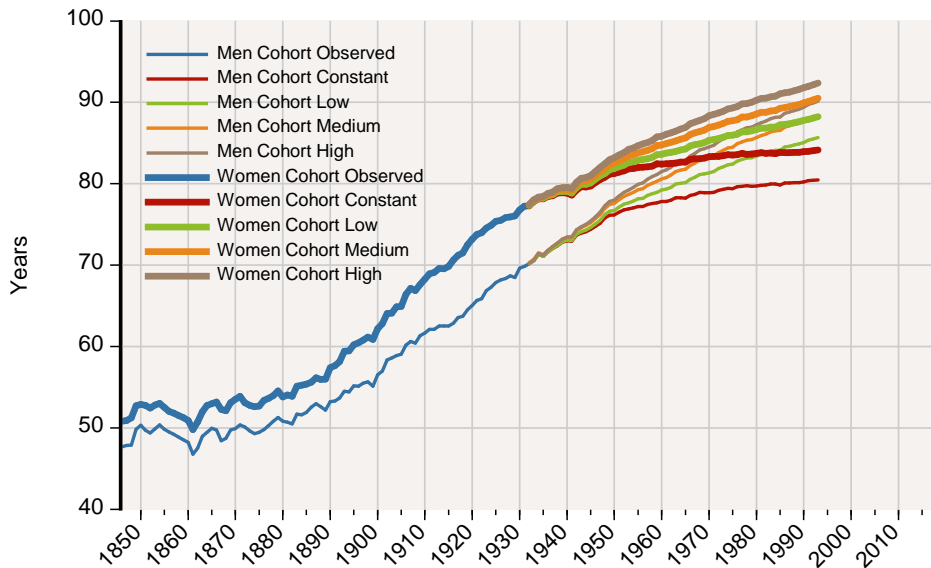


Figure 13.18 Life expectancy at birth for cohorts 1846-1993.

Source: Mamelund and Borgan (1996), updated by Inger Texmon in December 2019. Extrapolated for un-observed ages with 2018 observations (constant) and 2018-2100 population projections assumptions (low, medium and high) for cohorts 1932-1993, see Leknes et al. (2018).

13.5 Mortality

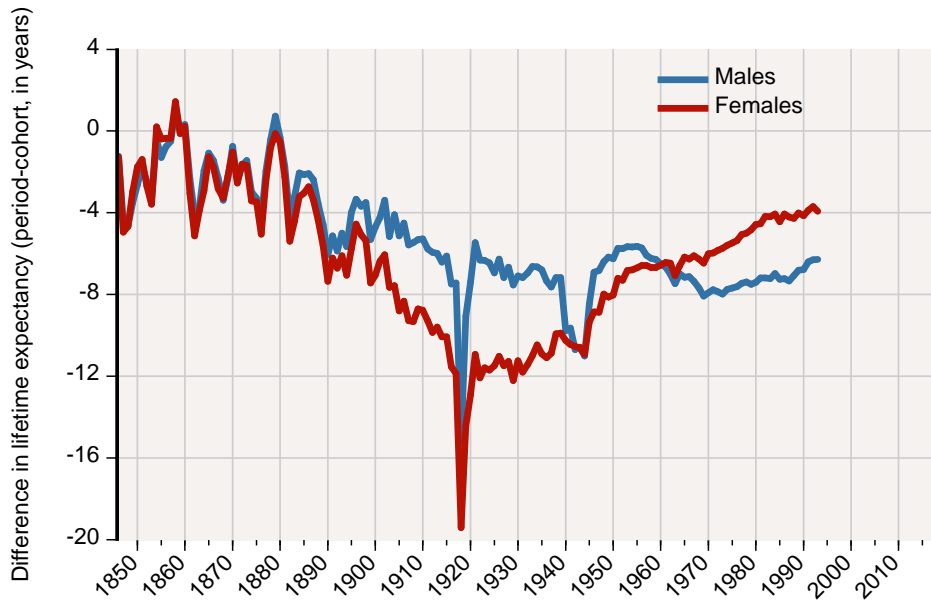


Figure 13.19 Difference between life expectancy at birth for periods and cohorts. Projected with 2018 population projection rates for incomplete cohorts and periods, see Leknes, Løkken, Syse and Tønnessen (2018).

did the life expectancy of all cohorts. Cohort life expectancy is a measure which takes into account all these changes as they appear and affect the remaining persons in each cohort.

13.6 Migration

Introduction

International migration is probably the demographic component that is most closely linked to economic development. Both out- and in-migration may change fast due to economic changes and may have profound economic effects. Examples of this include the emigration from Norway to North America in the 19th century and the recent labour migration to Norway from Eastern Europe, as well as the large migration flows to Europe from Africa and Asia in recent years.

The understanding of the economics of migration has been made more complicated by the introduction of legal factors in the past century, whereas the borders in the USA and elsewhere were nearly open in the late nineteenth century (Abramitzky et al., 2012).

Internal migration has similar effects and causes, although usually not as strong and fast as those linked to international migration. Urbanization is one of the effects of migration, due to net migration from rural to urban areas, and from remote to central regions, which has been going on for hundreds of years in Norway - and in most other countries of the world (see section 13.8). An extreme example of this is the high internal migration in connection with the population and housing boom in Kristiania (Oslo) at the end of the 1890s (see section 13.9).

Unfortunately, although migration is closely linked to population development, it is generally the most difficult demographic component to measure. This is particularly the case for emigration, as persons who leave a country are usually not required (or motivated) to report their departure. On the other hand, persons immigrating to a country are usually required to register, especially if a permit is required to enter and/or live in the country for the first time. However, from around 1870 to the 1930s we have more data on emigration than on immigration.⁴¹ In the 1910 and 1920 censuses there were special forms for returned emigrants. It is often difficult to differentiate between those arriving and leaving permanently from those who are just moving for a limited period. Some but not all temporary migration should be registered, depending on the laws of the country.⁴²

From 1812 the priests were asked to register in- and outmigration but there was a high degree of underregistration; between 1/4 and 1/2 were not registered (Dyrvik, 1983).

Registration of migration, whether external or internal, has for a long time received much less attention from demographers and statisticians than registration of births and deaths. It is noteworthy that United Nations does not consider migration to be a vital event, which primarily includes births, deaths, marriages and divorces (United Nations, 2014, p.4). This is unfortunate, since migration may strongly affect the size and age-sex structure of a population, often more than births and deaths, in addition to be a "vital" event in people's lives. Moreover, moves were not entered into parish registers because they were not ecclesiastical events.

⁴¹ Personal communication between the author and Gunnar Thorvaldsen.

⁴² According to the Norwegian law on population registration (Lov om folkeregistrering, see https://lovdata.no/dokument/NL/lov/2016-12-09-88#KAPITTEL_3), a person who is intending to live in Norway (or abroad) for at least six months, should register the move at the Population Registry. The same is the case for moves between municipalities in Norway. Moves should be reported within 8 days. The international recommendations on migration is one year of residence.

13.6 Migration

Generally, the main sources of statistics on both external and internal migration are population registration and censuses. Censuses may ask about year of immigration, place of usual residence one (or five) years ago, and country/place of birth, but can obviously not obtain reliable information for emigrants who do not live in the country any longer. Moreover, censuses cannot provide annual statistics on annual migration flows since they are usually taken only every ten years. They may, however, be used to make annual inter-censal estimates of net immigration, which was done for Norway for about one hundred years. The third major data source of population statistics, sample surveys, in particular labour force surveys, are used by some countries to collect information about migration but are usually too small to yield reliable estimates of migration flows.

Data on external migration

Migration to and from Norway has been going on for thousands of years. This includes the settling of Norway after the ice cap melted 11 000 years ago, the settling of Iceland and Greenland and other lands of Norwegian settlements 12-1300 years ago, migration between Norway, Denmark and Sweden during periods of political cooperation (1389-1905), the *Hansa* merchants migrating from Germany to Bergen since 1250, and Swedish workers during the industrialization and modernization of Norway (*rallare*) in the late 19th and early 20th centuries (Brochmann and Kjeldstadli, 2008). However, there was no systematic collection of data on the size of these migration flows. Censuses give indications of this, based on place or country of birth, but cannot provide exact numbers due to remigration and deaths, which are usually not recorded in a census.

The first documented significant emigration was to the Netherlands, mainly during the 17th and 18th century, which was researched particularly in the marriage registers of Amsterdam (Sogner, 2012). The oldest published statistic on emigration to overseas countries is for 1821 (1 person, named *Cleng Peerson*, founder of the first Norwegian settlements in the USA) and 1825 (53 persons on the ship *Restaurationen*) (Semningsen, 1975; Statistics Norway, 1978b). Annual statistics were published from 1836, but with rounded figures for the first 30 years, indicating rough estimates. The first official statistics on emigration were published in the five-year reports of the county governors. Since 1856 statistics on migration have been a part of the official statistics on the movement of the population (*Folkemengdens bevegelse*).

Emigrants from Norway were not required to register their moves until the 1860s, when new legislation was introduced. The police registered all overseas emigrants in so-called emigrant protocols, which included the emigrants' name, year of birth, place of birth, place of residence, and occupation. This made it possible to make statistics on emigration to overseas countries by age and sex (and other characteristics) since 1869 (Backer, 1965). The police reports on the number of emigrants were discontinued in 1966 and figures for later years have come from the central population register (Statistics Norway, 1978a, p. 24).

For the years 1941-1945 no statistics on international migration have been published, due to the occupation of Norway. When local population registers were established in 1946, it was made compulsory for persons moving to or from other countries to inform the register, and since 1951 returns

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forwarded by local registers have provided the basis for annual statistics on both emigration and immigration (Statistics Norway, 1978b, 1995).

Since 1969 citizens of Nordic countries do not need a residence permit to live in another Nordic country (Vassenden, 2015, p. 159). Information about immigration of a Nordic citizen has since 2007 been electronically forwarded to the Nordic country of origin. This is a rare example of international cooperation in this area. It implies that statistics on emigration from, for example, Norway to Sweden is virtually the same as immigration to Sweden from Norway. Small deviations may occur due to different cut-off dates, as discussed in section 13.2. For most other countries the reported statistics on such flows are vastly different, since emigrations in particular are under-recorded. For example, migration from Germany to Spain in 1990 was recorded by Germany (country of origin) at 3 784 whereas the same migration flow was recorded at 9 732 by Spain (country of destination) (Poulain, Herm and Depledge, 2013). In 2002 the statistics on these flows were closer, at 13 757 and 16 681, respectively (Nowok, Kupiszewska and Poulain, 2006).

Currently, persons intending to live in Norway for more than six months should report the move to the Central Population Register (CPR) no later than eight days after arrival.⁴³ Citizens of Nordic, EU and EFTA countries do not need a permit to live in Norway but have to register with Norwegian authorities. Citizens of other countries have to apply for a residence permit. Registration of immigration and emigration may now be done online via Internet. Emigration from Norway should also be reported to the CPR, but this is often omitted, due to lack of knowledge or incentives. Registration of migration has the longest registration lag and poorest quality of all demographic events, sometimes several years (Vassenden, 2015).⁴⁴

Asylum seekers need to report to the police when they arrive in Norway and apply for asylum.⁴⁵ Most of them are registered by the CPR, and assigned the co-called D-number, which is not the same as the PIN (but constructed in the same way from date of birth and sex). They are not included in the annual population statistics before their applications have been granted, neither in the immigration flow nor in the stock of people living in Norway. Compiling and publishing statistics on current and former asylums seekers is being considered by Statistics Norway (Utne, 2020).

Copies of the migration records are sent to Statistics Norway every night for checking and statistical processing and used to update the statistical population register kept by Statistics Norway. This register is in practice identical to the CPR in the Tax Administration.

Data on internal migration

Internal migration is even harder to measure than external migration, although censuses may provide some information, as mentioned above. Before 1946 it was generally not required to report to local

⁴³ <https://www.skatteetaten.no/en/person/national-registry/moving/to-Norway/>

⁴⁴ Some examples: The oldest emigration that was registered in 2011 is believed to have occurred in 1987. For events occurring during 1 September 2011 - 18 January 2012, 99.3 per cent of the births, 96.8 per cent of the deaths, 95.5 per cent of the immigrations but only 73.1 per cent of the emigrations were registered within 31 days of the reported date of the event (Brunborg, 2012b).

⁴⁵ <https://www.udi.no/en/want-to-apply/protection-asylum/protection-asylum-in-norway/>

13.6 Migration

(or central) government institution that a person (or family) moved to another place. The introduction of the law on population registration in 1946 made it compulsory for all municipalities in Norway to establish a municipal population register (paper-based at that time).⁴⁶

The law also specified that all moves, both within Norway and to or from the country, should be reported to the population register within 8 days. A previous law, of 1905, left it to the municipal board to establish a population register. A new population registration law was introduced in 2017, which is partly an adaptation to a more digitized and globalized society with many people born in other countries.⁴⁷

Since the CPR was established in 1964, it has become possible to estimate migration flows between and within municipalities (*kommuner*), counties (*fylker*) and regions (*landsdeler*) and. After the introduction of unique dwelling numbers around 2001 and geographical coordinates of all dwellings, it has since 2003 become possible to estimate the number of persons who change residential address during a period, or who move from one particular area to another (for example, away from dwellings close to high-voltage cables or noisy roads).

Like external migration, there are often long delays in the registration of an address change. Nowadays there are strong incentives for registering a change of usual residence to another municipality, to have access to public services such as health and education. Unfortunately, there are also incentives for not registering such moves, such as using commuting costs to reduce taxable income. Moreover, whereas students before the 1990s should be registered as living on the same address as their parents, they may now *choose* where they want to be registered, parental home or place of study. This causes uncertainty about the actual population size, especially in municipalities with many students.

Registration of internal migration is done, like other events, at the local population registration office (*Folkeregisteret*) or online. This registration is done by the migrants themselves, unlike births and deaths, which are usually registered by health personnel. In addition, many migrations are "discovered" by the CPR at the Tax Administration. There are often errors and delays in the registration of migrations, sometimes for years as mentioned above.

Annual statistics on moves between municipalities have been published since 1951, as shown in Table 13.A.6. A future source of data on both internal and external migration is the ongoing project *Historical Population Register*, which will register and link 37.5 million records from censuses and church registers with the modern population register (Thorvaldsen and Østrem, 2018).

⁴⁶ <https://snl.no/folkeregister>

⁴⁷ <https://lovdata.no/dokument/SF/forskrift/2017-07-14-1201>

Selected results on international migration

Table 13.A.6 shows the recorded numbers of immigrations and emigrations to and from Norway in absolute numbers and per 1000 of the mean population to adjust for the population size.⁴⁸ Absolute and relative numbers of internal migration have also been included.

The massive emigration from Norway to North America for about one hundred years is well known and documented, see Figure 13.20. It has been estimated that the emigration from Norway in relation to the population size was one of the highest in Europe, only beaten by Ireland (Backer, 1965). She estimated that 780 000 persons emigrated from Norway during 1865-1930, which is 42 per cent of the total birth surplus and 35 per cent of the population in 1900. The migration loss is reduced to 634 000 if the surplus of immigration from other countries is subtracted (Backer, 1965, p. 195). The emigration rate to overseas countries in the 1800s was almost as large as the immigration per 1000 of the mean population in recent years. However, the number of emigrants is a complex issue, see Mørkhagen (2009) and Thorvaldsen (2017).

There was substantial remigration to Norway of overseas emigrants, but data on this are not available before 1915. (Riis and Thonstad (1989, p. 475); Brochmann and Kjeldstadli (2008)).

The graph shows that there were substantial annual fluctuations in the number of emigrants. There were three major emigration waves, according to Backer (1965): 1866-1873, 1879-1883 and 1900-1910. However, when cohort data are considered, the pattern is surprisingly stable for the birth cohorts 1846-1886, with a net emigration of about 30 per cent of male cohorts and 20 per cent of female cohorts (Bævre et al., 2001).

At the end of the 1960s Norway changed from being an emigration country to an immigration country, as the immigration surplus changed from negative to positive. Since then immigration to Norway has grown rapidly, especially after 2005, when eight countries in Eastern Europe joined the European Union and could live and work in Norway almost without restrictions. As mentioned above, migration may both have significant economic effects but also be driven by economic factors. An example of this is the large emigration from Norway to North America in previous centuries, where both poverty in Norway and economic opportunities in America were important drivers. Another example is the high immigration to Norway since 2005, when high demand for employment in Norway and high unemployment in countries that had newly joined the European Union, together with significant wage differentials, stimulated immigration to Norway.⁴⁹

Figure 13.20 also shows that the immigration peak to Norway (in 2011) was of the same magnitude as the emigration peak to North America (in 1882). Moreover, it shows that emigration follows

⁴⁸ Note that there is in principle no such thing as immigration "rate", as a migration rate is an estimate of the propensity to migrate to a country for the population "at risk". For *emigration*, the population at risk is the total resident population of Norway, whereas for *immigration* it is in principle the total population of the world living outside Norway. It is nevertheless relevant to compare immigration to Norway to the population size, as a country's absorption capacity of additional people depends on the size of the existing population, regarding housing, employment, public and private infrastructure, etc.

⁴⁹ For analyses of recent migration to and from Norway, see Brunborg and Cappelen (2010) and Cappelen et al. (2014), who correctly predicted that the strong immigration boom to Norway would soon recede due to economic and demographic changes, both in Norway and in the major sending countries.

13.6 Migration

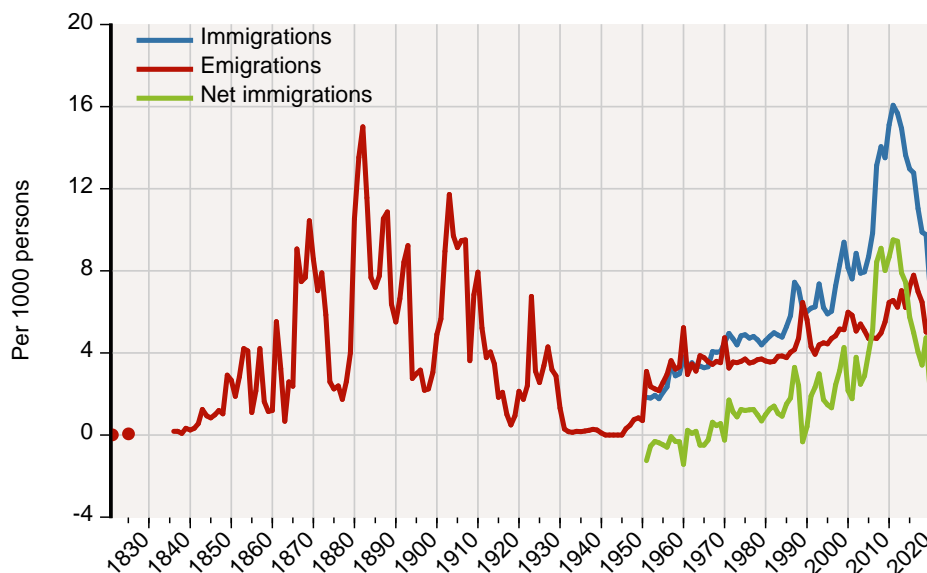


Figure 13.20 Migration flows to and from Norway, 1830-2021, per 1000 of the mean population.

immigration with a short lag, since immigrants have a high propensity to emigrate. The numbers are tabulated in Table 13.A.6.

The high inflow of immigrants to Norway has significantly changed the composition of the population with regard to foreign background, since most immigrants are non-Norwegian citizens born abroad (87 per cent during 2007-2019). Some indicators of the "globalization" of the population are proportion of people born abroad, proportion of non-Norwegian citizens, and the proportion of people with one or more parents or grandparents born abroad, as shown in Figures 13.21-13.23.

Figure 13.21 shows that the proportion of persons born abroad was fairly stable at 1-3 per cent between 1860 and 1980. The peaks at the beginning of the previous century are probably related to the industrialization of Norway and the expansion of the railroad system, when there was a great need for both unskilled and skilled labour. Since 1980 the proportion has more than quintupled (to 16.2 per cent in 2020), which has been caused by large immigration flows of primarily labour migrants, refugees and family members.

Figure 13.22 shows that the proportion of people with foreign citizenship has also increased strongly since 1980 (to 11.3 per cent in 2020), but not quite as much as the proportion born abroad, since most immigrants can apply to become Norwegian citizens after some time (generally after 7 years' residence, except for 3 years for spouses of Norwegian citizens or stateless persons, and 2 years for citizens of other Nordic countries).⁵⁰

Only people born abroad with two foreign-born parents are defined as immigrants by Statistics Norway, i.e., persons born abroad with four foreign-born grandparents. If we add their children born

⁵⁰ Lov om norsk statsborgerskap, <https://lovdata.no/dokument/NL/lov/2005-06-10-51>

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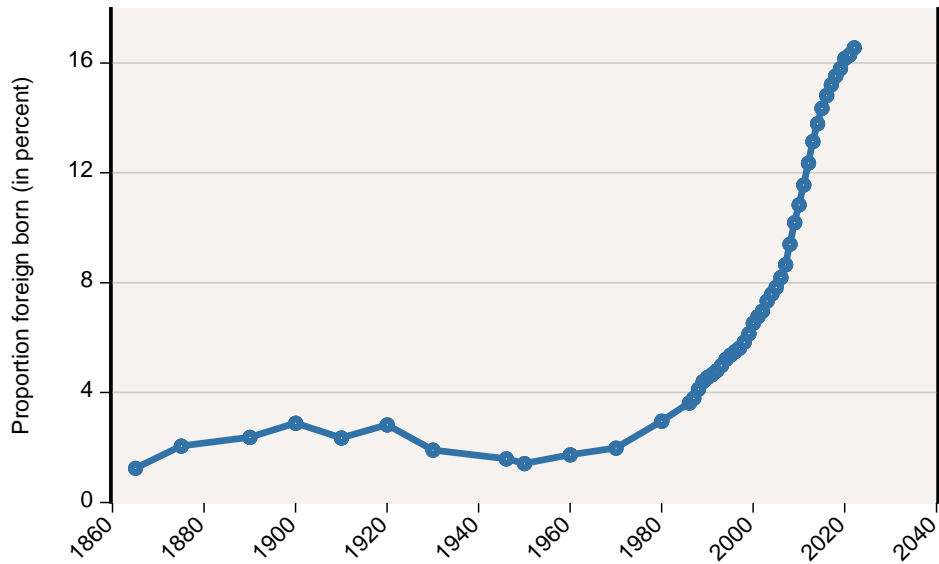


Figure 13.21 Proportion of population born abroad (per cent), 1865-2022. Sources: Population censuses 1865-1980 (<https://www.ssb.no/a/histstat/tabeller/3-9.html>) and Central Population Register 1970-2022 (<https://www.ssb.no/statbank/table/07109/>)

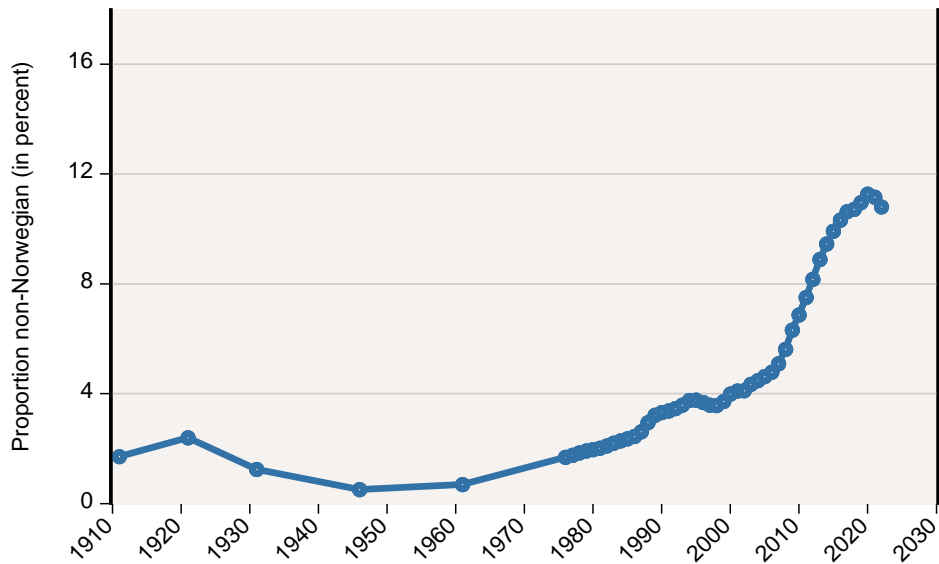


Figure 13.22 Proportion of population with non-Norwegian citizenship (per cent), 1910-2022. Sources: <https://www.ssb.no/a/histstat/tabeller/3-11.html> and <https://www.ssb.no/statbank/table/05196/>.

13.6 Migration

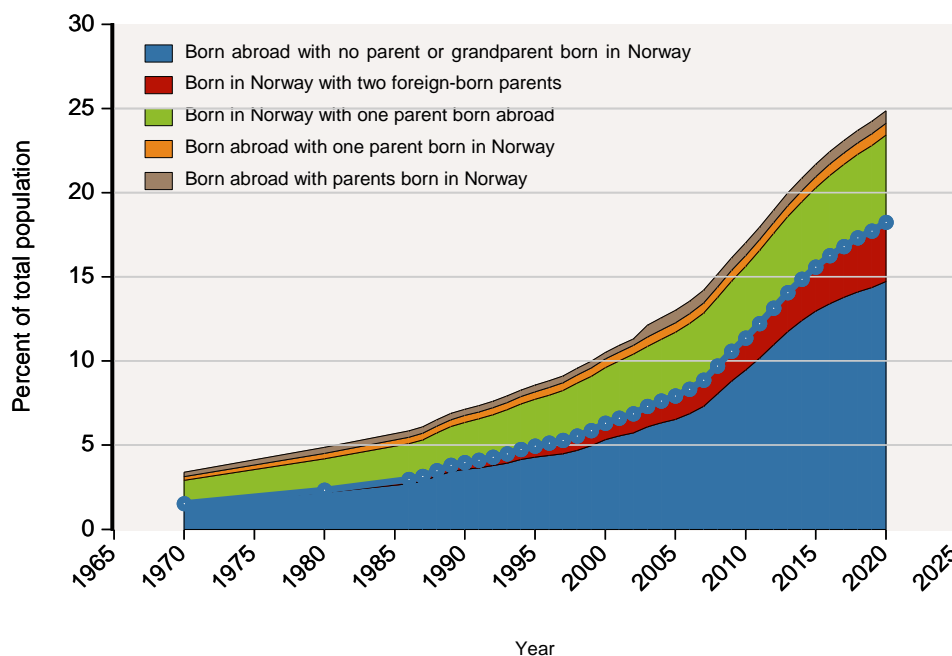


Figure 13.23 Stacked immigration categories in per cent of total population, 1970-2020. The blue dotted line denotes the "immigrant population", which consists of "Immigrants and Norwegian-born to immigrant parents".

Source: <https://www.ssb.no/en/statbank/table/05182/>.

in Norway, we arrive at the category "Immigrants and Norwegian-born to immigrant parents", which is called the "immigrant population" by Statistics Norway. In 1970, 1.5 per cent of the population belonged to this category. In 2020 this proportion had grown to 18.2 per cent, as shown in Figure 13.23 (blue line). It is noteworthy that the largest category after immigrants is "persons born in Norway with one parent born abroad" (5.2 per cent in 2020). This group includes both children with one immigrant parent with the same country background as the Norwegian-born parent, e.g. Pakistan, but it also includes many offspring of unions between an immigrant and a person with no immigration background.

Selected results on internal migration

The number of moves across municipal borders within Norway has increased from 170,000 in 1957 to 250,000 in 2017. But when we consider the growing population size and the decreasing number of municipalities in this period, especially in the 1960s, when the number of municipalities declined

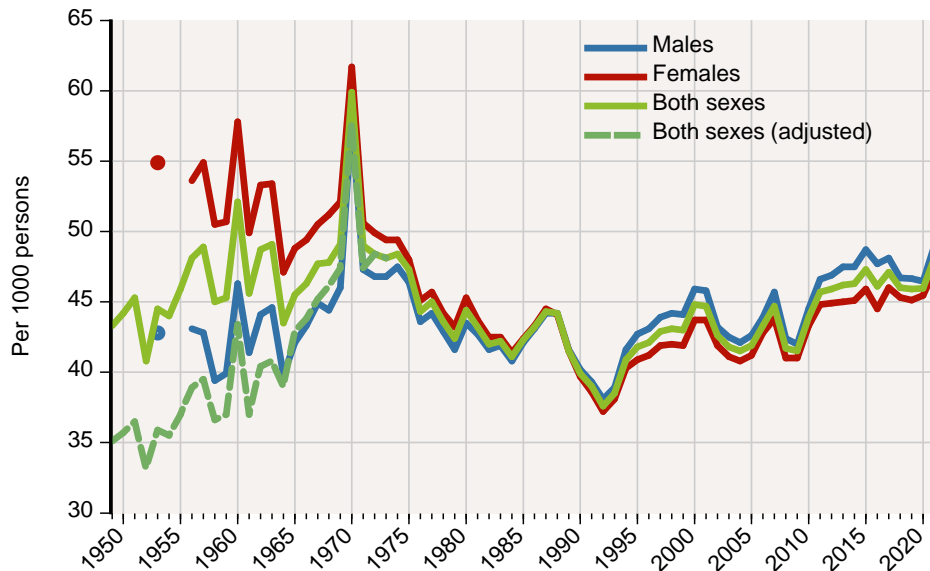


Figure 13.24 Internal migration in Norway, 1949-2018: Number of moves between municipalities per 1000 of the mean population.

Sources: 1949-1956: <https://www.ssb.no/en/statbank/table/05540/>;

1957-2021: <https://www.ssb.no/en/statbank/table/09585/>. The adjusted rate for 1949-1971 has been calculated on the assumption that the municipal borders were the same for the years 1949-1971 as on 1.1.1972, i.e. a constant number of municipalities (Statistics Norway, 1975).

from 744 in 1957 to 454 in 1967, the level of internal migration has been surprisingly stable, as shown in Figure 13.24.⁵¹

Figure 13.24 also shows that the internal migration rate has developed differently for men and women. In the 1950s and 1960s the rate was significantly higher for women than for men, whereas the opposite is the case in recent years, although the difference is much smaller. The reason for the high female intermunicipal migration 50-70 years ago may be related to the marriage market and employment opportunities for women. The slightly lower migration rate for women than for men in recent years cannot be explained without further analysis, but it may be linked to the increasing education level and employment among women.

⁵¹ The figures for internal migration in 1960 and 1970 are inflated as they include moves across municipal borders that occurred during the preceding 10-year period, but which were not detected and registered until the municipal population registers were checked against data from the population censuses in 1960 and 1970. Moreover, several persons registered as living in Norway at the time of these censuses had moved abroad. A similar but smaller surge in internal migration was experienced in 1980 due to moves that had occurred earlier (<https://www.ssb.no/en/flytting>).

13.6 Migration

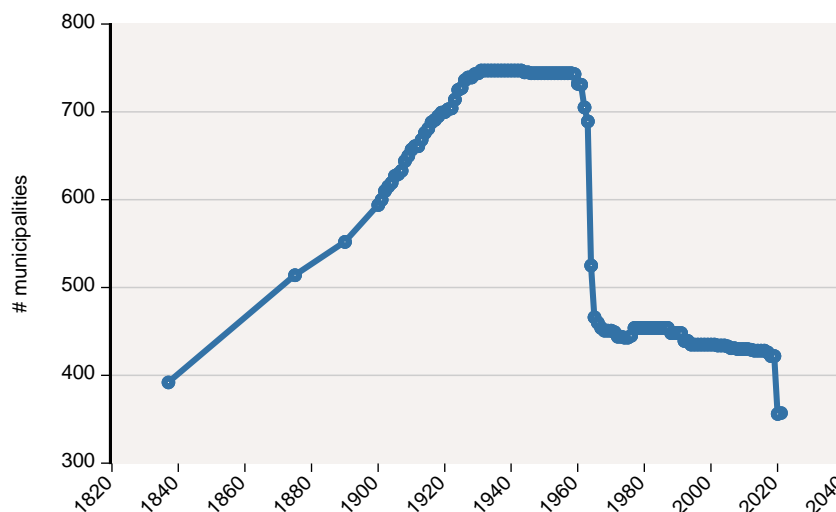


Figure 13.25 Number of municipalities in Norway on 1 January, 1837-2021.

Sources: 1837-1950: Korslund (1997);

1951-2021: <https://www.ssb.no/statbank/table/06913/> (number of municipalities with a population size greater than zero).

Number of municipalities

The number of intermunicipal moves is, of course, affected by the number of municipalities. When municipalities are merged the number will decline, depending on the size of the merged municipalities, as illustrated in Figure 13.25.

It has been surprisingly difficult to find consistent and reliable numbers of municipalities in Norway. Statistics Norway's StatBank may be used to estimate this number based on information about municipalities with a population greater than zero since 1951 but this is not entirely reliable. However, Korslund (1997) has used available local and national sources such as "cadastres, local history publications and encyclopedias" to estimate the number of municipalities on the first of January for each year 1837-1997.⁵² He seems to have done a thorough job, although references to specific sources have not been included, making it difficult to check the reliability of the numbers.

Municipal self-governance was introduced in 1837 (*Formannskapslovene*), when there were 392 municipalities. During the following one hundred years the number was more than doubled, to 747 in 1932-1942, through a gradual and voluntary splitting of municipalities.⁵³ Municipal reforms in the 1960s reduced the number to 451 in 1968 (Schei-komiteén, see Hansen and Thorsnæs (2019)), and the 2017 reform to 356 in 2020. Thus, the number is back to below 400, but in the meantime the population has grown from 1.2 to 5.4 mill., more than a quadrupling.

⁵² I am grateful to Vilni Verner Holst Bloch of SSB for pointing this out to me. Juvkam (1999) lists municipal changes 1838-1998 and county changes 1660-1998 but it is difficult to deduce the number of municipalities from this.

⁵³ The number of municipalities is only known for a few years in the 1800s, as shown in Figure 13.25. For other years the number is not known but the list in Juvkam (1999) indicates that there was a gradual change.

13.7 Household size and structure

Introduction

The number, size and structure of households are closely linked to economic factors, especially the demand for housing. Households are affected by the demographic components, births, deaths, immigration and emigration, marriages, divorces and separations. They are also affected by internal moves, for example, when young people leave their parental home or when grandparents or other relatives move into a household.

However, the number of households is also affected by the definition. The most common definitions are either based on the housekeeping concept, where most meals are eaten together (*kosthusholdning*), or living together in the same dwelling (*bohusholdning*). United Nations (2017) defines these as:

- A household may be either (a) a one-person household, that is to say, a person who makes provision for his or her own food and other essentials for living without combining with any other person to form a multiperson household; or (b) a multiperson household, that is to say, a group of two or more persons living together who make common provision for food and other essentials for living. The persons in the group may pool their resources and may have a common budget; and they may be related or unrelated persons, or constitute a combination of persons both related and unrelated.
- Some countries use a concept different from the housekeeping concept described in the previous paragraph, namely, the "household dwelling" concept, which regards all persons living in a housing unit as belonging to the same household. According to this concept, there is one household per occupied housing unit. Therefore, the number of occupied housing units and the number of households occupying them are equal and the locations of the housing units and households are identical. However, this concept can obscure information on living arrangements that are relevant for evaluating housing needs.

According to the "household dwelling" concept, the number of dwellings equals the number of households, which implies that there are neither multi-household dwellings nor multi-dwelling households. Such arrangements probably still exist (or existed) in Norway, although most likely not in large numbers (except among some immigrant groups).

According to the "housekeeping" concept, several households may live in the same dwelling. One single household may also be spread out in separate dwellings, if they have most meals together.

Data and methods

Both definitions presented above are used in Norway. Historically, household statistics were derived from population and housing censuses which basically employed the "household dwelling" concept, as discussed above.

13.7 Household size and structure

On the other hand, the "housekeeping" definition is the most common in sample surveys, including surveys on income and wealth, living conditions and consumer expenditure (Hauge, Hendriks, Hokstad and Hustoft, 2000).

When the Central Population Register (CPR) was established in 1964 a potential new data source opened up. In the CPR there was initially no way of linking the members of a household together. But there was a closely related variable, "family", which is defined as a married couple with or without children, an unmarried couple with children, or an unmarried person with or without children. Such families are established through record linkage using the unique personal identification number (PIN) which was introduced in 1964 together with the CPR. The PIN of the parents and the spouse are recorded in the CPR for each person, which makes it possible to link spouses, and parents and children, to establish families and make family statistics. A single person is also considered to be a family.

The problem with the family definition in the household context is that it does not include other relatives, such as grandparents and unrelated persons living together. In modern Norway, households with three or more generations or households consisting of several families are now unusual. These household types had declined to low levels in the 1970s, implying that the error in using the family variable to establish households was small. However, in the 1970s it became increasingly common for couples to live together without being married, called consensual unions, cohabitation without marriage, or paperless marriages (Brunborg, 1979). This implied that family statistics based on the family definition became more and more unreliable. Another source of error was students and other persons living together in the same dwelling (*bokollektiv*), especially if they had not registered the dwelling as their usual place of residence. Moreover, the increasing immigration of non-Europeans in the early 1970s led to more multi-generational households.

To overcome some of the weaknesses of the family statistics, Statistics Norway defined a new family type in 1987, "*Unmarried couples with common children living on the same address*", since data on this could be derived from the CPR. However, it was not possible to make reliable register-based statistics on this since the address system at that time was not sufficiently specific. There were, for example, many apartment buildings with many dwellings but only one street address, especially in urban areas. In many rural areas there were no street addresses at all, just the name of a farm or location, for example.

To identify a unique address for each individual, a dwelling number was introduced and registered for each person in the 2001 census, which was the main objective of that census. It took, however, several years before the dwelling numbers had a nearly complete coverage of the population. The greatest challenges were rural areas and housing corporations in the cities. In 2005 the quality was considered sufficiently good for producing reasonably accurate household statistics from administrative data in the Central Population Register, and in 2011 to conduct a census based entirely on administrative data.

Foss (2003) found that the 2001 population census underestimated the number of households by between 110,000 and 190,000 compared to two sample surveys. The main reason for this is that

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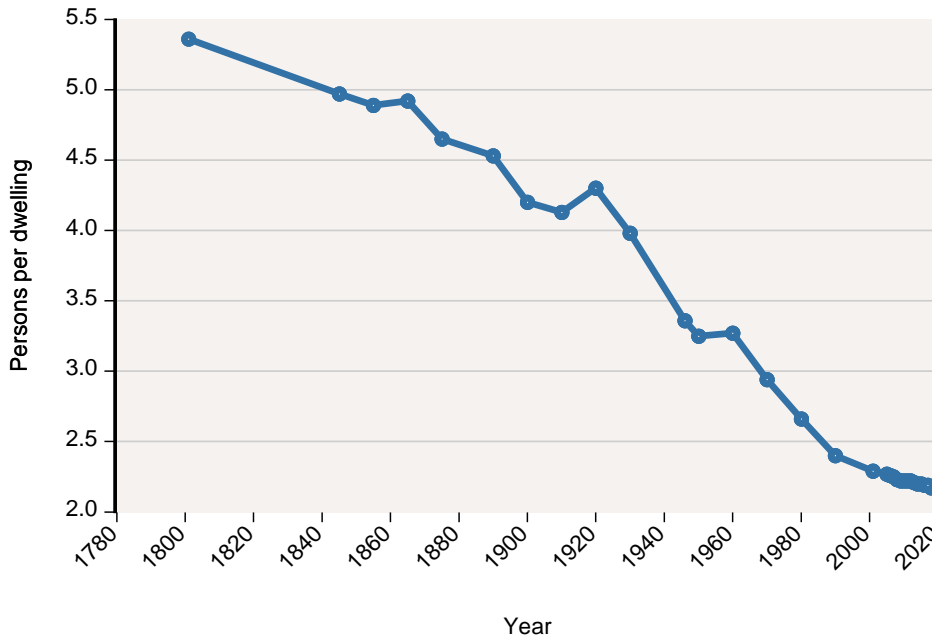


Figure 13.26 Average household size, 1801-2019. Sources: 1801-2001 Population Censuses; 2015-2019 (<https://www.ssb.no/statbank/table/06076/>). Notes: There are no statistics on private households in the census publications for 1875-1910. To rectify this, I combined family households (two or more persons) with one-person households (single persons) to estimate number of persons, number of households and average size. From the censuses in 1769, 1815, 1825 and 1835, no household statistics could be found. The statistics for 1920-2001 were based on censuses and downloaded from the statistics bank of Statistics Norway.

many persons in the 20-35 age group did not actually live where they were registered as living, including many students registered at their parents' address. This led to an underestimation of small households (1-2 persons) and overestimation of large households (3+ persons). The households in the sample surveys were actual (or real) households, whereas the census households were formal households, i.e. according to where the household members were registered as living in the CPR (Foss and Solheim, 2006).

Selected results

Figure 13.26 and Table 13.4 show the average household size for the years we have been able to collect consistent statistics for, based on the dwelling concept. The gradual decline in household size is striking, from 5.4 persons per household in 1801 to 2.2 in 2008. The temporary peak of 4.3 in 1920 may be due to the record high number of births in 1920, or it may be related to the census in 1920, where it was easy to mix the definitions of household and dwelling.⁵⁴

⁵⁴ Personal communication between the author and Gunnar Thorvaldsen.

13.7 Household size and structure

Table 13.4 *Private households and average household size, 1801-2018.*

	Households	Number of persons in private households	Average size of private households
1801	163 564	876 271	5.36
1845	266 913	1 328 378	4.97
1855	304 822	1 490 047	4.89
1865	346 061	1 701 756	4.92
1875	388 844	1 808 972	4.65
1890	436 371	1 976 563	4.53
1900	522 829	2 196 988	4.20
1910	563 778	2 330 922	4.13
1920	603 291	2 594 150	4.30
1930	690 651	2 748 789	3.98
1946	873 692	2 935 606	3.36
1950	964 568	3 134 847	3.25
1960	1 077 168	3 526 008	3.27
1970	1 296 734	3 818 591	2.94
1980	1 523 508	4 046 472	2.66
1990	1 751 363	4 206 413	2.40
2001	1 961 548	4 485 945	2.29
2005	2 011 000	4 569 064	2.27
2006	2 036 900	4 604 300	2.26
2007	2 064 841	4 644 593	2.25
2008	2 104 531	4 700 226	2.23
2009	2 142 638	4 762 260	2.22
2010	2 170 893	4 821 839	2.22
2011	2 201 787	4 882 714	2.22
2012	2 226 046	4 933 388	2.22
2013	2 258 794	4 990 842	2.21
2014	2 286 445	5 040 655	2.20
2015	2 316 647	5 096 732	2.20
2016	2 348 797	5 150 904	2.19
2017	2 376 971	5 197 367	2.19
2018	2 409 257	5 240 114	2.17

Notes: In the census publications for 1875-1910 there are no statistics on private households. To rectify this we combined family households (two or more persons) with single persons (one person per household) to estimate the number of persons, households and average size. From the censuses in 1769, 1815, 1825 and 1835, no household statistics could be found. The numbers for 1920-2001 were based on censuses and downloaded from the statistics bank of Statistics Norway. Since 2005 the household statistics are based on the CPR.

Housing and dwellings

All population censuses in Norway have been combined "Population and Housing Censuses", which illustrate the importance given to collecting and publishing statistics on housing. The censuses have mainly focused on the number of rooms and persons per dwelling. For the censuses 1920-1990 statistics have been published on the total number of dwellings, including the type of dwelling (farm dwelling, one-dwelling buildings, row houses, apartments, etc.) and the number of persons

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per dwelling and per room. This has been used, inter alia, to estimate indicators for crowded living quarters, defined by more than one person per room in a dwelling (Statistics Norway, 1995).

There has, however, been very limited collection of data on the size of dwellings, except for the definition of a dwelling that it has to be at least 6 m². Size statistics are only available from special surveys on housing conditions, which for 1997-2007 were part of the living conditions surveys of Statistics Norway. Since 2007 administrative registers (*Matrikkelen*) have been used to make statistics on housing size, following the introduction of dwelling numbers in 2001 and later. Only the distribution of dwellings by size (in m²) seem to be published, not the average dwelling size of the stock of newly built dwellings. There has been a decline of small dwellings (<40 m²) and initially an increase and later a stabilization of large dwellings (160+ m²).⁵⁵

The censuses 1920-1990 collected information on number of rooms and occupants of dwellings. In this period the average number of occupants per dwelling declined from 1.18 to 0.49. The proportion of dwellings with more than 1 person per room, which is a common indicator of crowdedness (*trangboddhet*), declined from 69 to 5 per cent (Table 13.5).

Table 13.5 *Persons per dwelling (per cent), 1920-1990.*

	One or less (per cent)	More than one (per cent)	Occupants per room	Occupants per dwelling
1920	31	69	1.18	
1930			1.10	
1946	53	47	0.98	
1950	58	42	0.92	3.41
1960	72	28	0.77	3.27
1970	82	18	0.67	2.94
1980	91	9	0.57	2.66
1990	95	5	0.49	2.40

Source: Statistics Norway (1995, Table 13.3), <https://www.ssb.no/a/histstat/nos/nos.c188.pdf>

13.8 Urbanization

”Urbanization is a complex socio-economic process that transforms the built environment, converting formerly rural into urban settlements, while also shifting the spatial distribution of a population from rural to urban areas. [...] A major consequence of urbanization is a rise in the number, land area and population size of urban settlements and in the number and share of urban residents compared to rural dwellers.” (United Nations, 2019, p. 10).

⁵⁵ For 1997 there are statistics both from the living conditions survey and the Register of ground properties, addresses and buildings (*Matrikkelen*). The differences, which are due to definitions, methodology and sample uncertainty (and non-response), are mostly around 1-2 percentage points. The biggest difference is for large dwellings (100-159 m²), for which the survey recorded 33 per cent and the register 27 per cent, and for unknown size (0 and 8 per cent, respectively).

13.8 Urbanization

Urbanization is closely linked to economic development. It grew rapidly during the industrialization and is still growing almost everywhere, now usually faster in poor than in rich countries.

Urbanization is usually measured by the proportion of the population living in urban areas, which are often defined by administrative classifications in each country. In 2007 the population of the world became more urban than rural for the first time (United Nations, 2019).

Censuses were the source of urbanization data on Norway until the modern population register was developed in the 1990s. Statistics on densely and sparsely populated areas represent the longest time series of demographic statistics for Norway, starting in 1665. Until 1845, densely populated areas were cities (*kjøpsteder* and *ladesteder*), for 1845-1950 also "housing clusters outside cities".

A drawback of this way of measuring urbanization is that the formal status of an administrative entity is often invalid. On one hand, the population density may be high in parts of an area classified as rural, and on the other hand it may be low in parts of an urban area. An example of this is the mining city of Kongsberg, which has large areas with sparse settlement. This issue was studied by Myklebost (1960), who introduced the concept "densely populated area", which is independent of administrative borders and administrative status.⁵⁶ Since 1960 his definition, with some modifications, has been the basis for official statistics (Statistics Norway, 1986).^{57 58}

*"A cluster of buildings shall be registered as an urban settlement if it is inhabited by at least 200 persons. The distance between the buildings should normally not exceed 50 metres, but for some space-demanding building categories - such as apartment buildings, industrial buildings, offices / commercial buildings, schools, hospitals etc. - the distance can be increased to 200 metres."*⁵⁹

For the years 1990-1998 annual statistics on densely populated areas were based on municipal registration in the real property register (GAB). Since 1999, except for 2001 and 2010, SSB has done an automatic updating of densely populated areas based on GIS coordinates of the address of each building. In 2013 the method was changed to utilize improved maps to cover populated areas, which led to a decline in densely populated areas and an increase of the population density by 16 per cent.⁶⁰

Figures 13.27 and 13.28 show the population in densely and sparsely populated areas, in absolute numbers and in percentages.

The graphs show that the urbanization was slow until the middle of the 1800s and very rapid since then - at a surprisingly steady pace. The period with the slowest urbanization growth since 1850 was

⁵⁶ Myklebost (1960) estimated urbanization based on densely populated areas for 1875-1950 but it does not appear that Statistics Norway has adopted his estimates as official statistics.

⁵⁷ Myklebost (1960) included commuting as part of his definition, but this criterion was dropped by Statistics Norway in 1980 (Dysterud, Engelen and Schøning, 1999).

⁵⁸ The Norwegian definition of densely populated areas differs slightly from the inter-Nordic recommendations, but Norwegian statistics on this are still comparable with statistics from the other Nordic countries (Dysterud et al., 1999).

⁵⁹ <https://www.ssb.no/en/befolkning/statistikker/befsett/aar>

⁶⁰ <https://www.ssb.no/befolkning/statistikker/befsett/aar>

Long run trends in demographic data, 1735-2021

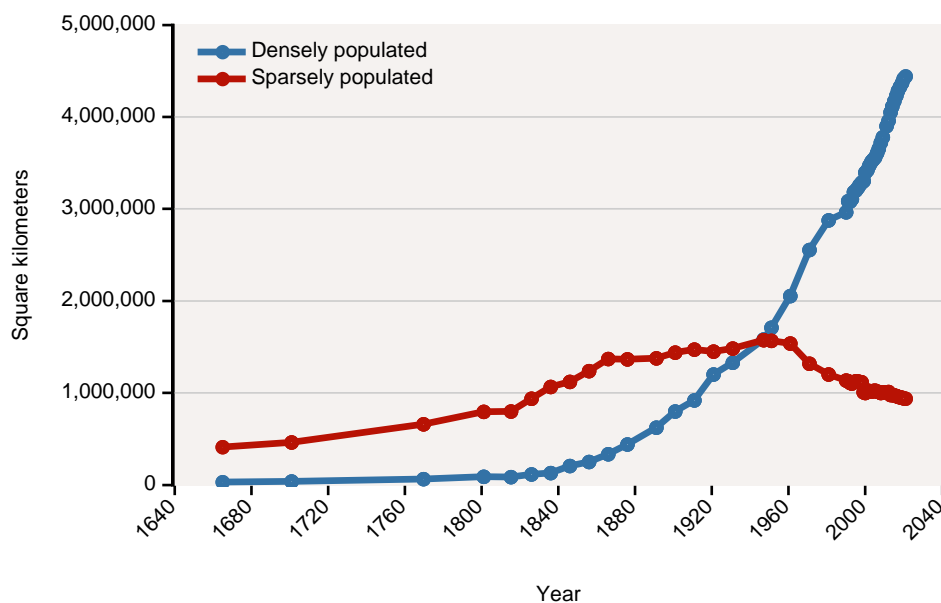


Figure 13.27 Population in densely and sparsely populated areas, 1665-2021. Sources: 1665-1980 Population censuses (<https://www.ssb.no/a/histstat/tabeller/3-1.html>); 1990-2021 Statistical population register of SSB (<https://www.ssb.no/statbank/table/05212/>). The StatBank provides no definition of densely and sparsely populated areas.

the depression in the 1930s, when the proportion of the population in densely populated areas grew by only 0.2 percentage points per year, against about 0.5 before and after.⁶¹

Since the early 1950s the total population in sparsely populated areas has declined, as shown in Figure 13.27. This is both due to migration flows towards the urban areas but also that some areas have been redefined from sparse to dense. The data are tabulated in Table 13.A.7.

Another indicator of urbanization and regional population distribution is the index of centrality of municipalities. It was established by Statistics Norway with data the population census 1970 and revised in 1985, 1994, 2004 and 2017 (Høydahl, 2017). The first version of the index was based on the municipalities' economic structure, population size, and travelling time to the nearest regional centre.

The classification of municipalities by centrality has proven useful for many purposes. It clearly distinguishes between, for example, the most and the least central municipalities. Over the past 40 years, the most central municipalities have consistently been growing whereas the least central have

⁶¹ The apparent small decline at the beginning of the 1990s is probably due to measurement issues. The proportion for 1980 (70.3 %), is taken from the 1980 census, whereas the 1990 proportion (70.0 %) is taken from the population register. Moreover, in 1990, which was the first year when the proportion in densely populated areas was estimated from register data, there were 133,827 (3.2 %) people for which the type of settlement was unknown. In 1991 this proportion had dropped to 0.8 %. The change of data source and methodology is indicated by not connecting the data points for 1980 and 1990 in Figure 13.28.

13.8 Urbanization

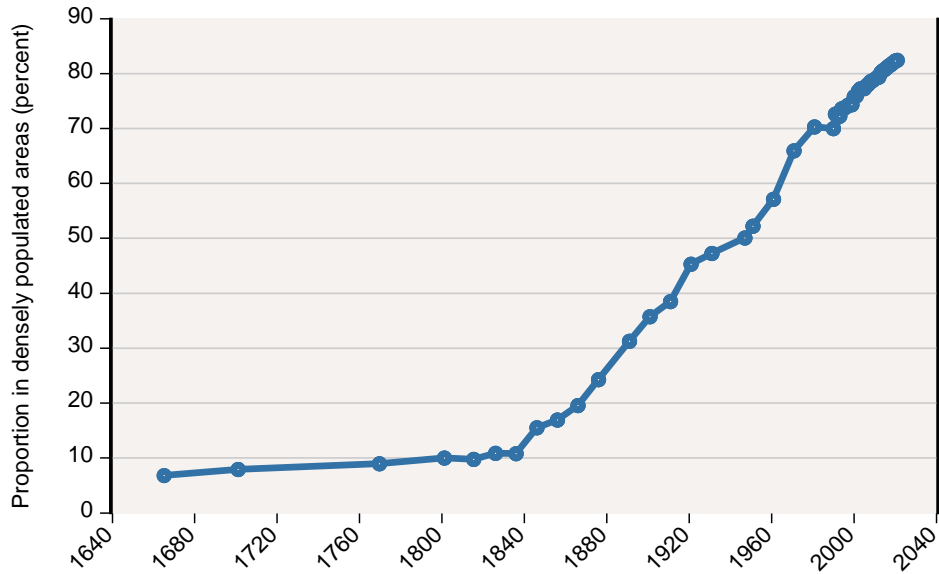


Figure 13.28 Urbanization (proportion of population living in densely populated areas), 1665-2021.
Sources: 1665-1980 <https://www.ssb.no/a/histstat/tabeller/3-1.html>;
1990-2021 <https://www.ssb.no/statbank/table/05212/>.

declined, with a few exceptions. The disadvantage of this indicator is that it covers a rather short time period, 1970 onwards.

13.9 Population of selected cities

Introduction

Norway has experienced strong urbanization for almost 200 years, as discussed in the previous section. The proportion of the population living in densely populated areas has increased from 10 per cent in 1801 to more than 82 per cent in 2019. Most of this growth has occurred in the largest cities and their surrounding areas.

This chapter presents population statistics for the cities of Oslo, Bergen, Trondheim, Bergen, Stavanger and Tromsø. Eitrheim and Erlandsen (2004) present long time series of historical house price indices (HPIs) for Oslo, Bergen, Trondheim and Kristiansand, as well as an aggregated house price index from 1819 to 2003. These four cities were part of the Norges Bank project to collect data on house prices.⁶² In this section we have also included Stavanger and Tromsø because Stavanger is the fourth largest city in Norway and Tromsø is a regional centre (*landsdelssenter*).

The six cities currently inhabit a little more than one quarter of Norway's total population (27 per cent in 2019), up from 7 per cent in 1769.

Changes in house prices can have significant economic effects (and causes), with the boom and crash of house prices in Christiania/Kristiania/Oslo in the late 1890s as a prime example.⁶³ These prices have also changed dramatically in modern times, both up and down. The fast population growth in Oslo in recent years has affected the demand for housing and contributed to the rapid growth of housing prices. For example, from 2005 to 2015, the price index for existing housing increased by 6.5 per cent per year, whereas the population size grew by 2.0 per cent, both rates being among the highest in Europe.

Data

A major challenge when establishing time series for cities is the administrative borders. In Norway all cities include one and only one municipality, unlike some cities elsewhere in the world. Most cities in Norway have expanded territorially by integrating surrounding areas, sometimes annexing complete municipalities, which were usually more rural than the city. This is the case for all of the six cities presented here.

Border changes make it difficult to establish consistent times series for the same geographical area over time. Statistics Norway and NSD (Norsk samfunnsvitenskapelig Datatjeneste) have published time series of the population size of municipalities according to the administrative borders in different years, including 1990 (Population and Housing Census 1990), 2002 (Table 1, Population and Housing Census 2001), 2012, and 2018-2019.

However, for our purpose, it is a question whether we should use fixed or changing administrative borders to study the population development of these cities. Note that the historical house prices for

⁶² See Chapter 11 for an overview of composite historical HPIs for Norway.

⁶³ The Kristiania crash in 1899 led to a local banking crisis in the capital. At that time the capital's name had changed from Christiania to Kristiania (in 1877). The capital changed its name to Oslo on 1 January 1925.

13.9 Population of selected cities

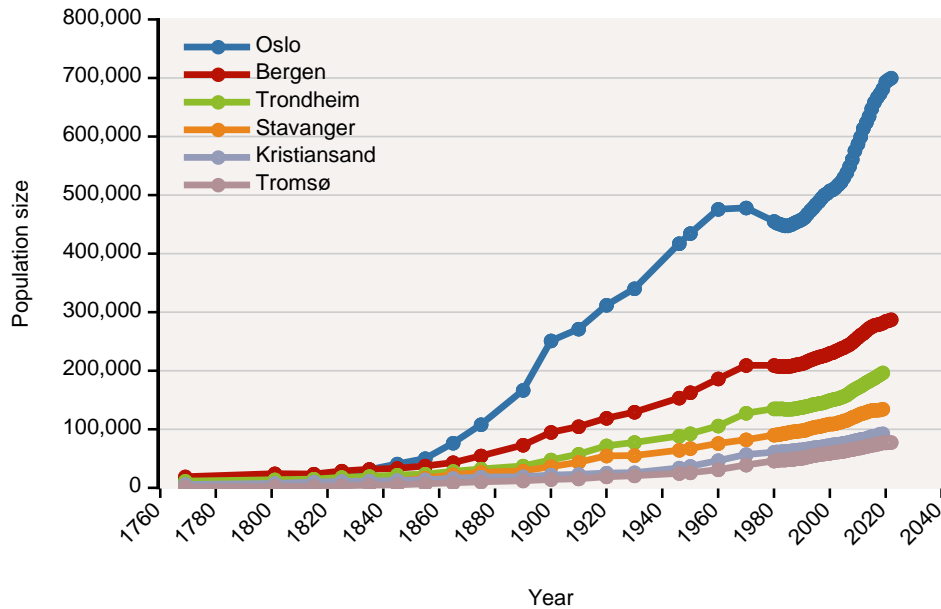


Figure 13.29 Population size of six cities 1769-2019 according to 2012 borders. Sources: 1769-1970: Population and Housing Censuses, <https://www.ssb.no/statbank/table/09501/>, 1980-2019: Central Population Register, <https://www.ssb.no/en/statbank/table/07459/>.

the four cities were only collected for parts of the cities, often small parts of the inner city. It may not make sense to include the population in adjacent municipalities (or parts of these) that later were annexed.

We may solve the dilemma caused by border changes by presenting population statistics both for "modern" (fixed) and historical borders.

Selected results

Figure 13.29 shows the population size of the six cities since the first census in 1769, according to the municipal borders in 2012. All of them have grown rapidly. A large part of the growth is due to expansion of the city territories. Since 1769 the population of the municipality of Tromsø has multiplied by 55, Oslo by 49 and Stavanger by 40, whereas the population of the whole country has "only" become 7 times as large. The rapid population at the beginning of the current century is primarily due to high immigration, particularly to Oslo.⁶⁴ In 1801, well before the industrialization started, the population of Oslo constituted only 1.9 percent of Norway's total population. Today it is 12.9 per cent.

⁶⁴ The term *Stor-Oslo* (Greater Oslo) is now used for the region including the municipality of Oslo and the surrounding municipalities. Alternatively, we may define Oslo and other cities as the densely populated areas in the city and the contiguous densely populated areas in the neighbouring municipalities (see the definition in 13.8). Dysterud et al. (1999, p.37) presents a map of Oslo tettstedt 1998, which covers parts of Oslo and 10 other municipalities.

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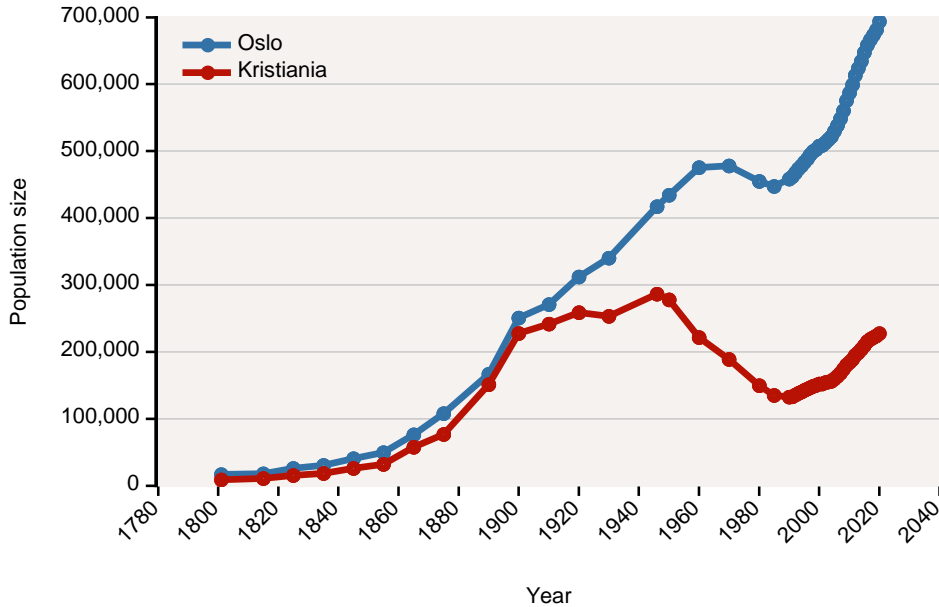


Figure 13.30 Population size of today's Oslo and the inner city part of Oslo, 1769-2020 according to 2012 borders. Source: <http://statistikkbanken.oslo.kommune.no/webview/> Notes: The population numbers for the inner city 1801-1875 are according to the borders of Kristiania for each year and for a smaller geographical area than for later years. From 1950 numbers for the inner city/centre are used, which correspond roughly with Oslo before the merging with Aker in 1948. The population of Oslo is according to the current borders with a few minor exceptions. Aker is included in Oslo before 1948. The numbers are taken from censuses up to 1970 and from the CPR after 1970.

Table 13.29 and Figures 13.30-13.32 show the territorial expansion of Oslo and Bergen over several hundred years. The area of Oslo multiplied 82 times from 1819 to 1948. The population of urban administrative areas (*kjøpstader* and *ladestader*) in Aker and Christiania in the 1801 census was 10 909 and in 1950 434 047, which implies a 40-fold growth. There have been no major border changes in Oslo since 1948, in Bergen since 1972, and in Trondheim since 1964. In 2020, Kristiansand, Stavanger and Trondheim were merged with several surrounding municipalities, which resulted in a population increase of 21, 7 and 5 per cent, respectively, from 2019 to 2020, whereas the other three cities grew by about 1 per cent.

13.9 Population of selected cities

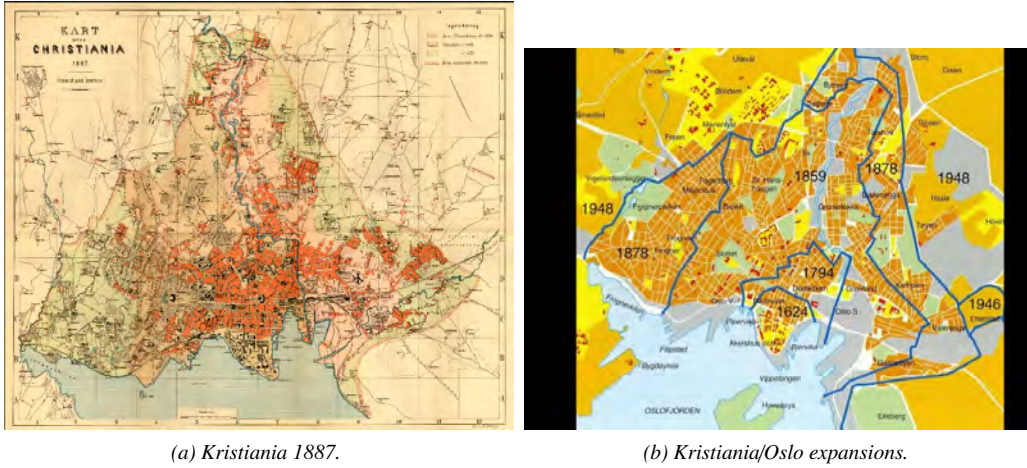


Figure 13.31 Left: Map of Kristiania, 1887, with the expansion of Kristiania in 1859 and 1878. Right: Map of the expansion of Christiania/Kristiania/Oslo, 1624-1948

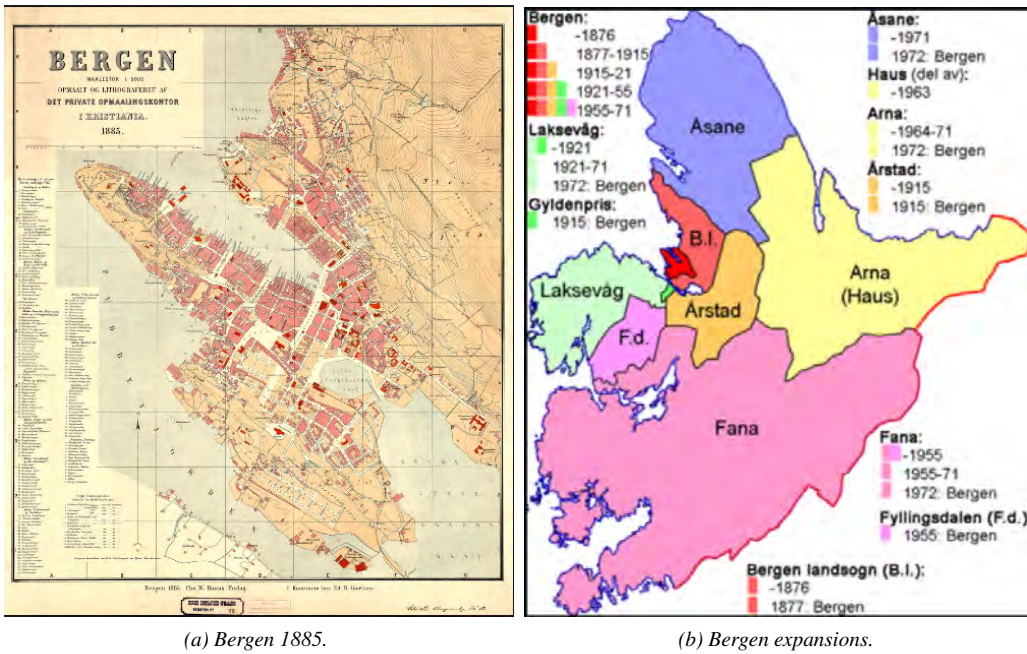


Figure 13.32 Left: Map of Bergen, 1885. Right: Map of the expansion of Bergen, 1877-1972

13.10 Other relevant time series

In addition to the comprehensive set of historical demographic time series presented in this chapter, there are several other demographic time series in Statistics Norway's StatBank related to determinants and consequences of household size, including

- Marriages, 1736 onwards
- Marriage rates, 1864 onwards
- Average age at marriage, 1851 onwards
- Divorces and separations, 1871 onwards
- Marriages dissolved by death, 1871 onwards
- Divorce rates, 1864 onwards
- Proportion married at various ages

There also exist many non-demographic and non-economic time series for Norway that are related to the economy, demography and welfare of the population, and which may be relevant for monetary research, including, some of them quite long:

- Average height of males of military age, 1878-2007
- Average IQ of males of military age
- Body Mass Index (BMI)
- Killed and injured in traffic accidents, 1946 onwards
- Vehicles by type, 1950 onwards
- Road traffic (mill. km), 2005 onwards
- Smoking habits: Daily and occasional smokers by sex and age group, 1973 onwards
- Number of murders and suicides
- Educational activity and attainment
- Doctors per 100 000 population
- Dentists per 100 000 population
- Weather observations: Temperature and precipitation

Graphs of some of these indicators are shown below. They illustrate the effects of many societal changes, including income growth, changing consumption structure and public policies. The first striking example is traffic deaths (Figure 13.33), which declined from a peak of 539 in 1975 to 108 in 2019 (81 % decline), in spite of an almost four-fold increase in the number of vehicles and a large increase in the number of kilometers driven. During the same period, the number of severely injured declined from 4 552 to 602 (88 % decline). Both the number of killed and injured are the lowest since the recording started in 1946, when roads were poor and cars were few (still rationed after the war).

Another example is smoking habits, where the proportion of daily smokers has declined from 32 percent in 1999 to 9 per cent in 2019, in particular after the ban on smoking in restaurants and bars was introduced in 2004 (Figure 13.35).

13.10 Other relevant time series

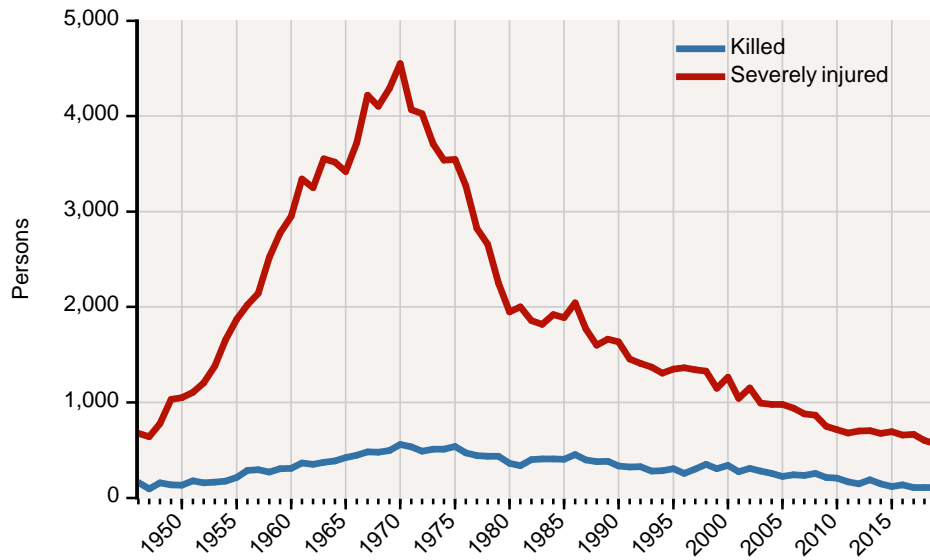


Figure 13.33 Killed and severely injured in traffic accidents, 1946-2019. Source: <https://www.ssb.no/en/statbank/table/12043/>.

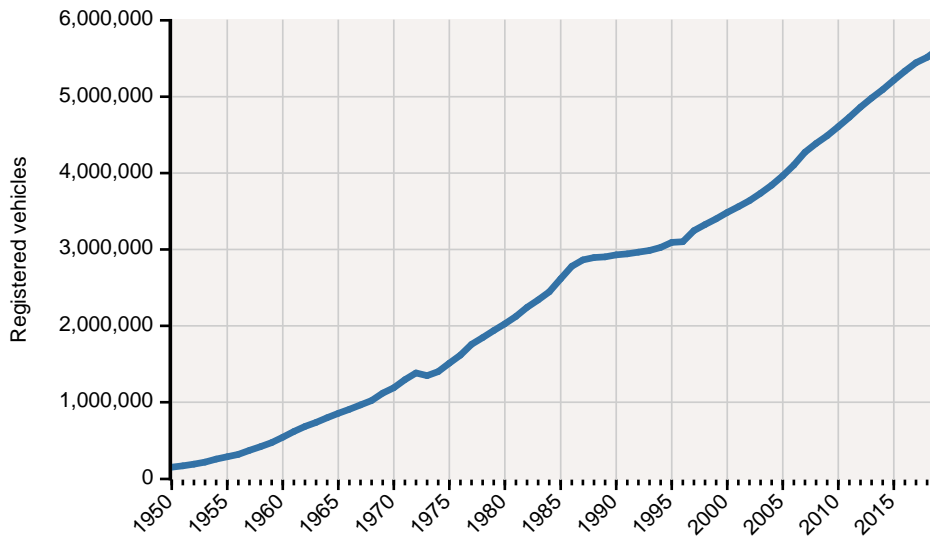


Figure 13.34 Registered vehicles, 1950-2019. Source: <https://www.ssb.no/en/statbank/table/01960/>.

The last graph, on temperature and rainfall (Figure 13.36), shows statistics for variables that have profound effects on the economy, and which may also be affected by public policies through climate change.

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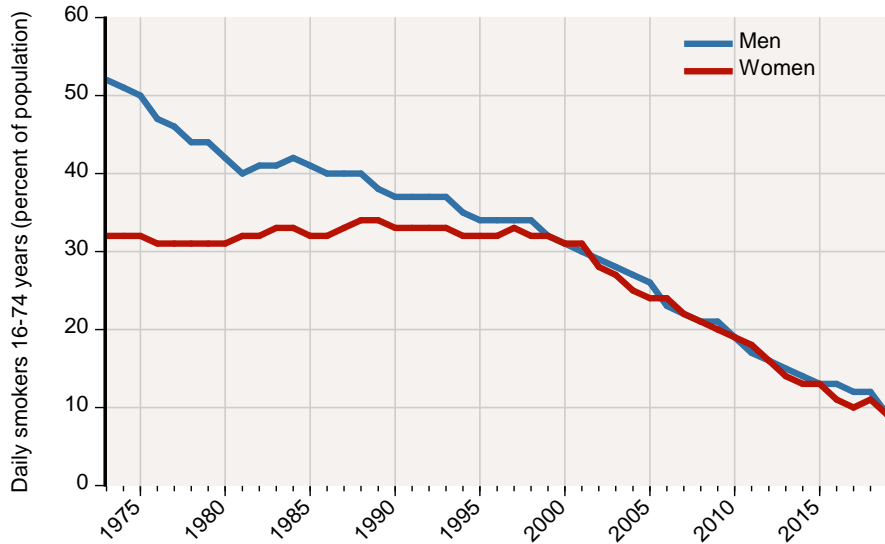


Figure 13.35 Daily smokers among persons 16-74 years (per cent), 1973-2019. <https://www.ssb.no/en/statbank/table/05307>.

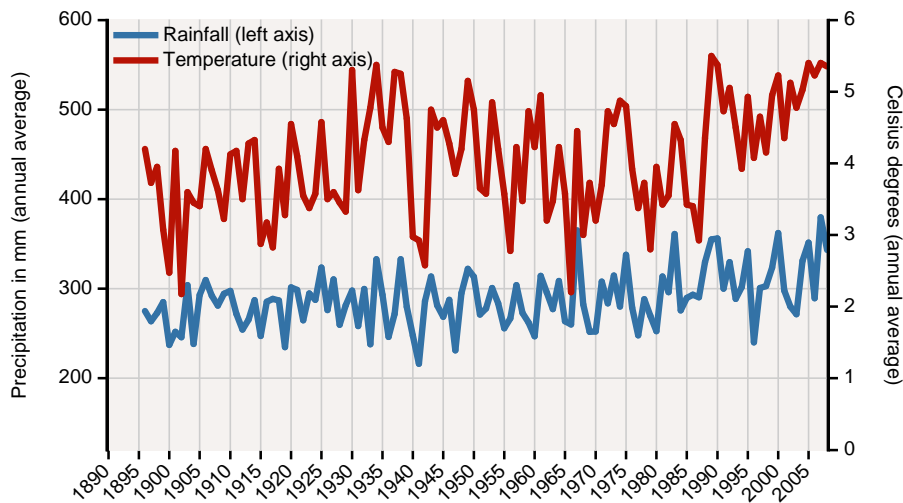


Figure 13.36 Average annual precipitation and temperature, 1896-2008. Note : The annual temperature is calculated as the average over the four seasons. Source: Norwegian Meteorological Institute, published at <https://www.ssb.no/a/histstat/tabeller/2-9.html>.

There are several other examples of very long series of climate data, including dendrochronology (tree-ring data), CO₂ contents in air, and harvest yields and prices (Dybdahl, 2016).

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13.A Appendix, Historical demographic time series

13.A Appendix, Historical demographic time series

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1735	616 109	17 850	11 726						29.00	19.00		
1736	622 197	18 845	12 791						30.30	20.60		
1737	626 986	18 860	15 337						30.10	24.50		
1738	630 253	17 405	14 393						27.60	22.80		
1739	634 164	19 300	14 489						30.40	22.80		
1740	637 769	18 401	16 009						28.90	25.10		
1741	634 504	16 981	25 907						26.80	40.80		
1742	621 807	15 989	32 457						25.70	52.20		
1743	613 379	17 015	17 404						27.70	28.40		
1744	615 673	18 176	13 197						29.50	21.40		
1745	622 417	19 861	11 352						31.90	18.20		
1746	629 375	18 351	12 943						29.20	20.60		
1747	634 866	20 309	14 738						32.00	23.20		
1748	637 553	20 278	20 474						31.80	32.10		
1749	639 043	20 472	17 297						32.00	27.10		
1750	641 980	19 083	16 384						29.70	25.50		
1751	645 838	21 906	16 888						33.90	26.10		
1752	650 905	21 113	15 998						32.40	24.60		
1753	657 090	22 147	14 892						33.70	22.70		
1754	664 320	22 733	15 526						34.20	23.40		
1755	670 545	21 882	16 640						32.60	24.80		
1756	676 082	23 655	17 821						35.00	26.40		
1757	683 096	22 864	14 672						33.50	21.50		
1758	690 189	22 481	16 485						32.60	23.90		
1759	695 025	21 879	18 204						31.50	26.20		
1760	700 793	23 940	15 830						34.20	22.60		
1761	708 274	23 380	16 027						33.00	22.60		
1762	715 154	23 533	16 627						32.90	23.20		
1763	716 837	22 514	25 555						31.40	35.60		
1764	717 179	23 614	19 386						32.90	27.00		
1765	720 192	22 536	20 241						31.30	28.10		
1766	722 269	22 370	20 010						31.00	27.70		
1767	726 856	23 444	16 136						32.30	22.20		
1768	733 160	22 140	16 340						30.20	22.30		
1769	739 180	22 846	16 100						30.90	21.80		
1770	745 183	23 515	17 606			5 396		855	31.60	23.60		
1771	750 811	23 325	17 176			5 007		727	31.10	22.90		

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1772	753 835	20 936	20 231			4 433		701	27.80	26.80		
1773	744 813	17 407	35 362			4 410		645	23.40	47.50		
1774	736 347	20 607	18 784			6 200		633	28.00	25.50		
1775	740 605	24 424	16 933			6 798		1 085	33.00	22.90		
1776	747 275	21 922	15 270			6 231		1 090	29.30	20.40		
1777	754 040	23 331	15 655			6 249		1 060	30.90	20.80		
1778	761 668	23 612	15 232			6 013		1 086	31.00	20.00		
1779	767 005	23 862	20 768			6 127		1 163	31.10	27.10		
1780	770 747	24 711	19 523			5 863		1 273	32.10	25.30		
1781	776 842	24 053	16 051			6 177		1 095	31.00	20.70		
1782	783 433	23 944	17 563			5 469		1 231	30.60	22.40		
1783	787 121	21 554	19 357			6 313		985	27.40	24.60		
1784	790 144	23 874	18 825						30.20	23.80		
1785	790 325	22 657	26 144						28.70	33.10		
1786	790 390	23 979	19 164						30.30	24.20		
1787	794 715	23 070	18 034						29.00	22.70		
1788	798 418	24 405	20 834						30.60	26.10		
1789	799 629	24 365	24 315						30.50	30.40		
1790	802 666	25 596	18 371						31.90	22.90		
1791	809 477	26 369	18 574						32.60	22.90		
1792	816 914	28 246	19 564						34.60	23.90		
1793	825 362	28 039	18 227						34.00	22.10		
1794	834 803	28 069	17 399						33.60	20.80		
1795	843 458	27 249	19 010			6 531			32.30	22.50		
1796	851 048	27 018	18 476			6 695			31.70	21.70		
1797	858 936	28 173	19 336			6 950			32.80	22.50		
1798	866 771	28 010	19 580			7 227			32.30	22.60		
1799	875 279	28 540	18 354			6 910			32.60	21.00		
1800	881 499	26 415	22 560						30.00	25.60		
1801	882 951	24 953	24 167			6 089		1 453	28.30	27.40		
1802	883 284	24 021	22 277			6 742		1 312	27.20	25.20		
1803	885 102	25 805	22 074			6 790		1 494	29.20	24.90		
1804	887 760	24 301	20 879			7 069		1 564	27.40	23.50		
1805	892 721	26 868	18 525			7 227		1 615	30.10	20.80		
1806	900 193	27 447	19 006			7 283		1 693	30.50	21.10		
1807	906 734	26 940	20 460			6 331		1 773	29.70	22.60		
1808	909 830	25 335	23 783			5 305		1 697	27.80	26.10		

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1809	903 529	20 172	32 486			5 370		1 370	22.30	36.00		
1810	896 479	24 083	24 029			7 100		1 533	26.90	26.80		
1811	896 566	24 805	22 844			7 854		1 665	27.70	25.50		
1812	900 332	26 612	19 203			7 850		1 817	29.60	21.30		
1813	901 580	23 525	26 598			6 453		1 639	26.10	29.50		
1814	899 999	22 085	20 334			5 801		1 393	24.50	22.60		
1815	904 777	27 650	17 953			9 171		1 866	30.60	19.80		
1816	911 996	32 259	17 767			9 427		2 585	35.09	19.33		
1817	926 488	30 300	16 487			8 010		2 455	32.46	17.66		
1818	940 301	29 102	18 016			7 713		2 384	30.77	19.05		
1819	951 387	30 537	18 859			7 721		2 332	31.90	19.70		
1820	963 065	32 309	18 340			8 712		2 380	33.31	18.91		
1821	977 034	34 166	20 127		1	8 895		2 709	34.72	20.45		0.00
1822	991 073	32 869	19 421			8 949		2 531	32.94	19.46		
1823	1 004 521	34 375	17 958			8 841		2 539	33.94	17.73		
1824	1 020 938	33 388	18 981			8 376		2 449	32.47	18.46		
1825	1 035 345	35 856	18 201		53	9 020		2 446	34.34	17.43		0.05
1826	1 053 000	37 006	19 609			8 805		2 620	34.85	18.47		
1827	1 070 784	34 538	19 391			8 087		2 533	32.02	17.98		
1828	1 086 318	34 767	21 217			8 358		2 419	31.80	19.41		
1829	1 100 255	37 280	21 457			8 639		2 503	33.64	19.36		
1830	1 116 466	36 307	22 161			8 669		2 539	32.31	19.72		
1831	1 131 000	35 225	22 502			8 190		2 455	30.97	19.78		
1832	1 143 834	34 400	21 254			7 839		2 247	29.90	18.47		
1833	1 157 091	35 718	23 656			8 548		2 399	30.71	20.34		
1834	1 169 264	37 240	26 356			8 872		2 395	31.70	22.44		
1835	1 180 259	38 780	23 151			8 784		2 615	32.64	19.49		
1836	1 196 000	35 367	23 134		200	8 424		2 499	29.41	19.24		0.17
1837	1 208 808	34 842	25 218		200	8 123		2 383	28.70	20.77		0.16
1838	1 219 007	37 098	26 581		100	8 415		2 324	30.30	21.71		0.08
1839	1 229 319	32 881	26 652		400	7 949		2 332	26.68	21.62		0.32
1840	1 235 924	34 548	24 593		300	8 601		2 474	27.84	19.81		0.24
1841	1 246 355	37 372	21 649		400	9 595		2 683	29.79	17.26		0.32
1842	1 262 454	39 056	22 847		700	9 962		3 277	30.74	17.98		0.55
1843	1 278 739	38 800	23 069		1 600	10 173		3 257	30.17	17.94		1.24
1844	1 293 646	38 973	22 297		1 200	10 290		3 157	29.94	17.13		0.92
1845	1 309 898	41 200	22 303		1 100	10 570		3 357	31.23	16.91		0.83

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1846	1 328 471	41 528	23 887		1 300	11 152		3 456	31.07	17.87		0.97
1847	1 344 984	41 610	27 489		1 600	9 890		3 561	30.79	20.34		1.18
1848	1 357 678	40 554	27 916		1 400	10 187		3 220	29.75	20.48		1.03
1849	1 369 089	44 113	25 226		4 000	10 629		3 527	32.04	18.32		2.91
1850	1 384 149	43 082	23 971		3 700	10 648		3 715	30.95	17.22		2.66
1851	1 399 733	44 899	24 092		2 640	10 575		4 090	31.87	17.10		1.87
1852	1 418 073	44 219	25 565		4 030	10 179		4 220	31.02	17.93		2.83
1853	1 432 870	46 039	26 391		6 050	11 257		4 144	31.98	18.33		4.20
1854	1 446 641	49 896	23 362		5 950	12 479		4 533	34.25	16.03		4.08
1855	1 467 398	49 438	25 362		1 600	12 009		4 583	33.43	17.15		1.08
1856	1 490 047	48 311	25 357		3 200	11 599		4 186	32.19	16.90		2.13
1857	1 511 175	50 198	26 017		6 400	11 447		4 103	33.01	17.11		4.21
1858	1 530 312	51 671	24 796		2 500	11 722		4 279	33.48	16.07		1.62
1859	1 556 076	54 556	26 738		1 800	12 083		4 489	34.75	17.03		1.15
1860	1 583 525	53 074	27 398		1 900	11 413		4 433	33.25	17.17		1.19
1861	1 608 653	49 546	31 493		8 900	10 909		4 073	30.70	19.51		5.51
1862	1 619 102	52 190	32 502		5 250	11 221		3 993	32.08	19.98		3.23
1863	1 634 869	53 905	31 076		1 100	11 808		4 165	32.74	18.87		0.67
1864	1 657 997	53 158	29 692		4 300	11 371		4 221	31.86	17.80		2.58
1865	1 678 510	53 939	28 066		4 000	11 593		4 205	31.91	16.61		2.37
1866	1 701 756	54 166	29 106		15 455	11 434		4 310	31.73	17.05		9.05
1867	1 712 787	51 607	31 693		12 829	11 105		4 208	30.07	18.47		7.47
1868	1 720 933	50 872	31 568		13 211	10 709		4 244	29.51	18.31		7.66
1869	1 729 242	49 985	29 656		18 070	10 635		4 308	28.91	17.15		10.44
1870	1 732 655	50 618	28 171		14 838	11 176		4 569	29.17	16.23		8.54
1871	1 741 162	51 163	29 453		12 276	11 610		4 652	29.32	16.88		7.03
1872	1 751 544	52 592	29 257		13 865	12 302		4 698	29.97	16.67		7.89
1873	1 762 313	52 749	29 979		10 352	12 822		4 774	29.85	16.97		5.85
1874	1 776 528	55 259	32 705		4 601	13 713		5 064	30.99	18.34		2.58
1875	1 796 752	56 856	33 871		4 048	14 177		4 998	31.53	18.78		2.24
1876	1 818 853	57 699	34 485		4 355	14 049		5 000	31.55	18.86		2.38
1877	1 838 858	58 717	31 252		3 206	14 022		4 981	31.71	16.88		1.73
1878	1 864 285	59 066	29 950		4 863	13 681		4 726	31.47	15.96		2.59
1879	1 889 385	61 106	28 736		7 608	12 850		5 151	32.13	15.11		4.00
1880	1 914 867	59 315	31 065		20 212	12 751		4 942	30.91	16.19		10.53
1881	1 923 283	57 778	32 716		25 976	12 316		4 710	30.05	17.01		13.51
1882	1 922 613	58 762	35 786		28 804	12 874		4 829	30.61	18.64		15.00

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1883	1 916 921	59 440	32 545		22 167	12 710		4 885	30.97	16.96		11.55
1884	1 921 712	61 019	32 071		14 776	13 247		4 852	31.63	16.63		7.66
1885	1 936 404	61 231	31 985		13 981	13 024		4 809	31.50	16.45		7.19
1886	1 951 429	60 466	31 844		15 158	12 819	38	4 726	30.88	16.26		7.74
1887	1 965 217	61 827	31 904		20 741	12 491	28	4 779	31.39	16.20		10.53
1888	1 974 396	60 052	34 126		21 452	12 154	33	4 579	30.38	17.26		10.85
1889	1 978 834	58 811	35 235		12 642	12 416	42	4 217	29.64	17.76		6.37
1890	1 989 756	60 747	35 961		10 991	12 922	40	4 286	30.42	18.01		5.50
1891	2 004 102	61 901	35 621		13 341	13 179	58	4 344	30.76	17.70		6.63
1892	2 020 905	59 933	36 218		17 049	12 742	76	4 293	29.58	17.88		8.42
1893	2 031 127	61 823	33 537		18 778	12 974	102	4 436	30.34	16.46		9.21
1894	2 044 466	60 889	34 754		5 642	12 966	109	4 334	29.61	16.90		2.74
1895	2 068 848	63 318	32 582		6 207	13 339	114	4 515	30.40	15.64		2.98
1896	2 097 328	63 254	32 101		6 679	13 962	97	4 639	29.95	15.20		3.16
1897	2 126 024	64 333	32 873		4 669	14 220	94	4 880	30.04	15.35		2.18
1898	2 157 418	65 926	33 228		4 859	15 039	140	5 024	30.33	15.29		2.24
1899	2 190 196	65 968	36 935		6 699	15 530	123	4 831	29.93	16.76		3.04
1900	2 217 971	66 229	35 345		10 931	15 222	106	4 872	29.69	15.85		4.90
1901	2 242 995	67 303	33 821		12 745	14 760	138	4 794	29.85	15.00		5.65
1902	2 266 827	66 494	31 670		20 343	14 385	139	4 753	29.22	13.92		8.94
1903	2 284 143	65 470	33 847		26 784	13 566	185	4 668	28.62	14.79		11.71
1904	2 291 392	64 143	32 895		22 264	13 481	180	4 370	27.92	14.32		9.69
1905	2 303 595	62 601	34 050		21 059	13 269	234	4 207	27.12	14.75		9.12
1906	2 313 549	62 091	31 668		21 967	13 590	216	4 145	26.77	13.65		9.47
1907	2 324 832	61 302	33 345		22 135	13 953	314	4 126	26.32	14.32		9.50
1908	2 333 092	61 686	33 366		8 497	14 153	292	4 173	26.30	14.23		3.62
1909	2 358 036	63 324	32 111		16 152	14 080	358	4 144	26.75	13.56		6.82
1910	2 376 952	61 486	32 207		18 912	14 566	412	4 041	25.79	13.51		7.93
1911	2 390 402	61 727	31 691		12 477	14 826	411	4 125	25.71	13.20		5.20
1912	2 411 190	61 409	32 663		9 105	14 797	490	4 202	25.34	13.48		3.76
1913	2 435 178	61 294	32 442		9 876	15 262	501	4 413	25.05	13.26		4.04
1914	2 458 569	62 111	33 280		8 522	15 773	424	4 503	25.12	13.46		3.45
1915	2 486 269	58 975	33 425		4 572	15 940	561	4 094	23.61	13.38		1.83
1916	2 509 263	61 120	34 910		5 212	17 312	513	4 367	24.23	13.84		2.07
1917	2 535 092	63 969	34 699		2 518	18 086	563	4 453	25.08	13.60		0.99
1918	2 565 994	63 468	44 218		1 226	20 019	618	4 212	24.62	17.15		0.48
1919	2 589 463	59 486	35 821		2 432	15 379	593	3 886	22.85	13.76		0.93

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1920	2 616 274	69 326	33 634		5 581	18 460	660	5 261	26.31	12.77		2.12
1921	2 653 054	64 610	30 698		4 627	18 063	612	4 885	24.22	11.51		1.73
1922	2 682 680	62 908	32 484		6 456	17 185	630	4 333	23.34	12.05		2.40
1923	2 707 000	61 731	31 543		18 287	16 963	662	4 073	22.75	11.63		6.74
1924	2 719 233	58 021	30 850		8 492	16 586	680	3 779	21.26	11.31		3.11
1925	2 738 298	54 066	30 481		7 009	16 214	687	3 561	19.68	11.10		2.55
1926	2 755 331	54 163	29 933		9 326	15 948	738	3 545	19.60	10.83		3.38
1927	2 770 880	50 175	31 141		11 881	15 803	626	3 451	18.08	11.22		4.28
1928	2 778 851	49 881	30 301		8 832	16 683	841	3 573	17.91	10.88		3.17
1929	2 790 497	48 372	32 023		8 029	17 795	829	3 459	17.31	11.46		2.87
1930	2 799 713	47 844	29 616		3 673	18 064	879	3 397	17.04	10.55		1.31
1931	2 815 164	45 989	30 674		825	17 666	908	3 208	16.29	10.86		0.29
1932	2 832 599	45 451	30 102		436	17 612	935	3 260	16.00	10.59		0.15
1933	2 850 457	42 114	28 943		344	17 995	837	2 970	14.73	10.13		0.12
1934	2 866 229	41 833	28 340		485	19 235	1 043	2 844	14.55	9.86		0.17
1935	2 882 182	41 321	29 747		462	20 511	983	2 773	14.30	10.30		0.16
1936	2 896 239	42 240	30 100		526	22 375	1 006	2 673	14.55	10.37		0.18
1937	2 910 798	43 808	30 217		647	23 959	1 046	2 769	15.01	10.35		0.22
1938	2 926 686	45 319	29 211		818	24 335	1 241	2 716	15.44	9.95		0.28
1939	2 944 920	46 603	29 870		687	26 095	1 149	2 875	15.77	10.11		0.23
1940	2 963 909	47 943	32 045		278	27 983	965	3 080	16.13	10.78		0.09
1941	2 982 224	45 773	32 209			26 459	1 106	3 178	15.31	10.77		0.00
1942	2 998 244	53 225	32 062				1 200	3 913	17.69	10.66		0.00
1943	3 019 521	57 281	31 623			24 021	1 303	4 303	18.89	10.43		0.00
1944	3 045 337	62 241	32 652			21 990	1 540	4 546	20.34	10.67		0.00
1945	3 075 084	61 814	30 030			23 504	1 917	4 548	20.00	9.71		0.00
1946	3 107 269	70 727	29 220		973	29 688	2 064	4 080	22.62	9.34		0.31
1947	3 146 497	67 625	29 894		1 477	29 923	2 236	3 598	21.37	9.45		0.47
1948	3 183 525	65 618	28 375		2 398	29 558	2 128	3 222	20.50	8.86		0.75
1949	3 218 499	63 052	29 082		2 669	27 469	2 350	2 689	19.50	8.99		0.83
1950	3 249 954	62 410	29 699		2 295	27 222	2 324	2 577	19.11	9.10		0.70
1951	3 280 296	60 571	27 736	6 046	10 172	27 180	2 151	2 436	18.38	8.42	1.83	3.09
1952	3 311 446	62 543	28 417	5 967	7 803	27 499	2 119	2 330	18.79	8.54	1.79	2.34
1953	3 344 010	62 985	28 412	6 454	7 529	27 032	2 076	2 269	18.74	8.45	1.92	2.24
1954	3 377 766	62 739	29 158	6 005	7 295	26 977	2 102	2 181	18.48	8.59	1.77	2.15
1955	3 410 726	63 552	29 099	7 089	8 728	26 156	1 982	2 192	18.54	8.49	2.07	2.55
1956	3 445 673	64 171	29 981	8 092	10 156	25 163	2 071	2 236	18.54	8.66	2.34	2.93

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1957	3 475 890	63 063	30 560	12 263	12 599	24 472	2 036	2 225	18.06	8.75	3.51	3.61
1958	3 507 986	62 985	31 645	10 161	11 266	23 931	2 093	2 240	17.88	8.98	2.88	3.20
1959	3 538 001	63 005	31 761	10 586	11 807	23 237	2 219	2 267	17.73	8.94	2.98	3.32
1960	3 567 707	61 880	32 543	13 536	18 681	23 651	2 379	2 277	17.28	9.09	3.78	5.22
1961	3 594 771	62 555	33 313	11 426	10 610	24 142	2 465	2 307	17.33	9.23	3.17	2.94
1962	3 624 829	62 254	34 318	12 778	12 534	24 070	2 439	2 390	17.11	9.43	3.51	3.44
1963	3 653 006	63 290	36 850	11 983	11 364	24 096	2 439	2 437	17.26	10.05	3.27	3.10
1964	3 680 068	65 570	35 171	12 406	14 264	25 005	2 556	2 758	17.75	9.52	3.36	3.86
1965	3 708 609	66 277	35 317	12 148	14 021	24 185	2 581	3 057	17.80	9.49	3.26	3.77
1966	3 737 726	67 061	36 010	12 446	13 391	27 680	2 672	3 286	17.87	9.59	3.32	3.57
1967	3 768 298	66 779	36 216	15 379	13 022	29 154	2 876	3 428	17.65	9.57	4.06	3.44
1968	3 800 780	67 350	37 668	15 350	13 644	29 441	3 058	3 770	17.65	9.87	4.02	3.58
1969	3 832 192	67 746	38 994	15 641	13 526	29 630	3 146	4 163	17.61	10.13	4.07	3.52
1970	3 863 221	64 551	38 723	17 383	18 352	29 370	3 429	4 431	16.66	9.99	4.49	4.74
1971	3 888 305	65 550	38 981	19 297	12 682	29 510	3 731	5 197	16.79	9.99	4.94	3.25
1972	3 917 773	64 260	39 375	18 388	13 965	28 596	4 022	5 568	16.34	10.01	4.68	3.55
1973	3 948 235	61 208	39 958	17 383	13 939	28 141	4 664	5 552	15.45	10.09	4.39	3.52
1974	3 972 990	59 603	39 464	19 209	14 287	27 344	5 156	5 543	14.96	9.90	4.82	3.58
1975	3 997 525	56 345	40 061	19 551	14 782	25 898	5 577	5 790	14.06	10.00	4.88	3.69
1976	4 017 101	53 474	40 216	18 955	14 066	25 389	5 825	5 824	13.28	9.99	4.71	3.49
1977	4 035 202	50 877	39 824	19 403	14 369	24 022	6 099	5 903	12.58	9.85	4.80	3.55
1978	4 051 208	51 749	40 682	18 825	14 851	23 690	6 246	6 150	12.75	10.02	4.64	3.66
1979	4 066 134	51 580	41 632	17 831	15 085	23 055	6 608	6 729	12.67	10.22	4.38	3.70
1980	4 078 900	51 039	41 340	18 776	14 705	22 230	6 634	7 392	12.49	10.12	4.60	3.60
1981	4 092 340	50 708	41 893	19 698	14 522	22 271	7 136	8 169	12.37	10.22	4.80	3.54
1982	4 107 063	51 245	41 454	20 468	14 728	21 706	7 165	9 041	12.45	10.07	4.97	3.58
1983	4 122 511	49 937	42 224	20 063	15 778	20 803	7 668	9 616	12.10	10.23	4.86	3.82
1984	4 134 353	50 274	42 581	19 688	15 927	20 537	7 974	10 687	12.14	10.29	4.76	3.85
1985	4 145 845	51 134	44 372	21 858	15 630	20 221	8 206	13 203	12.31	10.69	5.26	3.76
1986	4 159 187	52 514	43 560	24 196	16 745	20 513	7 891	14 673	12.60	10.45	5.81	4.02
1987	4 175 521	54 027	44 959	31 149	17 380	21 081	8 417	16 705	12.90	10.74	7.44	4.15
1988	4 198 289	57 526	45 354	29 964	19 821	21 744	8 772	19 407	13.67	10.77	7.12	4.71
1989	4 220 686	59 303	45 173	25 847	27 300	20 755	9 238	21 588	14.03	10.69	6.11	6.46
1990	4 233 116	60 939	46 021	25 494	23 784	21 926	10 170	23 503	14.37	10.85	6.01	5.61
1991	4 249 830	60 808	44 923	26 283	18 238	19 880	10 281	24 844	14.27	10.54	6.17	4.28
1992	4 273 634	60 109	44 731	26 743	16 801	19 266	10 209	25 801	14.02	10.44	6.24	3.92
1993	4 299 167	59 678	46 597	31 711	18 903	18 741	10 805	26 526	13.84	10.81	7.35	4.38

Long run trends in demographic data, 1735-2021

Table 13.A.1: Population changes, 1735-2021.

Year	Population 1 January	Births (liveborn)	Deaths	Immi- grations	Emi- grations	Marriages	Divorces	Extra- marital births	Births per 1000	Deaths per 1000	Immi- grations per 1000	Emi- grations per 1000
1994	4 324 815	60 092	44 071	26 911	19 475	19 866	10 795	27 581	13.85	10.16	6.21	4.49
1995	4 348 410	60 292	45 190	25 678	19 312	20 981	10 183	28 690	13.83	10.37	5.89	4.43
1996	4 369 957	60 927	43 860	26 407	20 590	22 478	9 836	29 435	13.91	10.01	6.03	4.70
1997	4 392 714	59 801	44 595	31 957	21 257	22 933	9 813	29 133	13.58	10.12	7.25	4.83
1998	4 417 599	58 352	44 112	36 704	22 881	22 349	9 213	28 573	13.17	9.95	8.28	5.16
1999	4 445 329	59 298	45 170	41 841	22 842	23 456	9 124	29 100	13.29	10.12	9.38	5.12
2000	4 478 497	59 234	44 002	36 542	26 854	25 356	10 053	29 368	13.19	9.80	8.14	5.98
2001	4 503 436	56 696	43 981	34 264	26 309	22 967	10 308	28 194	12.56	9.74	7.59	5.83
2002	4 524 066	55 434	44 465	40 122	22 948	24 069	10 450	27 890	12.22	9.80	8.84	5.06
2003	4 552 252	56 458	42 478	35 957	24 672	22 361	10 757	28 218	12.37	9.31	7.88	5.40
2004	4 577 457	56 951	41 200	36 482	23 271	22 354	11 045	29 252	12.40	8.97	7.94	5.07
2005	4 606 363	56 756	41 232	40 148	21 709	22 392	11 040	29 374	12.28	8.92	8.68	4.70
2006	4 640 219	58 545	41 253	45 776	22 053	21 721	10 598	31 158	12.56	8.85	9.82	4.73
2007	4 681 134	58 459	41 954	61 774	22 122	23 471	10 280	31 983	12.41	8.91	13.12	4.70
2008	4 737 171	60 497	41 712	66 961	23 615	25 125	10 158	33 424	12.69	8.75	14.04	4.95
2009	4 799 252	61 807	41 449	65 186	26 549	24 793	10 235	34 038	12.80	8.58	13.50	5.50
2010	4 858 199	61 442	41 499	73 852	31 506	23 577	10 228	33 655	12.65	8.54	15.10	6.44
2011	4 920 305	60 220	41 393	79 498	32 466	23 135	10 207	33 099	12.23	8.41	16.05	6.55
2012	4 985 870	60 255	41 992	78 570	31 227	24 346	9 929	33 301	12.09	8.42	15.66	6.22
2013	5 051 275	58 995	41 282	75 789	35 716	23 158	9 680	33 442	11.68	8.17	14.92	7.03
2014	5 109 056	59 084	40 394	70 030	31 875	22 887	9 556	33 589	11.50	7.90	13.63	6.20
2015	5 165 802	59 058	40 727	67 276	37 474	22 738	9 306	33 148	11.38	7.85	12.96	7.22
2016	5 213 985	58 890	40 726	66 800	40 724	22 537	9 345	33 254	11.29	7.81	12.76	7.78
2017	5 258 317	56 633	40 774	58 192	36 843	22 111	9 848	31 693	10.73	7.75	11.03	6.98
2018	5 295 619	55 120	40 840	52 485	34 382	20 949	9 545	31 103	10.41	7.71	9.88	6.47
2019	5 328 212	54 495	40 684	52 153	26 826	19 855	9 609	31 535	10.19	7.61	9.75	5.02
2020	5 367 580	52 979	40 611	38 071	26 744	16 151	9 355	31 002	9.85	7.55	7.08	4.97
2021	5 391 369	56 060	42 002	53 947	34 297			34 131	10.37	7.77	9.97	6.34
2022	5 425 270											

Source: 1735-2022 <https://www.ssb.no/en/statbank/table/05803> Population 1 January and population changes during the calendar year

Table 13.A.2: Population in three functional age groups per 1 January, Potential support ratio and Dependency ratio, Sex ratio of total population, 1846-2022.

Year	Population size			Percentage share			Potential support ratio			Dependency ratio			Sex ratio M/(M+F) *100	
	Total	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66		67+
1846	1 328 471	551 731	714 308	62 432	41.5	53.8	4.7	1.29	11.44	1.16	0.77	0.09	0.86	49.1
1847	1 344 984	558 276	723 425	63 283	41.5	53.8	4.7	1.30	11.43	1.16	0.77	0.09	0.86	49.1
1848	1 357 678	562 784	731 126	63 768	41.5	53.9	4.7	1.30	11.47	1.17	0.77	0.09	0.86	49.1
1849	1 369 089	564 869	740 684	63 536	41.3	54.1	4.6	1.31	11.66	1.18	0.76	0.09	0.85	49.1
1850	1 384 149	571 802	748 634	63 713	41.3	54.1	4.6	1.31	11.75	1.18	0.76	0.09	0.85	49.0
1851	1 399 733	578 788	757 165	63 780	41.3	54.1	4.6	1.31	11.87	1.18	0.76	0.08	0.85	49.0
1852	1 418 073	587 906	765 557	64 610	41.5	54.0	4.6	1.30	11.85	1.17	0.77	0.08	0.85	49.0
1853	1 432 870	593 828	773 862	65 180	41.4	54.0	4.5	1.30	11.87	1.17	0.77	0.08	0.85	49.0
1854	1 446 641	599 957	780 391	66 293	41.5	53.9	4.6	1.30	11.77	1.17	0.77	0.08	0.85	49.0
1855	1 467 398	609 521	789 990	67 887	41.5	53.8	4.6	1.30	11.64	1.17	0.77	0.09	0.86	49.0
1856	1 490 047	621 587	798 952	69 508	41.7	53.6	4.7	1.29	11.49	1.16	0.78	0.09	0.87	49.0
1857	1 511 175	634 040	805 705	71 430	42.0	53.3	4.7	1.27	11.28	1.14	0.79	0.09	0.88	49.0
1858	1 530 312	647 796	809 199	73 317	42.3	52.9	4.8	1.25	11.04	1.12	0.80	0.09	0.89	49.0
1859	1 556 076	665 572	814 655	75 849	42.8	52.4	4.9	1.22	10.74	1.10	0.82	0.09	0.91	49.0
1860	1 583 525	683 602	821 163	78 760	43.2	51.9	5.0	1.20	10.43	1.08	0.83	0.10	0.93	49.1
1861	1 608 653	697 964	829 835	80 854	43.4	51.6	5.0	1.19	10.26	1.07	0.84	0.10	0.94	49.1
1862	1 619 102	700 998	835 526	82 578	43.3	51.6	5.1	1.19	10.12	1.07	0.84	0.10	0.94	49.1
1863	1 634 866	707 582	843 179	84 105	43.3	51.6	5.1	1.19	10.03	1.07	0.84	0.10	0.94	49.1
1864	1 657 998	719 725	852 988	85 285	43.4	51.4	5.1	1.19	10.00	1.06	0.84	0.10	0.94	49.1
1865	1 678 510	730 368	861 751	86 391	43.5	51.3	5.1	1.18	9.98	1.06	0.85	0.10	0.95	49.1
1866	1 701 756	742 954	871 296	87 506	43.7	51.2	5.1	1.17	9.96	1.05	0.85	0.10	0.95	49.1
1867	1 712 787	748 880	874 813	89 094	43.7	51.1	5.2	1.17	9.82	1.04	0.86	0.10	0.96	49.1
1868	1 720 933	751 982	879 325	89 626	43.7	51.1	5.2	1.17	9.81	1.04	0.86	0.10	0.96	49.1
1869	1 729 242	752 257	886 638	90 347	43.5	51.3	5.2	1.18	9.81	1.05	0.85	0.10	0.95	49.0
1870	1 732 655	751 668	891 098	89 889	43.4	51.4	5.2	1.19	9.91	1.06	0.84	0.10	0.94	49.0
1871	1 741 162	753 447	897 681	90 034	43.3	51.6	5.2	1.19	9.97	1.06	0.84	0.10	0.94	48.9
1872	1 751 544	756 856	905 106	89 582	43.2	51.7	5.1	1.20	10.10	1.07	0.84	0.10	0.94	48.9
1873	1 762 313	759 545	911 079	91 689	43.1	51.7	5.2	1.20	9.94	1.07	0.83	0.10	0.93	48.9
1874	1 776 528	761 029	921 721	93 778	42.8	51.9	5.3	1.21	9.83	1.08	0.83	0.10	0.93	48.9
1875	1 796 752	766 063	935 534	95 155	42.6	52.1	5.3	1.22	9.83	1.09	0.82	0.10	0.92	48.9
1876	1 818 853	774 152	949 535	95 166	42.6	52.2	5.2	1.23	9.98	1.09	0.82	0.10	0.92	48.9
1877	1 838 858	780 612	964 068	94 178	42.5	52.4	5.1	1.24	10.24	1.10	0.81	0.10	0.91	48.8
1878	1 864 285	789 478	979 841	94 966	42.3	52.6	5.1	1.24	10.32	1.11	0.81	0.10	0.90	48.9
1879	1 889 385	797 358	995 702	96 325	42.2	52.7	5.1	1.25	10.34	1.11	0.80	0.10	0.90	48.9
1880	1 914 867	809 091	1 007 324	98 452	42.3	52.6	5.1	1.25	10.23	1.11	0.80	0.10	0.90	48.9
1881	1 923 283	816 325	1 008 198	98 760	42.4	52.4	5.1	1.24	10.21	1.10	0.81	0.10	0.91	48.8

Table 13.A.2: Population in three functional age groups per 1 January, Potential support ratio and Dependency ratio, Sex ratio of total population, 1846-2022.

Year	Population size			Percentage share			Potential support ratio			Dependency ratio			Sex ratio M/(M+F) *100	
	Total	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66		67+
1882	1 922 613	816 426	1 007 617	98 570	42.5	52.4	5.1	1.23	10.22	1.10	0.81	0.10	0.91	48.7
1883	1 916 921	812 030	1 004 428	100 463	42.4	52.4	5.2	1.24	10.00	1.10	0.81	0.10	0.91	48.5
1884	1 921 712	813 561	1 004 405	103 746	42.3	52.3	5.4	1.23	9.68	1.09	0.81	0.10	0.91	48.5
1885	1 936 404	819 685	1 010 456	106 263	42.3	52.2	5.5	1.23	9.51	1.09	0.81	0.11	0.92	48.5
1886	1 951 429	826 736	1 016 144	108 549	42.4	52.1	5.6	1.23	9.36	1.09	0.81	0.11	0.92	48.5
1887	1 965 217	835 020	1 018 929	111 268	42.5	51.8	5.7	1.22	9.16	1.08	0.82	0.11	0.93	48.5
1888	1 974 396	843 937	1 015 315	115 144	42.7	51.4	5.8	1.20	8.82	1.06	0.83	0.11	0.94	48.4
1889	1 978 834	850 558	1 009 945	118 331	43.0	51.0	6.0	1.19	8.53	1.04	0.84	0.12	0.96	48.3
1890	1 989 756	856 708	1 011 383	121 665	43.1	50.8	6.1	1.18	8.31	1.03	0.85	0.12	0.97	48.2
1891	2 004 102	864 994	1 013 926	125 182	43.2	50.6	6.2	1.17	8.10	1.02	0.85	0.12	0.98	48.2
1892	2 020 905	874 826	1 018 006	128 073	43.3	50.4	6.3	1.16	7.95	1.02	0.86	0.13	0.99	48.2
1893	2 031 127	881 146	1 019 271	130 710	43.4	50.2	6.4	1.16	7.80	1.01	0.86	0.13	0.99	48.2
1894	2 044 466	889 131	1 020 855	134 480	43.5	49.9	6.6	1.15	7.59	1.00	0.87	0.13	1.00	48.2
1895	2 068 848	897 129	1 034 773	136 946	43.4	50.0	6.6	1.15	7.56	1.00	0.87	0.13	1.00	48.2
1896	2 097 328	908 345	1 049 400	139 583	43.3	50.0	6.7	1.16	7.52	1.00	0.87	0.13	1.00	48.3
1897	2 126 024	918 224	1 064 768	143 032	43.2	50.1	6.7	1.16	7.44	1.00	0.86	0.13	1.00	48.3
1898	2 157 418	930 130	1 081 886	145 402	43.1	50.1	6.7	1.16	7.44	1.01	0.86	0.13	0.99	48.4
1899	2 190 196	942 496	1 100 466	147 234	43.0	50.2	6.7	1.17	7.47	1.01	0.86	0.13	0.99	48.4
1900	2 217 971	954 908	1 115 319	147 744	43.1	50.3	6.7	1.17	7.55	1.01	0.86	0.13	0.99	48.5
1901	2 242 995	967 844	1 126 352	148 799	43.1	50.2	6.6	1.16	7.57	1.01	0.86	0.13	0.99	48.5
1902	2 266 827	980 107	1 135 545	151 175	43.2	50.1	6.7	1.16	7.51	1.00	0.86	0.13	1.00	48.4
1903	2 284 143	989 691	1 140 648	153 804	43.3	49.9	6.7	1.15	7.42	1.00	0.87	0.13	1.00	48.4
1904	2 291 392	994 770	1 142 230	154 392	43.4	49.8	6.7	1.15	7.40	0.99	0.87	0.14	1.01	48.2
1905	2 303 595	999 618	1 149 443	154 534	43.4	49.9	6.7	1.15	7.44	1.00	0.87	0.13	1.00	48.2
1906	2 313 549	1 002 754	1 157 020	153 775	43.3	50.0	6.6	1.15	7.52	1.00	0.87	0.13	1.00	48.2
1907	2 324 832	1 005 774	1 165 041	154 017	43.3	50.1	6.6	1.16	7.56	1.00	0.86	0.13	1.00	48.2
1908	2 333 092	1 009 489	1 170 335	153 268	43.3	50.2	6.6	1.16	7.64	1.01	0.86	0.13	0.99	48.1
1909	2 358 036	1 017 139	1 186 732	154 165	43.1	50.3	6.5	1.17	7.70	1.01	0.86	0.13	0.99	48.2
1910	2 376 952	1 023 367	1 198 532	155 053	43.1	50.4	6.5	1.17	7.73	1.02	0.85	0.13	0.98	48.2
1911	2 390 402	1 025 769	1 208 490	156 143	42.9	50.6	6.5	1.18	7.74	1.02	0.85	0.13	0.98	48.2
1912	2 411 190	1 030 849	1 222 567	157 774	42.8	50.7	6.5	1.19	7.75	1.03	0.84	0.13	0.97	48.2
1913	2 435 178	1 035 317	1 240 531	159 330	42.5	50.9	6.5	1.20	7.79	1.04	0.83	0.13	0.96	48.2
1914	2 458 569	1 040 303	1 257 957	160 309	42.3	51.2	6.5	1.21	7.85	1.05	0.83	0.13	0.95	48.3
1915	2 483 269	1 043 658	1 278 359	161 252	42.0	51.5	6.5	1.22	7.93	1.06	0.82	0.13	0.94	48.3
1916	2 509 263	1 045 083	1 302 703	161 477	41.6	51.9	6.4	1.25	8.07	1.08	0.80	0.12	0.93	48.3
1917	2 535 092	1 047 155	1 325 085	162 852	41.3	52.3	6.4	1.27	8.14	1.10	0.79	0.12	0.91	48.4

Table 13.A.2: Population in three functional age groups per 1 January, Potential support ratio and Dependency ratio, Sex ratio of total population, 1846-2022.

Year	Population size			Percentage share			Potential support ratio			Dependency ratio			Sex ratio M/(M+F) *100	
	Total	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66		67+
1918	2 565 994	1 052 859	1 349 316	163 819	41.0	52.6	6.4	1.28	8.24	1.11	0.78	0.12	0.90	48.5
1919	2 589 463	1 056 105	1 367 240	166 118	40.8	52.8	6.4	1.29	8.23	1.12	0.77	0.12	0.89	48.6
1920	2 616 274	1 056 793	1 391 797	167 684	40.4	53.2	6.4	1.32	8.30	1.14	0.76	0.12	0.88	48.6
1921	2 653 054	1 065 932	1 416 711	170 411	40.2	53.4	6.4	1.33	8.31	1.15	0.75	0.12	0.87	48.7
1922	2 682 680	1 068 618	1 439 284	174 778	39.8	53.7	6.5	1.35	8.23	1.16	0.74	0.12	0.86	48.7
1923	2 707 000	1 069 459	1 459 953	177 588	39.5	53.9	6.6	1.37	8.22	1.17	0.73	0.12	0.85	48.8
1924	2 719 233	1 068 523	1 471 029	179 681	39.3	54.1	6.6	1.38	8.19	1.18	0.73	0.12	0.85	48.7
1925	2 738 298	1 067 156	1 488 477	182 665	39.0	54.4	6.7	1.39	8.15	1.19	0.72	0.12	0.84	48.7
1926	2 755 331	1 061 762	1 508 015	185 554	38.5	54.7	6.7	1.42	8.13	1.21	0.70	0.12	0.83	48.7
1927	2 770 880	1 057 275	1 524 494	189 111	38.2	55.0	6.8	1.44	8.06	1.22	0.69	0.12	0.82	48.7
1928	2 778 851	1 048 467	1 539 452	190 932	37.7	55.4	6.9	1.47	8.06	1.24	0.68	0.12	0.81	48.7
1929	2 790 497	1 038 787	1 559 180	192 530	37.2	55.9	6.9	1.50	8.10	1.27	0.67	0.12	0.79	48.7
1930	2 799 713	1 028 502	1 576 953	194 258	36.7	56.3	6.9	1.53	8.12	1.29	0.65	0.12	0.78	48.7
1931	2 815 164	1 018 850	1 598 159	198 155	36.2	56.8	7.0	1.57	8.07	1.31	0.64	0.12	0.76	48.8
1932	2 832 599	1 006 875	1 625 380	200 344	35.5	57.4	7.1	1.61	8.11	1.35	0.62	0.12	0.74	48.8
1933	2 850 457	994 315	1 653 264	202 878	34.9	58.0	7.1	1.66	8.15	1.38	0.60	0.12	0.72	48.9
1934	2 866 229	977 559	1 682 681	205 989	34.1	58.7	7.2	1.72	8.17	1.42	0.58	0.12	0.70	48.9
1935	2 882 182	963 902	1 710 022	208 258	33.4	59.3	7.2	1.77	8.21	1.46	0.56	0.12	0.69	48.9
1936	2 896 239	947 422	1 738 885	209 932	32.7	60.0	7.2	1.84	8.28	1.50	0.54	0.12	0.67	49.0
1937	2 910 798	929 539	1 770 254	211 005	31.9	60.8	7.2	1.90	8.39	1.55	0.53	0.12	0.64	49.0
1938	2 926 686	913 484	1 800 597	212 605	31.2	61.5	7.3	1.97	8.47	1.60	0.51	0.12	0.63	49.1
1939	2 944 920	902 613	1 827 271	215 036	30.6	62.0	7.3	2.02	8.50	1.63	0.49	0.12	0.61	49.1
1940	2 963 909	883 933	1 862 863	217 113	29.8	62.9	7.3	2.11	8.58	1.69	0.47	0.12	0.59	49.1
1941	2 982 224	870 810	1 891 788	219 626	29.2	63.4	7.4	2.17	8.61	1.73	0.46	0.12	0.58	49.2
1942	2 998 244	857 158	1 918 034	223 052	28.6	64.0	7.4	2.24	8.60	1.78	0.45	0.12	0.56	49.2
1943	3 019 521	850 871	1 940 626	228 024	28.2	64.3	7.6	2.28	8.51	1.80	0.44	0.12	0.56	49.2
1944	3 045 337	851 014	1 960 770	233 553	27.9	64.4	7.7	2.30	8.40	1.81	0.43	0.12	0.55	49.2
1945	3 075 084	859 361	1 976 630	239 093	27.9	64.3	7.8	2.30	8.27	1.80	0.43	0.12	0.56	49.3
1946	3 107 269	867 430	1 994 182	245 657	27.9	64.2	7.9	2.30	8.12	1.79	0.43	0.12	0.56	49.3
1947	3 146 497	895 062	1 999 500	251 935	28.4	63.5	8.0	2.23	7.94	1.74	0.45	0.13	0.57	49.4
1948	3 183 525	913 550	2 013 548	256 427	28.7	63.2	8.1	2.20	7.85	1.72	0.45	0.13	0.58	49.5
1949	3 218 499	931 231	2 026 678	260 590	28.9	63.0	8.1	2.18	7.78	1.70	0.46	0.13	0.59	49.5
1950	3 249 954	946 644	2 039 237	264 073	29.1	62.7	8.1	2.15	7.72	1.68	0.46	0.13	0.59	49.5
1951	3 280 296	963 255	2 049 479	267 562	29.4	62.5	8.2	2.13	7.66	1.67	0.47	0.13	0.60	49.6
1952	3 311 446	977 849	2 060 058	273 539	29.5	62.2	8.3	2.11	7.53	1.65	0.47	0.13	0.61	49.6
1953	3 344 010	997 905	2 066 420	279 685	29.8	61.8	8.4	2.07	7.39	1.62	0.48	0.14	0.62	49.7

Table 13.A.2: Population in three functional age groups per 1 January, Potential support ratio and Dependency ratio, Sex ratio of total population, 1846-2022.

Year	Population size			Percentage share			Potential support ratio			Dependency ratio			Sex ratio M/(M+F) *100	
	Total	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66		67+
1954	3 377 766	1 019 087	2 072 523	286 156	30.2	61.4	8.5	2.03	7.24	1.59	0.49	0.14	0.63	49.7
1955	3 410 726	1 040 398	2 077 443	292 885	30.5	60.9	8.6	2.00	7.09	1.56	0.50	0.14	0.64	49.8
1956	3 445 673	1 060 093	2 086 609	298 971	30.8	60.6	8.7	1.97	6.98	1.54	0.51	0.14	0.65	49.8
1957	3 475 890	1 081 991	2 087 991	305 908	31.1	60.1	8.8	1.93	6.83	1.50	0.52	0.15	0.66	49.8
1958	3 507 986	1 100 589	2 094 249	313 148	31.4	59.7	8.9	1.90	6.69	1.48	0.53	0.15	0.68	49.8
1959	3 538 001	1 118 151	2 099 316	320 534	31.6	59.3	9.1	1.88	6.55	1.46	0.53	0.15	0.69	49.8
1960	3 567 707	1 134 322	2 104 905	328 480	31.8	59.0	9.2	1.86	6.41	1.44	0.54	0.16	0.69	49.8
1961	3 594 771	1 151 709	2 105 831	337 231	32.0	58.6	9.4	1.83	6.24	1.41	0.55	0.16	0.71	49.8
1962	3 624 829	1 163 511	2 116 035	345 283	32.1	58.4	9.5	1.82	6.13	1.40	0.55	0.16	0.71	49.8
1963	3 653 006	1 171 004	2 127 822	354 180	32.1	58.2	9.7	1.82	6.01	1.40	0.55	0.17	0.72	49.8
1964	3 680 068	1 173 441	2 144 961	361 666	31.9	58.3	9.8	1.83	5.93	1.40	0.55	0.17	0.72	49.8
1965	3 708 609	1 175 147	2 162 755	370 707	31.7	58.3	10.0	1.84	5.83	1.40	0.54	0.17	0.71	49.8
1966	3 737 726	1 171 518	2 184 728	381 480	31.3	58.5	10.2	1.86	5.73	1.41	0.54	0.17	0.71	49.8
1967	3 768 298	1 172 060	2 204 263	391 975	31.1	58.5	10.4	1.88	5.62	1.41	0.53	0.18	0.71	49.8
1968	3 800 780	1 175 100	2 223 412	402 268	30.9	58.5	10.6	1.89	5.53	1.41	0.53	0.18	0.71	49.8
1969	3 832 192	1 181 519	2 238 938	411 735	30.8	58.4	10.7	1.89	5.44	1.41	0.53	0.18	0.71	49.8
1970	3 863 221	1 188 783	2 253 597	420 841	30.8	58.3	10.9	1.90	5.35	1.40	0.53	0.19	0.71	49.8
1971	3 888 305	1 194 269	2 263 968	430 068	30.7	58.2	11.1	1.90	5.26	1.39	0.53	0.19	0.72	49.7
1972	3 917 773	1 199 459	2 280 179	438 135	30.6	58.2	11.2	1.90	5.20	1.39	0.53	0.19	0.72	49.7
1973	3 948 234	1 203 497	2 298 365	446 372	30.5	58.2	11.3	1.91	5.15	1.39	0.52	0.19	0.72	49.7
1974	3 972 990	1 204 107	2 314 129	454 754	30.3	58.2	11.4	1.92	5.09	1.40	0.52	0.20	0.72	49.7
1975	3 997 525	1 202 674	2 330 883	463 968	30.1	58.3	11.6	1.94	5.02	1.40	0.52	0.20	0.72	49.7
1976	4 017 101	1 197 148	2 346 699	473 254	29.8	58.4	11.8	1.96	4.96	1.40	0.51	0.20	0.71	49.7
1977	4 035 202	1 190 305	2 360 983	483 914	29.5	58.5	12.0	1.98	4.88	1.41	0.50	0.20	0.71	49.6
1978	4 051 208	1 180 949	2 375 936	494 323	29.2	58.6	12.2	2.01	4.81	1.42	0.50	0.21	0.71	49.6
1979	4 066 134	1 171 665	2 389 786	504 683	28.8	58.8	12.4	2.04	4.74	1.43	0.49	0.21	0.70	49.6
1980	4 078 900	1 162 946	2 401 101	514 853	28.5	58.9	12.6	2.06	4.66	1.43	0.48	0.21	0.70	49.6
1981	4 092 340	1 153 705	2 413 599	525 036	28.2	59.0	12.8	2.09	4.60	1.44	0.48	0.22	0.70	49.5
1982	4 107 063	1 144 720	2 427 849	534 494	27.9	59.1	13.0	2.12	4.54	1.45	0.47	0.22	0.69	49.5
1983	4 122 511	1 134 336	2 444 297	543 878	27.5	59.3	13.2	2.15	4.49	1.46	0.46	0.22	0.69	49.5
1984	4 134 353	1 120 294	2 461 528	552 531	27.1	59.5	13.4	2.20	4.46	1.47	0.46	0.22	0.68	49.5
1985	4 145 845	1 105 796	2 477 459	562 590	26.7	59.8	13.6	2.24	4.40	1.48	0.45	0.23	0.67	49.4
1986	4 159 187	1 091 861	2 496 653	570 673	26.3	60.0	13.7	2.29	4.37	1.50	0.44	0.23	0.67	49.4
1987	4 175 521	1 079 433	2 518 981	577 107	25.9	60.3	13.8	2.33	4.36	1.52	0.43	0.23	0.66	49.4
1988	4 198 288	1 068 555	2 540 050	589 683	25.5	60.5	14.0	2.38	4.31	1.53	0.42	0.23	0.65	49.5
1989	4 220 686	1 060 071	2 562 571	598 044	25.1	60.7	14.2	2.42	4.28	1.55	0.41	0.23	0.65	49.5

Table 13.A.2: Population in three functional age groups per 1 January, Potential support ratio and Dependency ratio, Sex ratio of total population, 1846-2022.

Year	Population size			Percentage share			Potential support ratio			Dependency ratio			Sex ratio M/(M+F) *100	
	Total	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66	67+	0-18	19-66		67+
1990	4 233 116	1 054 792	2 572 751	605 573	24.9	60.8	14.3	2.44	4.25	1.55	0.41	0.24	0.65	49.5
1991	4 249 830	1 051 016	2 587 095	611 719	24.7	60.9	14.4	2.46	4.23	1.56	0.41	0.24	0.64	49.4
1992	4 273 634	1 049 043	2 607 815	616 776	24.5	61.0	14.4	2.49	4.23	1.57	0.40	0.24	0.64	49.5
1993	4 299 167	1 049 884	2 629 510	619 773	24.4	61.2	14.4	2.50	4.24	1.57	0.40	0.24	0.63	49.5
1994	4 324 815	1 053 544	2 650 520	620 751	24.4	61.3	14.4	2.52	4.27	1.58	0.40	0.23	0.63	49.5
1995	4 348 410	1 058 241	2 668 383	621 786	24.3	61.4	14.3	2.52	4.29	1.59	0.40	0.23	0.63	49.4
1996	4 369 959	1 065 648	2 682 778	621 533	24.4	61.4	14.2	2.52	4.32	1.59	0.40	0.23	0.63	49.4
1997	4 392 714	1 075 801	2 695 463	621 450	24.5	61.4	14.1	2.51	4.34	1.59	0.40	0.23	0.63	49.4
1998	4 417 599	1 085 009	2 711 684	620 906	24.6	61.4	14.1	2.50	4.37	1.59	0.40	0.23	0.63	49.5
1999	4 445 329	1 093 641	2 731 978	619 710	24.6	61.5	13.9	2.50	4.41	1.59	0.40	0.23	0.63	49.5
2000	4 478 497	1 106 137	2 754 853	617 507	24.7	61.5	13.8	2.49	4.46	1.60	0.40	0.22	0.63	49.5
2001	4 503 436	1 114 730	2 775 006	613 700	24.8	61.6	13.6	2.49	4.52	1.61	0.40	0.22	0.62	49.5
2002	4 524 066	1 120 324	2 794 135	609 607	24.8	61.8	13.5	2.49	4.58	1.62	0.40	0.22	0.62	49.6
2003	4 552 252	1 129 060	2 818 049	605 143	24.8	61.9	13.3	2.50	4.66	1.62	0.40	0.21	0.62	49.6
2004	4 577 457	1 136 619	2 837 508	603 330	24.8	62.0	13.2	2.50	4.70	1.63	0.40	0.21	0.61	49.6
2005	4 606 363	1 143 737	2 858 692	603 934	24.8	62.1	13.1	2.50	4.73	1.64	0.40	0.21	0.61	49.6
2006	4 640 219	1 149 964	2 884 045	606 210	24.8	62.2	13.1	2.51	4.76	1.64	0.40	0.21	0.61	49.6
2007	4 681 134	1 156 590	2 914 797	609 747	24.7	62.3	13.0	2.52	4.78	1.65	0.40	0.21	0.61	49.7
2008	4 737 171	1 161 853	2 961 590	613 728	24.5	62.5	13.0	2.55	4.83	1.67	0.39	0.21	0.60	49.8
2009	4 799 252	1 168 235	3 014 403	616 614	24.3	62.8	12.8	2.58	4.89	1.69	0.39	0.20	0.59	49.9
2010	4 858 199	1 174 347	3 058 709	625 143	24.2	63.0	12.9	2.60	4.89	1.70	0.38	0.20	0.59	50.0
2011	4 920 305	1 179 368	3 103 900	637 037	24.0	63.1	12.9	2.63	4.87	1.71	0.38	0.21	0.59	50.0
2012	4 985 870	1 182 953	3 148 316	654 601	23.7	63.1	13.1	2.66	4.81	1.71	0.38	0.21	0.58	50.1
2013	5 051 275	1 187 989	3 190 074	673 212	23.5	63.2	13.3	2.69	4.74	1.71	0.37	0.21	0.58	50.2
2014	5 109 056	1 191 002	3 219 332	698 722	23.3	63.0	13.7	2.70	4.61	1.70	0.37	0.22	0.59	50.3
2015	5 165 802	1 192 473	3 250 588	722 741	23.1	62.9	14.0	2.73	4.50	1.70	0.37	0.22	0.59	50.3
2016	5 213 985	1 193 441	3 275 848	744 696	22.9	62.8	14.3	2.74	4.40	1.69	0.36	0.23	0.59	50.3
2017	5 258 317	1 196 190	3 296 125	766 002	22.7	62.7	14.6	2.76	4.30	1.68	0.36	0.23	0.60	50.4
2018	5 295 619	1 195 391	3 313 869	786 359	22.6	62.6	14.8	2.77	4.21	1.67	0.36	0.24	0.60	50.4
2019	5 328 212	1 188 869	3 333 649	805 694	22.3	62.6	15.1	2.80	4.14	1.67	0.36	0.24	0.60	50.4
2020	5 367 580	1 182 165	3 357 995	827 420	22.0	62.6	15.4	2.84	4.06	1.67	0.35	0.25	0.60	50.4
2021	5 391 369	1 174 037	3 367 675	849 657	21.8	62.5	15.8	2.87	3.96	1.66	0.35	0.25	0.60	50.4
2022	5 425 270	1 172 140	3 382 167	870 963	21.6	62.3	16.1	2.89	3.88	1.66	0.35	0.26	0.60	50.5

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Long run trends in demographic data, 1735-2021

Source: 1846-2022 <https://www.ssb.no/en/statbank/table/10211> Population, by sex and age (0, 1,..., 104, 105+ years)

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
1845	4.557			32.8					
1846	4.514			32.8					
1847	4.452			32.8					
1848	4.281			32.8					
1849	4.589			32.8					
1850	4.411			32.8			1820	4.550	4.550
1851	4.521			32.8			1821	4.552	4.552
1852	4.382			32.8			1822	4.553	4.553
1853	4.500			32.8			1823	4.554	4.554
1854	4.796			32.8			1824	4.554	4.554
1855	4.715			32.8			1825	4.557	4.557
1856	4.409			32.8			1826	4.556	4.556
1857	4.549			32.8			1827	4.553	4.553
1858	4.647			32.8			1828	4.554	4.554
1859	4.855			32.8			1829	4.555	4.555
1860	4.676			32.8			1830	4.556	4.556
1861	4.342			32.8			1831	4.551	4.551
1862	4.568			32.8			1832	4.553	4.553
1863	4.697			32.8			1833	4.549	4.549
1864	4.603			32.8			1834	4.550	4.550
1865	4.559			32.8			1835	4.546	4.546
1866	4.726			32.8			1836	4.543	4.543
1867	4.481			32.8			1837	4.541	4.541
1868	4.398			32.8			1838	4.535	4.535
1869	4.305			32.8			1839	4.536	4.536
1870	4.342			32.8			1840	4.531	4.531
1871	4.369			32.8			1841	4.531	4.531
1872	4.462			32.8			1842	4.532	4.532
1873	4.447			32.8			1843	4.533	4.533
1874	4.616			32.8			1844	4.527	4.527
1875	4.699			32.8			1845	4.526	4.526
1876	4.696			32.8			1846	4.525	4.525
1877	4.716			32.8			1847	4.522	4.522

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
1878	4.677			32.7			1848	4.518	4.518
1879	4.768			32.7			1849	4.512	4.512
1880	4.581			32.7			1850	4.506	4.506
1881	4.447			32.7			1851	4.497	4.497
1882	4.526			32.7			1852	4.485	4.485
1883	4.576			32.7			1853	4.470	4.470
1884	4.669			32.7			1854	4.451	4.451
1885	4.642			32.7			1855	4.426	4.426
1886	4.545			32.7			1856	4.401	4.401
1887	4.615			32.7			1857	4.373	4.373
1888	4.462			32.6			1858	4.348	4.348
1889	4.349			32.6			1859	4.324	4.324
1890	4.459			32.6			1860	4.297	4.297
1891	4.513			32.6			1861	4.274	4.274
1892	4.342			32.5			1862	4.256	4.256
1893	4.461			32.5			1863	4.226	4.226
1894	4.360			32.4			1864	4.195	4.195
1895	4.483			32.3			1865	4.163	4.163
1896	4.424			32.3			1866	4.128	4.128
1897	4.445			32.2			1867	4.095	4.095
1898	4.494			32.2			1868	4.060	4.060
1899	4.442			32.1			1869	4.029	4.029
1900	4.390			32.1			1870	4.001	4.001
1901	4.366			32.1			1871	3.977	3.977
1902	4.258			32.0			1872	3.953	3.953
1903	4.163			32.0			1873	3.918	3.918
1904	4.069			32.1			1874	3.875	3.875
1905	3.952			32.0			1875	3.833	3.833
1906	3.916			32.0			1876	3.781	3.781
1907	3.865			32.0			1877	3.731	3.731
1908	3.872			31.9			1878	3.677	3.677
1909	3.956			31.9			1879	3.622	3.622
1910	3.823			31.9			1880	3.567	3.567

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
1911	3.804			31.8			1881	3.513	3.513
1912	3.723			31.8			1882	3.466	3.466
1913	3.645			31.8			1883	3.412	3.412
1914	3.623			31.7			1884	3.346	3.346
1915	3.374			31.7			1885	3.279	3.279
1916	3.433			31.6			1886	3.203	3.203
1917	3.533			31.6			1887	3.125	3.125
1918	3.439			31.5			1888	3.041	3.041
1919	3.175			31.5			1889	2.958	2.958
1920	3.610			31.3			1890	2.879	2.879
1921	3.312			31.2			1891	2.803	2.803
1922	3.184			31.3			1892	2.733	2.733
1923	3.092			31.3			1893	2.662	2.662
1924	2.853			31.3			1894	2.584	2.584
1925	2.615			31.3			1895	2.507	2.507
1926	2.591			31.3			1896	2.431	2.431
1927	2.376			31.3			1897	2.349	2.349
1928	2.337			31.2			1898	2.269	2.269
1929	2.235			31.1			1899	2.189	2.189
1930	2.188			30.9			1900	2.122	2.122
1931	2.078			30.9			1901	2.067	2.067
1932	2.038			30.9			1902	2.009	2.009
1933	1.865			30.8			1903	1.977	1.977
1934	1.823			30.6			1904	1.965	1.965
1935	1.779			30.6			1905	1.964	1.964
1936	1.798			30.4			1906	1.973	1.973
1937	1.839			30.3			1907	1.983	1.983
1938	1.878			30.2			1908	1.998	1.998
1939	1.906			30.0			1909	2.025	2.025
1940	1.947			29.9			1910	2.042	2.042
1941	1.834			29.8			1911	2.052	2.052
1942	2.114			29.7			1912	2.084	2.084
1943	2.265			29.9			1913	2.092	2.092

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
1944	2.448			30.0			1914	2.111	2.111
1945	2.434			30.1			1915	2.143	2.143
1946	2.737			30.3			1916	2.149	2.149
1947	2.650			30.0			1917	2.173	2.173
1948	2.590			29.8			1918	2.204	2.204
1949	2.502			29.6			1919	2.209	2.209
1950	2.504			29.4			1920	2.218	2.218
1951	2.465			29.1			1921	2.216	2.216
1952	2.583			28.9			1922	2.223	2.223
1953	2.659			28.7			1923	2.255	2.255
1954	2.696			28.5			1924	2.279	2.279
1955	2.784			28.4			1925	2.292	2.292
1956	2.857			28.2			1926	2.354	2.354
1957	2.862			28.1			1927	2.383	2.383
1958	2.896			28.0			1928	2.420	2.420
1959	2.924			28.0			1929	2.427	2.427
1960	2.896			27.9			1930	2.494	2.494
1961	2.942	1.422	1.385	27.9	24.6	28.2	1931	2.520	2.520
1962	2.911	1.415	1.379	27.8	24.3	27.9	1932	2.554	2.554
1963	2.922	1.429	1.393	27.8	24.0	27.5	1933	2.572	2.572
1964	2.978	1.436	1.399	27.8	23.8	27.2	1934	2.578	2.578
1965	2.944	1.423	1.388	27.7	23.6	26.9	1935	2.571	2.571
1966	2.897	1.400	1.367	27.6	23.4	26.6	1936	2.557	2.557
1967	2.808	1.361	1.330	27.5	23.3	26.3	1937	2.536	2.536
1968	2.750	1.333	1.304	27.3	23.3	26.2	1938	2.517	2.517
1969	2.690	1.308	1.278	27.2	23.3	26.0	1939	2.493	2.493
1970	2.500	1.210	1.187	27.0	23.2	26.0	1940	2.436	2.436
1971	2.490	1.213	1.186	26.8	23.3	26.0	1941	2.401	2.401
1972	2.380	1.159	1.134	26.7	23.3	25.9	1942	2.348	2.348
1973	2.230	1.079	1.058	26.6	23.4	26.0	1943	2.292	2.292
1974	2.130	1.047	1.027	26.5	23.5	26.1	1944	2.248	2.248
1975	1.980	0.967	0.950	26.4	23.5	26.2	1945	2.213	2.213
1976	1.860	0.909	0.893	26.5	23.6	26.4	1946	2.181	2.181

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
1977	1.750	0.852	0.836	26.6	23.8	26.5	1947	2.155	2.155
1978	1.770	0.858	0.843	26.8	24.1	26.8	1948	2.132	2.132
1979	1.750	0.851	0.838	26.8	24.1	27.0	1949	2.107	2.107
1980	1.720	0.834	0.821	26.9	24.3	27.1	1950	2.089	2.089
1981	1.700	0.834	0.822	26.9	24.4	27.2	1951	2.082	2.082
1982	1.710	0.827	0.815	27.1	24.5	27.3	1952	2.067	2.067
1983	1.660	0.801	0.790	27.3	24.7	27.5	1953	2.045	2.045
1984	1.660	0.809	0.797	27.4	24.9	27.7	1954	2.050	2.051
1985	1.680	0.815	0.802	27.5	25.0	27.7	1955	2.054	2.054
1986	1.710	0.829	0.817	27.5	25.1	27.8	1956	2.056	2.056
1987	1.750	0.857	0.844	27.7	25.1	28.0	1957	2.062	2.062
1988	1.840	0.898	0.886	27.8	25.2	28.1	1958	2.072	2.072
1989	1.890	0.918	0.904	28.0	25.3	28.1	1959	2.080	2.080
1990	1.930	0.941	0.928	28.1	25.5	28.3	1960	2.093	2.093
1991	1.920	0.931	0.919	28.3	25.7	28.4	1961	2.089	2.089
1992	1.880	0.908	0.898	28.4	25.9	28.5	1962	2.092	2.092
1993	1.860	0.908	0.898	28.6	26.0	28.8	1963	2.085	2.085
1994	1.870	0.906	0.895	28.7	26.3	28.9	1964	2.082	2.082
1995	1.870	0.908	0.900	28.8	26.5	29.0	1965	2.074	2.074
1996	1.890	0.913	0.905	28.9	26.7	29.2	1966	2.075	2.075
1997	1.860	0.903	0.895	29.1	27.0	29.5	1967	2.071	2.071
1998	1.810	0.885	0.877	29.2	27.2	29.7	1968	2.079	2.079
1999	1.850	0.915	0.906	29.2	27.2	29.9	1969	2.066	2.066
2000	1.850	0.900	0.891	29.3	27.3	30.1	1970	2.062	2.062
2001	1.780	0.870	0.862	29.4	27.5	30.3	1971	2.046	2.047
2002	1.750	0.858	0.849	29.5	27.7	30.5	1972	2.039	2.042
2003	1.800	0.873	0.864	29.6	27.9	30.7	1973	2.034	2.039
2004	1.830	0.893	0.883	29.7	28.0	30.8	1974	2.014	2.023
2005	1.840	0.896	0.888	29.8	28.1	30.9	1975	2.001	2.018
2006	1.900	0.929	0.921	29.8	28.1	30.8	1976	1.987	2.016
2007	1.900	0.925	0.917	29.9	28.1	30.9	1977	1.962	2.011
2008	1.960	0.950	0.942	29.9	28.1	30.9	1978	1.908	1.986
2009	1.980	0.960	0.952	30.0	28.1	30.9	1979	1.855	1.971

Table 13.A.3: Fertility indicators: Total fertility rate, gross and net reproduction rate, and mean age of birth for calendar years 1845-2021. Total fertility rate (TFR) for birth cohorts 1820-1983 (moved 30 years ahead). Cohort TFR from 1968 onwards (marked with red background) are in part based on projections of the yet unobserved age-specific fertility rates.

Year	TFR for calendar years	Gross reproduction rate	Net reproduction rate	Calculated mean age of child-bearing	Mean age of Child-bearing mothers	Mean age of Child-bearing fathers	Birth cohort	Cumulated sum of rates as observed in 2017 or earlier	TFR for cohorts, projected with 2017 rates for unobserved rates
2010	1.950	0.949	0.941	30.1	28.1	30.8	1980	1.788	1.953
2011	1.880	0.912	0.905	30.2	28.3	31.1	1981	1.708	1.933
2012	1.850	0.901	0.895	30.3	28.5	31.2	1982	1.627	1.928
2013	1.780	0.871	0.865	30.4	28.6	31.3	1983	1.503	1.895
2014	1.760	0.853	0.848	30.6	28.7	31.3	1984	1.395	1.889
2015	1.730	0.841	0.835	30.7	28.9	31.4	1985	1.257	1.864
2016	1.710	0.826	0.820	30.9	29.0	31.5	1986	1.123	1.852
2017	1.620	0.787	0.782	31.0	29.3	31.7	1987	0.963	1.821
2018	1.560	0.757	0.753		29.5	31.8	1988	0.818	1.808
2019	1.530	0.743	0.738		29.8	32.0	1989	0.652	1.765
2020	1.480	0.722	0.717		29.9	32.1	1990	0.519	1.742
2021	1.550	0.758	0.753		30.1	32.1	1991		

Sources:

Total reproduction rate: 1845-1967 Brunborg and Mamelund (1994), 1961-2021 <https://www.ssb.no/en/statbank/table/08454>

Total fertility rate: 1845-1967 Brunborg and Mamelund (1994), 1968-2021 <https://www.ssb.no/en/statbank/table/04232>

Mean age of parent at first child's birth: 1961-2021 <https://www.ssb.no/en/statbank/table/07872>

Cohort TFR from 1968 onwards (marked with red background) is in part based on projections of the yet unobserved age-specific fertility rate (Figure 13.7).

Table 13.A.4: Mortality indicators: Life expectancy at ages 0, 60, 70, 80 and 90, excess female life expectancy, infant mortality rate, 1846-2021.

Year	Life expectancy, male					Life expectancy, female					Excess female life expectancy	Infant mortality rate
	age 0	age 60	age 70	age 80	age 90	age 0	age 60	age 70	age 80	age 90		
1846	46.4	15.0	9.5	5.4	2.8	49.6	15.8	9.8	5.6	2.7	3.1	117.8
1847	43.4	13.9	8.6	5.1	3.2	46.0	14.8	9.1	5.1	2.3	2.6	119.5
1848	43.3	13.3	8.3	4.7	2.4	46.6	14.1	8.6	4.8	2.1	3.3	120.5
1849	46.3	14.3	8.8	4.9	2.4	49.8	14.7	9.0	4.8	2.3	3.4	99.4
1850	47.7	14.4	9.0	5.3	2.5	51.1	15.6	9.7	5.4	2.4	3.4	102.0
1851	47.9	14.5	9.1	5.1	2.1	51.4	15.6	9.6	5.5	2.4	3.4	107.8
1852	46.9	14.4	8.9	4.9	2.1	49.8	15.5	9.6	5.4	2.5	2.9	118.6
1853	46.4	14.3	9.1	5.2	3.1	49.2	15.0	9.4	5.4	2.8	2.8	102.5
1854	49.9	15.1	9.4	5.4	2.7	53.2	16.1	10.1	5.7	2.7	3.3	97.2
1855	48.5	14.3	8.8	5.0	2.5	52.1	15.1	9.1	5.2	3.2	3.6	102.5
1856	48.7	14.7	8.9	5.1	3.1	51.7	15.9	9.7	5.5	2.8	3.0	97.1
1857	48.7	14.8	9.2	4.8	2.7	51.5	15.4	9.4	5.2	2.9	2.8	100.3
1858	49.9	15.5	9.6	4.8	2.9	52.9	16.3	10.2	5.8	3.0	3.0	102.4
1859	48.5	15.7	10.0	5.3	2.7	51.2	16.3	10.4	5.7	3.0	2.7	104.3
1860	48.5	15.1	9.5	4.9	2.3	51.1	16.3	10.2	5.3	3.0	2.6	102.0
1861	44.5	15.4	9.6	4.9	2.5	46.7	16.3	10.2	5.6	2.9	2.3	113.2
1862	43.4	15.4	9.6	5.1	3.0	45.6	16.5	10.4	5.8	3.1	2.2	109.8
1863	45.2	15.2	9.5	5.0	2.9	48.1	16.4	10.2	5.6	3.1	2.9	105.7
1864	47.5	15.0	9.4	5.2	3.3	49.9	15.8	9.9	5.4	2.8	2.3	100.7
1865	48.9	15.7	9.7	5.3	3.2	51.7	16.8	10.5	5.7	3.0	2.8	103.2
1866	48.3	15.3	9.6	5.4	2.2	51.4	16.3	10.3	6.0	2.7	3.1	107.6
1867	46.1	14.6	8.9	5.0	1.7	49.4	15.3	9.5	5.5	2.4	3.3	121.8
1868	45.3	15.0	9.5	5.5	1.9	48.8	16.0	10.0	5.7	2.4	3.5	126.1
1869	47.5	15.0	9.5	5.3	2.0	50.9	15.9	10.1	5.9	2.3	3.4	111.4
1870	49.2	14.9	9.4	5.2	2.3	52.5	16.0	10.2	5.9	2.6	3.3	100.7
1871	47.9	15.0	9.4	5.2	2.6	51.3	15.9	9.9	5.3	2.3	3.4	98.7
1872	48.4	15.4	9.6	5.3	2.9	51.5	16.2	10.2	5.7	2.9	3.0	102.5
1873	48.2	15.6	9.9	5.6	3.2	51.1	16.4	10.3	5.5	3.0	2.9	105.9
1874	46.3	15.3	9.5	5.4	3.2	49.2	16.4	10.3	5.6	3.4	2.9	112.7
1875	46.1	14.7	9.2	5.2	3.0	49.2	15.8	9.9	5.7	3.5	3.1	114.9
1876	45.4	15.4	9.8	5.7	3.2	48.3	16.4	10.4	6.1	3.7	3.0	108.1
1877	48.3	16.0	10.1	6.0	3.8	51.2	17.1	10.8	6.2	3.5	2.9	107.2
1878	50.4	16.4	10.4	6.1	3.6	53.2	17.3	10.9	6.2	3.5	2.8	103.1
1879	52.0	16.6	10.5	5.8	3.2	54.4	17.5	11.1	6.5	3.5	2.4	91.7
1880	50.5	16.1	10.2	5.7	3.2	53.3	17.0	10.9	6.1	3.5	2.8	95.3
1881	49.0	15.5	9.5	5.3	3.1	51.8	16.6	10.5	5.8	3.3	2.8	96.6

Table 13.A.4: Mortality indicators: Life expectancy at ages 0, 60, 70, 80 and 90, excess female life expectancy, infant mortality rate, 1846-2021.

Year	Life expectancy, male					Life expectancy, female					Excess female life expectancy	Infant mortality rate
	age 0	age 60	age 70	age 80	age 90	age 0	age 60	age 70	age 80	age 90		
1882	46.2	16.0	10.1	5.5	2.9	48.5	16.8	10.7	6.0	3.2	2.3	111.0
1883	48.5	16.2	10.2	5.7	3.3	50.7	17.0	10.8	6.1	3.3	2.2	96.6
1884	49.5	16.5	10.4	6.0	3.2	52.0	17.3	11.1	6.1	3.7	2.5	96.3
1885	49.8	16.0	10.1	5.6	3.1	52.3	17.3	11.0	6.1	3.1	2.5	93.1
1886	50.5	16.2	10.2	5.6	3.2	52.9	17.5	11.1	6.1	3.1	2.4	90.6
1887	50.6	16.5	10.4	5.7	3.1	52.8	17.7	11.2	6.2	3.1	2.2	87.5
1888	49.0	16.0	10.0	5.5	2.9	51.6	16.9	10.6	5.7	3.0	2.6	97.3
1889	47.6	16.3	10.1	5.6	2.9	50.4	17.6	11.1	6.2	3.3	2.8	110.0
1890	47.2	16.2	10.3	5.9	3.1	50.0	17.2	10.9	6.1	3.3	2.9	97.2
1891	48.2	15.9	10.0	5.6	3.0	51.4	16.9	10.7	5.9	3.3	3.3	96.9
1892	47.8	15.5	9.6	5.2	2.9	51.4	16.5	10.2	5.7	3.2	3.6	103.8
1893	49.5	16.5	10.4	5.8	3.1	53.3	17.5	11.1	6.2	3.6	3.8	89.1
1894	48.8	16.4	10.3	5.6	3.0	52.4	17.6	11.1	6.2	3.3	3.6	103.0
1895	51.2	16.7	10.6	5.9	3.2	54.5	17.8	11.2	6.2	3.4	3.3	95.5
1896	51.8	17.0	10.7	6.0	3.3	55.9	18.0	11.4	6.4	3.5	4.1	96.5
1897	51.8	16.6	10.4	5.8	3.3	55.7	17.9	11.3	6.5	3.5	3.9	95.6
1898	52.2	16.7	10.6	5.8	3.1	55.8	17.8	11.3	6.5	3.2	3.6	89.4
1899	49.8	16.3	10.2	5.6	3.1	53.4	17.1	10.7	6.0	3.1	3.6	106.7
1900	51.8	16.3	10.0	5.4	2.8	55.2	17.2	10.7	5.8	3.2	3.4	90.5
1901	52.7	16.8	10.5	5.8	2.9	56.5	17.9	11.2	6.3	3.2	3.7	91.1
1902	55.0	17.1	11.0	6.1	3.1	58.0	18.0	11.5	6.5	3.6	3.1	73.8
1903	53.4	16.5	10.5	5.8	3.3	56.4	17.8	11.2	6.2	3.4	3.0	77.9
1904	54.8	16.8	10.5	5.9	3.2	57.3	17.8	11.2	6.3	3.3	2.5	74.8
1905	53.9	16.8	10.6	5.7	3.0	56.1	17.7	11.1	6.1	2.9	2.2	81.5
1906	55.6	17.2	10.9	6.2	3.3	58.1	18.3	11.6	6.5	3.2	2.5	69.1
1907	55.0	16.6	10.3	5.7	2.9	57.8	17.4	10.9	5.9	3.1	2.8	65.8
1908	55.0	16.7	10.5	5.8	3.0	57.5	17.8	11.1	6.2	3.1	2.6	75.0
1909	56.0	16.9	10.6	6.0	3.1	58.9	18.0	11.3	6.5	3.5	2.9	69.5
1910	56.4	16.8	10.5	5.6	2.8	59.5	17.8	11.1	6.2	3.3	3.1	67.2
1911	56.4	17.0	10.7	6.0	3.1	59.6	18.4	11.7	6.6	3.5	3.3	64.5
1912	56.2	16.7	10.5	5.9	3.1	59.2	17.9	11.3	6.3	3.5	3.0	67.2
1913	56.5	16.8	10.6	5.7	3.0	60.0	17.9	11.2	6.2	3.3	3.5	64.3
1914	56.1	16.7	10.4	5.8	3.1	59.5	17.8	11.2	6.2	3.2	3.4	67.6
1915	56.4	16.5	10.2	5.5	2.8	59.8	17.6	10.9	6.0	3.3	3.4	67.3
1916	55.4	16.5	10.2	5.6	2.9	59.1	17.5	10.8	5.9	3.2	3.8	64.0
1917	56.1	16.6	10.3	5.5	3.0	59.4	17.6	10.9	5.9	3.0	3.2	64.0

Table 13.A.4: Mortality indicators: Life expectancy at ages 0, 60, 70, 80 and 90, excess female life expectancy, infant mortality rate, 1846-2021.

Year	Life expectancy, male					Life expectancy, female					Excess female life expectancy	Infant mortality rate
	age 0	age 60	age 70	age 80	age 90	age 0	age 60	age 70	age 80	age 90		
1918	48.5	16.7	10.5	5.9	3.3	52.1	17.5	11.1	6.3	3.4	3.5	62.9
1919	55.4	16.7	10.4	5.7	3.0	58.0	17.8	11.2	6.3	3.1	2.6	61.7
1920	57.6	16.9	10.6	5.9	3.2	60.3	18.1	11.3	6.3	3.2	2.6	57.5
1921	60.2	17.2	10.9	6.0	3.0	62.8	18.5	11.8	6.5	3.3	2.6	53.8
1922	59.6	16.8	10.5	5.8	3.0	61.9	17.8	11.2	6.2	3.2	2.3	54.5
1923	60.5	16.9	10.4	5.7	2.8	63.0	18.0	11.2	6.1	3.3	2.4	49.5
1924	60.8	17.1	10.7	6.0	3.0	63.2	18.3	11.6	6.5	3.3	2.4	50.0
1925	60.9	17.1	10.8	6.1	3.1	63.9	18.4	11.6	6.4	3.3	3.0	50.2
1926	61.9	17.4	11.0	6.1	3.0	64.5	18.3	11.6	6.5	3.3	2.6	47.9
1927	61.2	16.9	10.6	5.8	2.7	64.3	18.1	11.3	6.1	3.1	3.2	50.7
1928	62.0	17.1	10.7	6.0	3.1	64.6	18.3	11.6	6.4	3.3	2.6	49.0
1929	60.9	17.0	10.5	5.6	2.7	63.8	18.0	11.2	6.1	3.2	2.9	54.4
1930	62.6	17.4	11.1	6.1	3.3	65.6	18.5	11.6	6.6	3.5	3.0	45.6
1931	62.7	17.0	10.5	5.8	2.9	65.5	18.2	11.3	6.1	3.1	2.8	46.3
1932	63.2	17.1	10.7	5.9	3.0	65.9	18.3	11.3	6.2	3.3	2.6	46.8
1933	63.9	17.4	10.8	6.0	3.1	66.8	18.7	11.7	6.4	3.4	2.9	47.6
1934	64.7	17.6	11.1	6.1	3.3	67.7	18.7	11.8	6.7	3.6	3.0	39.3
1935	64.3	17.1	10.7	5.9	2.9	67.3	18.2	11.3	6.2	3.3	3.0	44.2
1936	64.3	17.2	10.7	5.8	3.1	67.3	18.4	11.3	6.1	3.2	3.1	42.0
1937	64.4	17.2	10.7	5.8	3.0	67.6	18.3	11.3	6.2	3.3	3.3	42.0
1938	65.2	17.3	10.8	5.9	3.3	69.0	18.6	11.6	6.3	3.2	3.8	37.3
1939	65.6	17.2	10.5	5.6	2.7	69.0	18.3	11.3	6.1	3.0	3.4	37.2
1940	63.2	17.2	10.8	5.8	2.9	68.6	18.2	11.2	6.1	3.0	5.4	38.7
1941	63.3	17.4	10.8	5.7	2.7	68.2	18.6	11.4	6.1	2.9	4.9	43.0
1942	63.0	17.8	11.1	6.2	2.9	68.7	19.1	12.0	6.6	3.3	5.7	35.9
1943	63.3	18.1	11.4	6.1	3.0	69.0	19.6	12.3	6.7	3.2	5.7	35.4
1944	63.1	18.2	11.5	6.3	3.1	68.7	19.3	12.1	6.6	3.1	5.6	36.7
1945	65.9	18.5	11.6	6.3	3.0	70.4	19.8	12.5	6.7	3.2	4.5	36.4
1946	67.9	18.6	11.8	6.5	3.1	71.3	19.6	12.3	6.6	3.1	3.5	34.6
1947	68.3	18.3	11.4	6.2	2.9	71.6	19.3	12.0	6.4	3.3	3.3	34.6
1948	69.4	18.6	11.5	6.5	3.1	72.8	19.8	12.3	6.8	3.5	3.4	29.6
1949	70.0	18.4	11.4	6.3	3.2	73.0	19.3	11.9	6.4	3.2	3.1	27.7
1950	69.9	18.1	11.2	6.0	3.1	73.2	19.2	11.8	6.4	3.2	3.3	28.2
1951	70.8	18.9	11.8	6.5	3.4	74.2	20.0	12.4	6.7	3.5	3.5	25.7
1952	71.0	18.6	11.6	6.4	3.5	74.3	19.9	12.3	6.7	3.3	3.3	23.7
1953	71.2	18.5	11.6	6.4	3.2	75.0	20.1	12.4	6.7	3.3	3.8	22.0

Table 13.A.4: Mortality indicators: Life expectancy at ages 0, 60, 70, 80 and 90, excess female life expectancy, infant mortality rate, 1846-2021.

Year	Life expectancy, male					Life expectancy, female					Excess female life expectancy	Infant mortality rate
	age 0	age 60	age 70	age 80	age 90	age 0	age 60	age 70	age 80	age 90		
1954	71.4	18.3	11.5	6.4	3.4	75.1	20.0	12.3	6.6	3.2	3.7	21.4
1955	71.6	18.7	11.8	6.5	3.2	75.3	20.1	12.5	6.6	3.1	3.7	20.6
1956	71.5	18.3	11.4	6.3	3.1	75.5	20.2	12.4	6.7	3.1	4.0	21.2
1957	71.4	18.3	11.6	6.4	3.2	75.5	20.1	12.3	6.6	3.2	4.1	20.5
1958	71.4	18.1	11.3	6.3	3.1	75.5	20.1	12.3	6.6	3.2	4.1	20.0
1959	71.4	18.1	11.4	6.3	3.1	75.8	20.1	12.5	6.7	3.2	4.4	18.7
1960	71.3	18.0	11.3	6.2	3.2	75.8	20.1	12.4	6.7	3.2	4.5	18.9
1961	71.2	17.8	11.2	6.1	3.0	76.0	20.3	12.5	6.6	3.3	4.9	17.9
1962	71.0	17.7	11.1	6.1	3.0	76.0	20.2	12.4	6.6	3.2	5.1	17.7
1963	70.8	17.3	10.7	5.9	3.0	75.5	19.5	11.8	6.2	3.0	4.7	16.9
1964	71.3	17.7	11.2	6.2	3.3	76.1	20.1	12.3	6.6	3.4	4.8	16.4
1965	71.1	17.7	11.2	6.2	3.3	76.5	20.5	12.7	6.8	3.4	5.4	16.8
1966	71.4	17.6	11.0	6.2	3.2	76.7	20.5	12.7	6.8	3.4	5.3	14.6
1967	71.3	17.6	11.1	6.3	3.2	77.0	20.8	13.0	7.1	3.6	5.6	14.8
1968	71.2	17.4	10.9	6.2	3.3	76.8	20.6	12.7	6.9	3.5	5.6	13.7
1969	70.8	17.1	10.8	6.1	3.3	76.7	20.6	12.8	7.1	3.7	5.9	13.8
1970	71.0	17.3	10.8	6.1	3.2	77.3	20.9	13.0	7.0	3.7	6.3	12.7
1971	71.2	17.4	10.8	6.1	3.4	77.4	21.0	13.0	7.0	3.6	6.2	12.8
1972	71.3	17.4	10.9	6.2	3.2	77.5	21.1	13.1	7.1	3.8	6.2	11.8
1973	71.3	17.4	10.8	6.1	3.3	77.7	21.2	13.1	7.1	3.5	6.4	11.9
1974	71.7	17.6	11.0	6.3	3.3	78.0	21.4	13.4	7.3	3.6	6.3	10.4
1975	71.7	17.5	11.0	6.2	3.4	78.1	21.5	13.5	7.3	3.7	6.4	11.1
1976	72.0	17.6	11.0	6.3	3.3	78.2	21.7	13.7	7.4	3.7	6.2	10.5
1977	72.2	17.9	11.2	6.5	3.4	78.7	21.9	13.9	7.6	3.9	6.4	9.2
1978	72.4	17.8	11.1	6.4	3.4	78.6	21.9	13.9	7.6	3.9	6.3	8.6
1979	72.2	17.7	11.1	6.4	3.4	78.8	21.9	13.9	7.6	3.7	6.7	8.8
1980	72.3	17.8	11.3	6.5	3.5	79.2	22.2	14.2	7.8	3.9	6.8	8.1
1981	72.6	17.8	11.2	6.3	3.4	79.3	22.3	14.3	7.8	3.8	6.7	7.5
1982	72.7	18.0	11.3	6.6	3.6	79.6	22.6	14.6	8.1	4.2	6.9	8.1
1983	72.7	18.0	11.4	6.6	3.4	79.6	22.7	14.5	8.0	4.1	6.8	7.9
1984	73.0	18.0	11.3	6.5	3.5	79.6	22.8	14.7	8.1	4.1	6.6	8.3
1985	72.6	17.9	11.1	6.5	3.4	79.4	22.6	14.4	8.0	4.0	6.8	8.5
1986	72.9	18.0	11.4	6.6	3.5	79.7	23.0	14.8	8.2	4.1	6.9	7.8
1987	72.8	18.0	11.3	6.4	3.4	79.6	22.8	14.7	8.2	4.1	6.8	8.4
1988	73.1	18.2	11.4	6.5	3.6	79.6	22.7	14.6	8.1	3.9	6.5	8.0
1989	73.3	18.3	11.5	6.5	3.5	79.9	22.9	14.8	8.2	3.9	6.5	7.8

Table 13.A.4: Mortality indicators: Life expectancy at ages 0, 60, 70, 80 and 90, excess female life expectancy, infant mortality rate, 1846-2021.

Year	Life expectancy, male					Life expectancy, female					Excess female life expectancy	Infant mortality rate
	age 0	age 60	age 70	age 80	age 90	age 0	age 60	age 70	age 80	age 90		
1990	73.4	18.3	11.4	6.4	3.3	79.8	22.7	14.6	8.1	4.0	6.4	6.9
1991	74.0	18.5	11.6	6.5	3.5	80.1	23.0	14.9	8.3	4.0	6.1	6.2
1992	74.2	18.7	11.7	6.5	3.4	80.3	23.2	15.1	8.4	4.2	6.2	5.8
1993	74.2	18.5	11.5	6.4	3.2	80.3	22.9	14.8	8.1	3.9	6.0	5.0
1994	74.9	19.0	12.0	6.7	3.4	80.6	23.4	15.3	8.5	4.0	5.8	5.2
1995	74.8	18.9	11.8	6.5	3.3	80.8	23.4	15.2	8.4	4.0	6.0	4.0
1996	75.4	19.3	12.0	6.8	3.5	81.1	23.7	15.5	8.6	4.0	5.7	4.0
1997	75.5	19.4	12.1	6.7	3.3	81.0	23.7	15.4	8.5	4.0	5.5	4.1
1998	75.5	19.6	12.2	6.8	3.5	81.3	23.9	15.6	8.6	4.1	5.7	4.0
1999	75.6	19.6	12.2	6.6	3.3	81.1	23.7	15.5	8.5	3.9	5.5	3.9
2000	76.0	20.1	12.5	6.8	3.4	81.4	24.0	15.6	8.6	4.1	5.4	3.8
2001	76.2	20.1	12.6	6.8	3.4	81.5	24.0	15.8	8.7	4.1	5.3	3.9
2002	76.5	20.2	12.7	6.9	3.3	81.6	24.0	15.7	8.7	4.0	5.1	3.5
2003	77.0	20.7	13.1	7.1	3.4	81.9	24.4	16.0	8.9	4.2	4.9	3.4
2004	77.5	21.1	13.4	7.3	3.6	82.3	24.8	16.4	9.2	4.3	4.8	3.2
2005	77.7	21.2	13.4	7.3	3.6	82.5	24.9	16.5	9.3	4.3	4.8	3.1
2006	78.1	21.5	13.8	7.5	3.7	82.7	24.9	16.5	9.2	4.2	4.5	3.2
2007	78.2	21.4	13.7	7.4	3.5	82.7	24.9	16.5	9.2	4.3	4.4	3.1
2008	78.3	21.6	13.8	7.5	3.5	83.0	25.1	16.7	9.4	4.4	4.6	2.7
2009	78.6	21.9	14.1	7.7	3.7	83.1	25.2	16.8	9.4	4.4	4.5	3.1
2010	78.9	22.0	14.2	7.8	3.6	83.2	25.3	16.9	9.6	4.4	4.3	2.8
2011	79.0	22.2	14.3	7.9	3.8	83.5	25.5	17.1	9.6	4.4	4.5	2.4
2012	79.4	22.3	14.4	7.8	3.7	83.4	25.3	16.9	9.5	4.3	4.0	2.5
2013	79.7	22.5	14.6	8.0	3.9	83.6	25.6	17.1	9.7	4.5	4.0	2.5
2014	80.0	22.8	14.8	8.2	3.7	84.1	25.9	17.4	9.9	4.6	4.1	2.4
2015	80.4	23.0	14.9	8.2	3.8	84.2	25.9	17.3	9.9	4.5	3.8	2.4
2016	80.6	23.2	15.2	8.4	3.9	84.2	26.0	17.4	9.9	4.6	3.6	2.2
2017	80.9	23.4	15.3	8.4	3.9	84.3	26.0	17.4	10.0	4.6	3.4	2.3
2018	81.0	23.5	15.4	8.5	4.0	84.5	26.2	17.6	10.0	4.6	3.5	2.3
2019	81.2	23.7	15.6	8.7	3.9	84.7	26.3	17.6	10.2	4.7	3.5	2.1
2020	81.5	23.9	15.7	8.7	4.1	84.9	26.5	17.8	10.3	4.7	3.4	1.7
2021	81.6	23.9	15.7	8.8	4.1	84.7	26.3	17.6	10.1	4.6	3.1	1.8

Sources:

Life expectancy: 1826 and 1836 Brunborg (1976), 1846-1985 Mamelund and Borgan (1996),

1986-2021 <https://www.ssb.no/en/statbank/table/05375>

Infant mortality rate: 1846-1975 Mamelund and Borgan (1996), 1976-2021 <https://www.ssb.no/en/statbank/table/08393>

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females						
	Period	Cohort	Period -Cohort	Const.	Cohort projections			Period	Cohort	Period -Cohort	Const.	Cohort projections		
					Low	Medium	High					Low	Medium	High
1846	46.4	47.7	-1.2					49.6	50.8	-1.3				
1847	43.4	47.8	-4.5					46.0	50.9	-4.9				
1848	43.3	47.9	-4.6					46.5	51.2	-4.7				
1849	46.3	49.8	-3.5					49.8	52.7	-2.9				
1850	47.7	50.3	-2.6					51.1	52.9	-1.8				
1851	47.9	49.7	-1.8					51.4	52.8	-1.4				
1852	46.9	49.4	-2.5					49.8	52.4	-2.7				
1853	46.4	49.8	-3.4					49.2	52.8	-3.6				
1854	49.9	50.4	-0.4					53.2	53.0	0.2				
1855	48.5	49.8	-1.3					52.1	52.5	-0.4				
1856	48.7	49.5	-0.8					51.7	52.0	-0.4				
1857	48.7	49.2	-0.5					51.5	51.8	-0.4				
1858	49.9	48.9	1.1					52.9	51.5	1.4				
1859	48.5	48.5	-0.1					51.2	51.3	-0.1				
1860	48.5	48.2	0.3					51.1	50.9	0.2				
1861	44.4	46.8	-2.3					46.7	49.8	-3.1				
1862	43.4	47.5	-4.1					45.6	50.7	-5.1				
1863	45.2	49.0	-3.7					48.1	52.0	-3.9				
1864	47.5	49.5	-1.9					49.8	52.8	-2.9				
1865	48.9	50.0	-1.1					51.7	53.0	-1.3				
1866	48.3	49.7	-1.5					51.4	53.2	-1.8				
1867	46.1	48.4	-2.3					49.4	52.3	-2.8				
1868	45.3	48.7	-3.4					48.8	52.1	-3.3				
1869	47.5	49.8	-2.3					50.9	53.1	-2.2				
1870	49.2	49.9	-0.8					52.5	53.5	-1.0				
1871	47.9	50.4	-2.5					51.3	53.9	-2.5				
1872	48.4	50.1	-1.7					51.5	53.1	-1.6				
1873	48.2	49.6	-1.4					51.1	52.8	-1.7				
1874	46.3	49.3	-3.0					49.2	52.6	-3.4				
1875	46.1	49.4	-3.3					49.2	52.7	-3.5				
1876	45.4	49.8	-4.4					48.3	53.4	-5.1				
1877	48.3	50.3	-2.0					51.2	53.6	-2.4				
1878	50.4	50.8	-0.4					53.2	54.0	-0.8				
1879	52.0	51.3	0.7					54.4	54.5	-0.1				

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females						
	Period	Cohort	Period -Cohort	Const.	Cohort projections			Period	Cohort	Period -Cohort	Const.	Cohort projections		
					Low	Medium	High					Low	Medium	High
1880	50.5	50.8	-0.3					53.3	53.8	-0.5				
1881	49.0	50.7	-1.7					51.8	54.0	-2.2				
1882	46.2	50.5	-4.3					48.5	53.9	-5.4				
1883	48.5	51.7	-3.2					50.7	55.1	-4.4				
1884	49.5	51.6	-2.1					52.0	55.2	-3.2				
1885	49.8	51.9	-2.1					52.3	55.3	-3.0				
1886	50.5	52.6	-2.1					52.9	55.6	-2.7				
1887	50.6	52.9	-2.4					52.8	56.1	-3.4				
1888	49.0	52.6	-3.6					51.6	55.9	-4.3				
1889	47.6	52.2	-4.6					50.4	56.0	-5.6				
1890	47.2	53.2	-6.1					50.0	57.4	-7.4				
1891	48.2	53.3	-5.1					51.4	57.6	-6.2				
1892	47.8	53.7	-5.9					51.4	58.1	-6.7				
1893	49.5	54.5	-5.0					53.3	59.4	-6.1				
1894	48.8	54.4	-5.7					52.4	59.4	-7.1				
1895	51.2	55.2	-4.0					54.5	60.2	-5.8				
1896	51.8	55.1	-3.3					55.9	60.5	-4.6				
1897	51.8	55.5	-3.7					55.7	60.8	-5.1				
1898	52.2	55.7	-3.5					55.8	61.1	-5.4				
1899	49.8	55.1	-5.3					53.4	60.9	-7.4				
1900	51.8	56.5	-4.7					55.1	62.2	-7.1				
1901	52.7	57.0	-4.2					56.5	62.8	-6.4				
1902	54.9	58.3	-3.4					58.0	64.1	-6.1				
1903	53.4	58.6	-5.2					56.4	64.1	-7.6				
1904	54.8	58.9	-4.1					57.3	64.9	-7.6				
1905	53.9	59.0	-5.1					56.1	64.9	-8.8				
1906	55.6	60.1	-4.5					58.1	66.4	-8.3				
1907	55.0	60.6	-5.6					57.8	67.1	-9.3				
1908	55.0	60.4	-5.5					57.5	66.9	-9.3				
1909	56.0	61.3	-5.3					58.9	67.6	-8.7				
1910	56.4	61.6	-5.3					59.5	68.2	-8.8				
1911	56.3	62.1	-5.8					59.6	68.9	-9.3				
1912	56.2	62.1	-5.9					59.2	69.1	-9.9				
1913	56.5	62.5	-6.0					60.0	69.6	-9.6				

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females						
	Period	Cohort	Period -Cohort	Const.	Cohort projections			Period	Cohort	Period -Cohort	Const.	Cohort projections		
					Low	Medium	High					Low	Medium	High
1914	56.1	62.5	-6.4					59.5	69.5	-10.1				
1915	56.4	62.5	-6.1					59.8	69.9	-10.1				
1916	55.3	62.8	-7.5					59.1	70.6	-11.5				
1917	56.1	63.6	-7.4					59.4	71.2	-11.9				
1918	48.5	63.7	-15.2					52.1	71.5	-19.4				
1919	55.4	64.5	-9.1					58.0	72.5	-14.4				
1920	57.6	65.0	-7.4					60.3	73.2	-12.9				
1921	60.2	65.7	-5.5					62.8	73.8	-10.9				
1922	59.6	65.9	-6.3					61.9	74.0	-12.1				
1923	60.5	66.9	-6.3					63.0	74.5	-11.6				
1924	60.8	67.3	-6.5					63.2	74.9	-11.7				
1925	60.9	67.8	-6.9					63.9	75.4	-11.5				
1926	61.9	68.2	-6.3					64.5	75.5	-11.0				
1927	61.2	68.3	-7.2					64.3	75.8	-11.5				
1928	62.0	68.7	-6.7					64.6	75.9	-11.3				
1929	60.9	68.5	-7.5					63.8	76.0	-12.2				
1930	62.6	69.6	-7.1					65.6	76.8	-11.2				
1931	62.6	69.8	-7.2					65.5	77.3	-11.8				
1932	63.2	70.2	-6.9	70.2	70.2	70.3	70.2	65.9	77.3	-11.4	77.3	77.3	77.4	77.5
1933	63.9			70.6	70.5	70.7	70.6	66.8			77.8	77.9	77.9	78.0
1934	64.7			71.3	71.3	71.5	71.4	67.7			78.1	78.2	78.3	78.4
1935	64.3			71.1	71.1	71.3	71.2	67.2			78.2	78.2	78.3	78.5
1936	64.3			71.6	71.6	71.8	71.8	67.3			78.4	78.5	78.7	78.8
1937	64.4			72.0	72.0	72.3	72.3	67.6			78.5	78.6	78.8	79.0
1938	65.2			72.4	72.4	72.7	72.7	68.9			78.9	79.0	79.2	79.4
1939	65.6			72.8	72.8	73.2	73.2	69.0			78.9	79.1	79.3	79.5
1940	63.2			73.0	73.0	73.4	73.4	68.6			78.8	79.0	79.3	79.6
1941	63.3			72.9	73.0	73.4	73.5	68.2			78.6	78.9	79.1	79.4
1942	63.0			73.7	73.8	74.3	74.3	68.7			79.2	79.5	79.8	80.2
1943	63.3			73.9	74.1	74.6	74.7	69.0			79.6	79.9	80.3	80.7
1944	63.1			74.1	74.3	74.9	75.0	68.7			79.6	79.9	80.3	80.7
1945	65.9			74.4	74.6	75.2	75.4	70.4			79.7	80.1	80.5	81.0
1946	67.8			74.8	75.1	75.7	75.9	71.3			80.1	80.5	81.0	81.5
1947	68.3			75.1	75.5	76.2	76.5	71.6			80.5	80.9	81.5	82.0

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Long run trends in demographic data, 1735-2021

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females						
	Period	Cohort	Period -Cohort	Const.	Cohort projections			Period	Cohort	Period -Cohort	Const.	Cohort projections		
					Low	Medium	High					Low	Medium	High
1948	69.4			75.8	76.2	77.0	77.3	72.8			80.8	81.3	81.8	82.4
1949	70.0			76.1	76.6	77.4	77.8	73.0			81.2	81.7	82.3	83.0
1950	69.9			76.2	76.7	77.6	78.0	73.2			81.2	81.8	82.5	83.2
1951	70.8			76.5	77.1	78.0	78.5	74.2			81.4	82.1	82.8	83.5
1952	71.0			76.8	77.5	78.4	78.9	74.3			81.6	82.3	83.1	83.8
1953	71.2			76.9	77.6	78.7	79.2	75.0			81.8	82.6	83.4	84.2
1954	71.3			77.0	77.9	78.9	79.5	75.1			81.9	82.7	83.6	84.4
1955	71.6			77.2	78.1	79.3	79.9	75.3			82.0	82.9	83.8	84.7
1956	71.5			77.2	78.2	79.4	80.1	75.5			82.0	83.0	84.0	84.9
1957	71.4			77.4	78.6	79.8	80.5	75.5			82.1	83.1	84.1	85.1
1958	71.4			77.6	78.8	80.1	80.9	75.5			82.2	83.2	84.3	85.3
1959	71.4			77.7	78.9	80.3	81.1	75.8			82.4	83.6	84.7	85.7
1960	71.3			77.8	79.2	80.6	81.5	75.8			82.4	83.6	84.8	85.9
1961	71.2			77.8	79.3	80.8	81.7	76.0			82.5	83.8	84.9	86.1
1962	71.0			78.0	79.6	81.1	82.0	76.0			82.5	83.9	85.1	86.3
1963	70.8			78.3	80.0	81.5	82.5	75.5			82.5	84.0	85.3	86.5
1964	71.3			78.3	80.0	81.6	82.7	76.1			82.6	84.2	85.5	86.7
1965	71.1			78.2	80.1	81.8	82.9	76.5			82.7	84.3	85.6	86.9
1966	71.4			78.5	80.5	82.2	83.4	76.7			83.0	84.6	86.0	87.4
1967	71.3			78.7	80.8	82.5	83.7	77.0			83.0	84.8	86.2	87.6
1968	71.2			78.9	81.1	82.9	84.2	76.8			83.1	84.9	86.4	87.8
1969	70.8			78.9	81.2	83.1	84.3	76.7			83.1	85.1	86.6	88.0
1970	71.0			78.9	81.3	83.2	84.5	77.3			83.3	85.3	86.9	88.3
1971	71.2			78.9	81.5	83.4	84.7	77.4			83.3	85.4	87.0	88.5
1972	71.3			79.2	81.9	83.8	85.2	77.5			83.4	85.5	87.2	88.7
1973	71.3			79.3	82.1	84.1	85.5	77.7			83.4	85.7	87.4	88.9
1974	71.7			79.4	82.3	84.4	85.8	78.0			83.6	85.9	87.6	89.2
1975	71.7			79.4	82.4	84.5	85.9	78.1			83.5	86.0	87.7	89.3
1976	72.0			79.6	82.8	84.9	86.4	78.2			83.5	86.1	87.9	89.5
1977	72.2			79.7	83.0	85.1	86.6	78.7			83.7	86.4	88.2	89.8
1978	72.4			79.8	83.2	85.4	86.9	78.6			83.6	86.4	88.2	89.9
1979	72.2			79.7	83.2	85.4	87.0	78.8			83.6	86.5	88.4	90.0
1980	72.3			79.7	83.4	85.7	87.2	79.2			83.7	86.7	88.6	90.2
1981	72.6			79.8	83.6	85.9	87.5	79.3			83.8	86.8	88.8	90.5

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females						
	Period	Cohort	Period -Cohort	Const.	Cohort projections			Period	Cohort	Period -Cohort	Const.	Cohort projections		
					Low	Medium	High					Low	Medium	High
1982	72.7			79.8	83.7	86.1	87.7	79.5			83.7	86.8	88.8	90.5
1983	72.7			80.0	84.0	86.4	88.0	79.6			83.8	87.0	88.9	90.7
1984	73.0			80.0	84.1	86.5	88.2	79.6			83.7	87.0	89.0	90.7
1985	72.6			79.8	84.1	86.5	88.2	79.4			83.9	87.2	89.3	91.1
1986	72.9			80.1	84.5	87.0	88.6	79.7			83.8	87.3	89.4	91.2
1987	72.8			80.1	84.6	87.1	88.8	79.6			83.8	87.4	89.5	91.3
1988	73.1			80.1	84.8	87.3	89.0	79.6			83.8	87.5	89.6	91.4
1989	73.3			80.1	84.9	87.4	89.2	79.9			83.9	87.6	89.7	91.6
1990	73.4			80.2	85.0	87.6	89.4	79.8			83.9	87.8	89.9	91.8
1991	74.0			80.4	85.3	88.0	89.7	80.1			84.0	87.9	90.1	92.0
1992	74.2			80.4	85.5	88.2	89.9	80.3			84.1	88.1	90.3	92.2
1993	74.2			80.5	85.7	88.4	90.1	80.3			84.2	88.2	90.5	92.4
1994	74.9							80.6						
1995	74.8							80.8						
1996	75.4							81.1						
1997	75.5							81.0						
1998	75.5							81.3						
1999	75.6							81.1						
2000	76.0							81.4						
2001	76.2							81.5						
2002	76.5							81.6						
2003	77.0							81.9						
2004	77.5							82.3						
2005	77.7							82.5						
2006	78.1							82.7						
2007	78.2							82.7						
2008	78.3							83.0						
2009	78.6							83.1						
2010	78.9							83.2						
2011	79.0							83.5						
2012	79.4							83.4						
2013	79.7							83.6						
2014	80.0							84.1						
2015	80.4							84.2						

Table 13.A.5: Mortality indicators: male and female period and cohort life expectancy at birth estimated under different projection assumptions (marked with red background).

Year	Life expectancy at birth, males							Life expectancy at birth, females												
	Period	Cohort	Period -Cohort	Const.	Cohort projections Low Medium High			Period	Cohort	Period -Cohort	Const.	Cohort projections Low Medium High								
2016	80.6																			
2017	80.9																			
2018	81.0																			
2019	81.2																			
2020	81.5																			
2021	81.6																			

Sources:

Period life expectancy: 1846-1985 Mamelund and Borgan (1996), 1986-2021 <https://www.ssb.no/en/statbank/table/05375>

Cohort life expectancy: 1846-1985 Mamelund and Borgan (1996), 1986-2018 Inger Texmon (unpublished tables), 2019-2021 <https://www.ssb.no/statbank/table/07902>

Cohort projections: 1932-1993 Leknes et al. (2018)

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
1821	977 034	984 054		1				0.00		
1822	991 073	997 797								
1823	1 004 521	1 012 730								
1824	1 020 938	1 028 142								
1825	1 035 345	1 044 173		53				0.05		
1826	1 053 000	1 061 892								
1827	1 070 784	1 078 551								
1828	1 086 318	1 093 287								
1829	1 100 255	1 108 361								
1830	1 116 466	1 123 733								
1831	1 131 000	1 137 417								
1832	1 143 834	1 150 463								
1833	1 157 091	1 163 178								
1834	1 169 264	1 174 762								
1835	1 180 259	1 188 130								
1836	1 196 000	1 202 404		200				0.17		
1837	1 208 808	1 213 908		200				0.16		
1838	1 219 007	1 224 163		100				0.08		
1839	1 229 319	1 232 622		400				0.32		
1840	1 235 924	1 241 140		300				0.24		
1841	1 246 355	1 254 405		400				0.32		
1842	1 262 454	1 270 597		700				0.55		
1843	1 278 739	1 286 193		1 600				1.24		
1844	1 293 646	1 301 772		1 200				0.92		
1845	1 309 898	1 319 185		1 100				0.83		
1846	1 328 471	1 336 728		1 300				0.97		
1847	1 344 984	1 351 331		1 600				1.18		
1848	1 357 678	1 363 384		1 400				1.03		
1849	1 369 089	1 376 619		4 000				2.91		
1850	1 384 149	1 391 941		3 700				2.66		
1851	1 399 733	1 408 903		2 640				1.87		
1852	1 418 073	1 425 472		4 030				2.83		
1853	1 432 870	1 439 756		6 050				4.20		
1854	1 446 641	1 457 020		5 950				4.08		
1855	1 467 398	1 478 723		1 600				1.08		
1856	1 490 047	1 500 611		3 200				2.13		
1857	1 511 175	1 520 744		6 400				4.21		
1858	1 530 312	1 543 194		2 500				1.62		

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
1859	1 556 076	1 569 801		1 800				1.15		
1860	1 583 525	1 596 089		1 900				1.19		
1861	1 608 653	1 613 878		8 900				5.51		
1862	1 619 102	1 626 986		5 250				3.23		
1863	1 634 869	1 646 433		1 100				0.67		
1864	1 657 997	1 668 254		4 300				2.58		
1865	1 678 510	1 690 133		4 000				2.37		
1866	1 701 756	1 707 272		15 455				9.05		
1867	1 712 787	1 716 860		12 829				7.47		
1868	1 720 933	1 725 088		13 211				7.66		
1869	1 729 242	1 730 949		18 070				10.44		
1870	1 732 655	1 736 909		14 838				8.54		
1871	1 741 162	1 746 353		12 276				7.03		
1872	1 751 544	1 756 929		13 865				7.89		
1873	1 762 313	1 769 421		10 352				5.85		
1874	1 776 528	1 786 640		4 601				2.58		
1875	1 796 752	1 807 803		4 048				2.24		
1876	1 818 853	1 828 856		4 355				2.38		
1877	1 838 858	1 851 572		3 206				1.73		
1878	1 864 285	1 876 835		4 863				2.59		
1879	1 889 385	1 902 126		7 608				4.00		
1880	1 914 867	1 919 075		20 212				10.53		
1881	1 923 283	1 922 948		25 976				13.51		
1882	1 922 613	1 919 767		28 804				15.00		
1883	1 916 921	1 919 317		22 167				11.55		
1884	1 921 712	1 929 058		14 776				7.66		
1885	1 936 404	1 943 917		13 981				7.19		
1886	1 951 429	1 958 323		15 158				7.74		
1887	1 965 217	1 969 807		20 741				10.53		
1888	1 974 396	1 976 615		21 452				10.85		
1889	1 978 834	1 984 295		12 642				6.37		
1890	1 989 756	1 996 929		10 991				5.50		
1891	2 004 102	2 012 504		13 341				6.63		
1892	2 020 905	2 026 016		17 049				8.42		
1893	2 031 127	2 037 797		18 778				9.21		
1894	2 044 466	2 056 657		5 642				2.74		
1895	2 068 848	2 083 088		6 207				2.98		
1896	2 097 328	2 111 676		6 679				3.16		

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
1897	2 126 024	2 141 721		4 669				2.18		
1898	2 157 418	2 173 807		4 859				2.24		
1899	2 190 196	2 204 084		6 699				3.04		
1900	2 217 971	2 230 483		10 931				4.90		
1901	2 242 995	2 254 911		12 745				5.65		
1902	2 266 827	2 275 485		20 343				8.94		
1903	2 284 143	2 287 768		26 784				11.71		
1904	2 291 392	2 297 494		22 264				9.69		
1905	2 303 595	2 308 572		21 059				9.12		
1906	2 313 549	2 319 191		21 967				9.47		
1907	2 324 832	2 328 962		22 135				9.50		
1908	2 333 092	2 345 564		8 497				3.62		
1909	2 358 036	2 367 494		16 152				6.82		
1910	2 376 952	2 383 677		18 912				7.93		
1911	2 390 402	2 400 796		12 477				5.20		
1912	2 411 190	2 423 184		9 105				3.76		
1913	2 435 178	2 446 874		9 876				4.04		
1914	2 458 569	2 470 919		8 522				3.45		
1915	2 483 269	2 496 266		4 572				1.83		
1916	2 509 263	2 522 178		5 212				2.07		
1917	2 535 092	2 550 543		2 518				0.99		
1918	2 565 994	2 577 729		1 226				0.48		
1919	2 589 463	2 602 869		2 432				0.93		
1920	2 616 274	2 634 664		5 581				2.12		
1921	2 653 054	2 667 867		4 627				1.73		
1922	2 682 680	2 694 840		6 456				2.40		
1923	2 707 000	2 713 117		18 287				6.74		
1924	2 719 233	2 728 766		8 492				3.11		
1925	2 738 298	2 746 815		7 009				2.55		
1926	2 755 331	2 763 106		9 326				3.38		
1927	2 770 880	2 774 866		11 881				4.28		
1928	2 778 851	2 784 674		8 832				3.17		
1929	2 790 497	2 795 105		8 029				2.87		
1930	2 799 713	2 807 439		3 673				1.31		
1931	2 815 164	2 823 882		825				0.29		
1932	2 832 599	2 841 528		436				0.15		
1933	2 850 457	2 858 343		344				0.12		
1934	2 866 229	2 874 206		485				0.17		

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
1935	2 882 182	2 889 211		462				0.16		
1936	2 896 239	2 903 519		526				0.18		
1937	2 910 798	2 918 742		647				0.22		
1938	2 926 686	2 935 803		818				0.28		
1939	2 944 920	2 954 415		687				0.23		
1940	2 963 909	2 973 067		278				0.09		
1941	2 982 224	2 990 234						0.00		
1942	2 998 244	3 008 883						0.00		
1943	3 019 521	3 032 429						0.00		
1944	3 045 337	3 060 211						0.00		
1945	3 075 084	3 091 177						0.00		
1946	3 107 269	3 126 883		973				0.31		
1947	3 146 497	3 165 011		1 477				0.47		
1948	3 183 525	3 201 012		2 398				0.75		
1949	3 218 499	3 234 227		2 669		140 204		0.83		43.40
1950	3 249 954	3 265 125		2 295		144 619		0.70		44.30
1951	3 280 296	3 295 871	6 046	10 172	-4 126	149 270	1.83	3.09	-1.25	45.30
1952	3 311 446	3 327 728	5 967	7 803	-1 836	135 686	1.79	2.34	-0.55	40.80
1953	3 344 010	3 360 888	6 454	7 529	-1 075	149 546	1.92	2.24	-0.32	44.50
1954	3 377 766	3 394 246	6 005	7 295	-1 290	149 303	1.77	2.15	-0.38	44.00
1955	3 410 726	3 428 200	7 089	8 728	-1 639	157 432	2.07	2.55	-0.48	45.90
1956	3 445 673	3 460 782	8 092	10 156	-2 064	166 512	2.34	2.93	-0.60	48.10
1957	3 475 890	3 491 938	12 263	12 599	-336	170 709	3.51	3.61	-0.10	48.90
1958	3 507 986	3 522 994	10 161	11 266	-1 105	158 456	2.88	3.20	-0.31	45.00
1959	3 538 001	3 552 854	10 586	11 807	-1 221	160 938	2.98	3.32	-0.34	45.30
1960	3 567 707	3 581 239	13 536	18 681	-5 145	186 527	3.78	5.22	-1.44	52.10
1961	3 594 771	3 609 800	11 426	10 610	816	164 710	3.17	2.94	0.23	45.60
1962	3 624 829	3 638 918	12 778	12 534	244	177 247	3.51	3.44	0.07	48.70
1963	3 653 006	3 666 537	11 983	11 364	619	179 852	3.27	3.10	0.17	49.10
1964	3 680 068	3 694 339	12 406	14 264	-1 858	160 533	3.36	3.86	-0.50	43.50
1965	3 708 609	3 723 168	12 148	14 021	-1 873	169 399	3.26	3.77	-0.50	45.50
1966	3 737 726	3 753 012	12 446	13 391	-945	173 845	3.32	3.57	-0.25	46.30
1967	3 768 298	3 784 539	15 379	13 022	2 357	180 657	4.06	3.44	0.62	47.70
1968	3 800 780	3 816 486	15 350	13 644	1 706	182 584	4.02	3.58	0.45	47.80
1969	3 832 192	3 847 707	15 641	13 526	2 115	189 003	4.07	3.52	0.55	49.10
1970	3 863 221	3 875 763	17 383	18 352	-969	232 087	4.49	4.74	-0.25	59.90
1971	3 888 305	3 903 039	19 297	12 682	6 615	191 156	4.94	3.25	1.69	49.00
1972	3 917 773	3 933 004	18 388	13 965	4 423	190 175	4.68	3.55	1.12	48.40

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
1973	3 948 235	3 960 613	17 383	13 939	3 444	190 513	4.39	3.52	0.87	48.10
1974	3 972 990	3 985 258	19 209	14 287	4 922	192 964	4.82	3.58	1.24	48.40
1975	3 997 525	4 007 313	19 551	14 782	4 769	189 622	4.88	3.69	1.19	47.30
1976	4 017 101	4 026 152	18 955	14 066	4 889	178 478	4.71	3.49	1.21	44.30
1977	4 035 202	4 043 205	19 403	14 369	5 034	181 783	4.80	3.55	1.25	45.00
1978	4 051 208	4 058 671	18 825	14 851	3 974	176 830	4.64	3.66	0.98	43.60
1979	4 066 134	4 072 517	17 831	15 085	2 746	172 803	4.38	3.70	0.67	42.40
1980	4 078 900	4 085 620	18 776	14 705	4 071	181 394	4.60	3.60	1.00	44.40
1981	4 092 340	4 099 702	19 698	14 522	5 176	177 112	4.80	3.54	1.26	43.20
1982	4 107 063	4 114 787	20 468	14 728	5 740	173 004	4.97	3.58	1.39	42.00
1983	4 122 511	4 128 432	20 063	15 778	4 285	174 128	4.86	3.82	1.04	42.20
1984	4 134 353	4 140 099	19 688	15 927	3 761	170 203	4.76	3.85	0.91	41.10
1985	4 145 845	4 152 516	21 858	15 630	6 228	175 583	5.26	3.76	1.50	42.30
1986	4 159 187	4 167 354	24 196	16 745	7 451	179 859	5.81	4.02	1.79	43.20
1987	4 175 521	4 186 905	31 149	17 380	13 769	185 639	7.44	4.15	3.29	44.30
1988	4 198 289	4 209 488	29 964	19 821	10 143	186 001	7.12	4.71	2.41	44.20
1989	4 220 686	4 226 901	25 847	27 300	-1 453	175 473	6.11	6.46	-0.34	41.50
1990	4 233 116	4 241 473	25 494	23 784	1 710	169 289	6.01	5.61	0.40	39.90
1991	4 249 830	4 261 732	26 283	18 238	8 045	166 029	6.17	4.28	1.89	39.00
1992	4 273 634	4 286 401	26 743	16 801	9 942	161 269	6.24	3.92	2.32	37.60
1993	4 299 167	4 311 991	31 711	18 903	12 808	165 894	7.35	4.38	2.97	38.50
1994	4 324 815	4 336 613	26 911	19 475	7 436	177 503	6.21	4.49	1.71	40.90
1995	4 348 410	4 359 184	25 678	19 312	6 366	182 172	5.89	4.43	1.46	41.80
1996	4 369 957	4 381 336	26 407	20 590	5 817	184 576	6.03	4.70	1.33	42.10
1997	4 392 714	4 405 157	31 957	21 257	10 700	188 957	7.25	4.83	2.43	42.90
1998	4 417 599	4 431 464	36 704	22 881	13 823	190 948	8.28	5.16	3.12	43.10
1999	4 445 329	4 461 913	41 841	22 842	18 999	191 640	9.38	5.12	4.26	43.00
2000	4 478 497	4 490 967	36 542	26 854	9 688	201 043	8.14	5.98	2.16	44.80
2001	4 503 436	4 513 751	34 264	26 309	7 955	201 851	7.59	5.83	1.76	44.70
2002	4 524 066	4 538 159	40 122	22 948	17 174	193 100	8.84	5.06	3.78	42.60
2003	4 552 252	4 564 855	35 957	24 672	11 285	190 893	7.88	5.40	2.47	41.80
2004	4 577 457	4 591 910	36 482	23 271	13 211	190 446	7.94	5.07	2.88	41.50
2005	4 606 363	4 623 291	40 148	21 709	18 439	193 615	8.68	4.70	3.99	41.90
2006	4 640 219	4 660 677	45 776	22 053	23 723	202 009	9.82	4.73	5.09	43.30
2007	4 681 134	4 709 153	61 774	22 122	39 652	210 679	13.12	4.70	8.42	44.70
2008	4 737 171	4 768 212	66 961	23 615	43 346	198 877	14.04	4.95	9.09	41.70
2009	4 799 252	4 828 726	65 186	26 549	38 637	200 494	13.50	5.50	8.00	41.50
2010	4 858 199	4 889 252	73 852	31 506	42 346	214 685	15.10	6.44	8.66	43.90

Table 13.A.6: External and internal migration in Norway, 1821-2021.

Year	Population 1 January	Population average	Immigration	Emigration	Net immigration	Internal moving	Immigration per 1000	Emigration per 1000	Net per 1000	Internal per 1000
2011	4 920 305	4 953 088	79 498	32 466	47 032	226 361	16.05	6.55	9.50	45.70
2012	4 985 870	5 018 573	78 570	31 227	47 343	230 343	15.66	6.22	9.43	45.90
2013	5 051 275	5 080 166	75 789	35 716	40 073	234 795	14.92	7.03	7.89	46.20
2014	5 109 056	5 137 429	70 030	31 875	38 155	237 861	13.63	6.20	7.43	46.30
2015	5 165 802	5 189 894	67 276	37 474	29 802	245 735	12.96	7.22	5.74	47.30
2016	5 213 985	5 236 151	66 800	40 724	26 076	241 362	12.76	7.78	4.98	46.10
2017	5 258 317	5 276 968	58 192	36 843	21 349	248 527	11.03	6.98	4.05	47.10
2018	5 295 619	5 311 916	52 485	34 382	18 103	244 353	9.88	6.47	3.41	46.00
2019	5 328 212	5 347 896	52 153	26 826	25 327	245 467	9.75	5.02	4.74	45.90
2020	5 367 580	5 379 475	38 071	26 744	11 327	247 257	7.08	4.97	2.11	45.96
2021	5 391 369	5 408 320	53 947	34 297	19 650	260 345	9.97	6.34	3.63	48.14
2022	5 425 270									

Sources:

Immigration and emigration: 1958 - 2021 <https://www.ssb.no/en/statbank/table/05869>

Internal migration: 1949-1956 Østby (1970), 1957 - 2021 <https://www.ssb.no/en/statbank/table/09585>

Table 13.A.7: Population in densely populated areas, 1665-2021.

Year	Total population	Densely populated areas	Sparsely populated areas	Unknown	Densely populated areas (in square km)	Densely populated areas (in percent)	Sparsely populated areas (in percent)	Unknown (in percent) areas (in percent)
1665	440 000	30 000	410 000			6.8	93.2	
1701	504 000	40 000	464 000			7.9	92.1	
1770	723 618	64 747	658 871			8.9	91.1	
1801	883 603	88 404	795 199			10.0	90.0	
1815	885 431	86 604	798 827			9.8	90.2	
1826	1 051 318	114 198	937 120			10.9	89.1	
1836	1 194 827	129 002	1 065 825			10.8	89.2	
1846	1 328 471	206 338	1 122 133			15.5	84.5	
1856	1 490 047	252 308	1 237 739			16.9	83.1	
1866	1 701 756	333 485	1 368 271			19.6	80.4	
1876	1 813 424	440 273	1 366 627			24.3	75.4	
1891	2 000 917	625 417	1 375 500			31.3	68.7	
1901	2 240 032	800 198	1 439 834			35.7	64.3	
1911	2 391 782	921 382	1 470 400			38.5	61.5	
1921	2 649 775	1 200 020	1 449 755			45.3	54.7	
1931	2 814 194	1 330 217	1 483 977			47.3	52.7	
1947	3 156 950	1 581 901	1 575 049			50.1	49.9	
1951	3 278 546	1 711 628	1 566 918			52.2	47.8	
1961	3 591 234	2 052 634	1 538 600			57.2	42.8	
1971	3 874 133	2 554 913	1 319 220			65.9	34.1	
1981	4 091 132	2 874 990	1 200 190			70.3	29.3	
1990	4 233 116	2 963 944	1 135 345	133 827		70.0	26.8	3.2
1991	4 249 830	3 086 815	1 128 057	34 958		72.6	26.5	0.8
1992	4 273 634	3 081 385	1 108 276	83 973		72.1	25.9	2.0
1993	4 299 167	3 106 280	1 103 605	89 282		72.3	25.7	2.1
1994	4 324 815	3 184 340	1 118 521	21 954		73.6	25.9	0.5
1995	4 348 410	3 203 718	1 129 059	15 633		73.7	26.0	0.4
1996	4 369 957	3 229 853	1 125 519	14 585		73.9	25.8	0.3
1997	4 392 714	3 259 418	1 122 386	10 910		74.2	25.6	0.2
1998	4 417 599	3 287 978	1 117 334	12 287		74.4	25.3	0.3
1999	4 445 329	3 304 352	1 006 076	134 901		74.3	22.6	3.0
2000	4 478 497	3 396 382	998 922	83 193	2139	75.8	22.3	1.9
2001	4 503 436	3 419 975	1 025 055	58 406		75.9	22.8	1.3
2002	4 524 066	3 474 623	1 022 609	26 834	2 194	76.8	22.6	0.6
2003	4 552 252	3 514 417	1 014 854	22 981	2 225	77.2	22.3	0.5
2004	4 577 457	3 536 454	1 020 840	20 163	2 218	77.3	22.3	0.4

Table 13.A.7: Population in densely populated areas, 1665-2021.

Year	Total population	Densely populated areas	Sparsely populated areas	Unknown	Densely populated areas (in square km)	Densely populated areas (in percent)	Sparsely populated areas (in percent)	Unknown (in percent) areas
2005	4 606 363	3 560 137	1 027 690	18 536	2 219	77.3	22.3	0.4
2006	4 640 219	3 607 813	1 016 736	15 670	2 263	77.8	21.9	0.3
2007	4 681 134	3 655 391	1 012 003	13 740	2 294	78.1	21.6	0.3
2008	4 737 171	3 722 786	1 000 943	13 442	2 334	78.6	21.1	0.3
2009	4 799 252	3 780 068	1 009 435	9 749	2 340	78.8	21.0	0.2
2011	4 920 305	3 899 115	1 007 310	13 880	2 403	79.2	20.5	0.3
2012	4 985 870	3 957 981	1 011 611	16 278	2 423	79.4	20.3	0.3
2013	5 051 275	4 050 638	978 344	22 293	2 128	80.2	19.4	0.4
2014	5 109 056	4 114 425	976 827	17 804	2 147	80.5	19.1	0.3
2015	5 165 802	4 172 804	973 812	19 186	2 158	80.8	18.9	0.4
2016	5 213 985	4 229 849	968 576	15 560	2 173	81.1	18.6	0.3
2017	5 258 317	4 283 184	960 461	14 672	2 191	81.5	18.3	0.3
2018	5 295 619	4 327 951	954 612	13 056	2 205	81.7	18.0	0.2
2019	5 328 212	4 368 614	949 123	10 475	2 206	82.0	17.8	0.2
2020	5 367 580	4 416 981	940 251	10 348	2 218	82.3	17.5	0.2
2021	5 391 369	4 443 243	938 083	10 043	2 233	82.4	17.4	0.2

Sources:
1665-1990 Population and Housing censuses. Historical Statistics 1994, Statistics Norway
1991-2021 Central Population register. Statistics Norway's Statbank

Revisions and cross-checks of composite historical price and
wage data

Øyvind Eitheim

14.1 Introduction

Norges Bank published the first long historical time series for Cost of Living/Consumer Price Indices (CLI-CPIs) in its project on Historical Monetary Statistics (HMS) in 2004. Since then the series have been revised on several occasions. Two important revisions are presented in Chapter 9 and Chapter 10 in this volume. The first revision is based on Jan T. Klovland's work on the construction of monthly historical Wholesale Price Indices (WPIs), which is presented in Chapter 9.¹ The second revision is based on work by Ola H. Grytten and others on historical CLI-CPIs, which is presented in Chapter 10. This work builds on many new and hitherto unused primary sources of information about historical prices on consumer goods in different subperiods from 1492 onwards.²

This chapter provides an overview of the main vintages of historical CLI-CPIs which have been available in Norges Bank's historical database since 2004. The changes over time in these vintages reflect a significant amount of learning on our side after we launched the first vintage in 2004. This concerns in particular the construction of CLI-CPIs around the time when the Dano-Norwegian union was dissolved in 1814 and the following years. The size of this revision is of a significant order of magnitude.

How can we tell that we have made progress and that the revisions have brought us closer to the "truth"? That the revised CLI-CPIs are more reliable and valid representations than previous versions. We base this observation on two types of cross-checks which are presented in this study.

- We compare the revised CLI-CPIs for Norway with historical price indices for other countries when measured in a common currency based on available data for historical exchange rates.
- We have on the basis of the revised nominal CLI-CPIs for Norway revised nominal wage data back to 1726. The resulting wage data for the 18th century, expressed in the currency unit of those years, riksdaler species, are compared with observations of wage levels at Baasland/Næs iron works in southern Norway as reported in Fløystad (1979).

We will let HMS I denote the first vintages of historical price and wage data published in Eitrheim et al. (2004, 2007), whereas HMS II denotes subsequent vintages of these data, which have been available in spreadsheet format at Norges Bank's web-site www.norges-bank.no and updated on an annual basis. In this volume on *HMFS for Norway*, which we will interchangeably also refer to as HMS III many places in the text and in figures, we present revised composite price indices which stretches all the way back to 1492 for the CLI-CPIs and to 1767 for the WPIs, whereas historical wage data have been revised from 1726 onwards. The revised CLI-CPIs are constructed from a significantly enlarged set of price observations for a broader set of consumer goods.

The Norwegian price history has in the mean time been extended with a set of monthly Wholesale Price Indices (WPIs) which covers the period from January 1767 onwards, drawing on work by one of the authors (Klovland, 2013, 2014, 2018). This work provided new perspectives and challenged

¹ This work builds on Klovland's previous work published in Klovland (2013, 2014, 2018)

² See Appendix 10.A in Chapter 10 for references to published work and details on the coverage of consumer goods prices in different subperiods.

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our previous understanding of the Norwegian price history, in particular for the years around the dissolution of the Dano-Norwegian union. These improvements in our understanding of the price history have been thoroughly documented in the two previous chapters on historical wholesale price indices (WPIs in Chapter 9) and cost of living indices (CLIs in Chapter 10), respectively.

Section 14.2 provides an overview of the vintages of historical CLI-CPIs which have been reported in Norges Bank's historical database since 2004 and report results from some cross-checks. Section 14.3 report revised historical dataseries for annual nominal wages and results from a cross-check against reported wages across different types of workers at Nes Jernverk during the 18th century.

14.2 Revisions in aggregated price indices

Revisions of historical CLI-CPIs in Norges Bank's HMS database

Figure 14.1 compares the revised CLI-CPI in HMFS with previous vintages of similar price indices which appeared in HMS I (Grytten, 2004) and HMS II (www.norges-bank.no), respectively. The price index we refer to as HMS II took into account revisions suggested by Ellingsæther (2007) and Klovland (2013, 2014) for the periods 1870-1910 and 1777-1830, respectively. Subsequent improvements have been documented in Chapter 10 of this volume and in Grytten (2018, 2020), which we refer to in the following as the HMS III version.

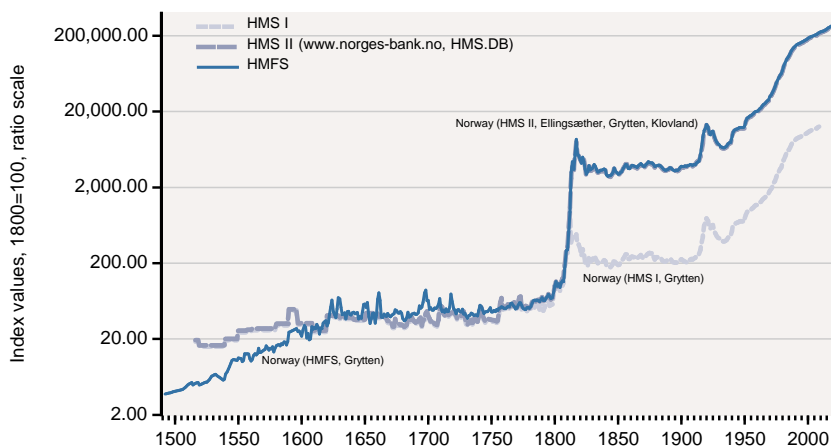


Figure 14.1 New and revised historical CLI-CPIs in HMFS, 1492-2021, compared with the previous price indices originally published in HMS I and HMS II (www.norges-bank.no).

The three price indices show a very similar picture of a relatively constant price level during the period of the Dano-Norwegian monarchy in most of the 17th and 18th century, before the union split in 1814. There are some short-run deviations, which are discussed in Chapter 9, but in broad terms the development is nearly identical during most of this period. We note that the revisions in

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the early years from the late 15th century until the early years of the 17th century has rendered a picture of more pronounced inflation during this period. We will return to this in a later paragraph. However, it is seen by a glance that there is a distinct break between the two series after 1813. This is almost certainly due to a different treatment of the transition from *riksdaler Danish courant* to *riksbankdaler*. Our procedure for handling this problem is discussed in detail in Chapter 9.4. There is also a large discrepancy between the two series in the years from 1815 to 1817, at the time of the transition from *riksbankdaler* to *speciedaler*. Between 1815 and 1817 the HMS I version of the CLI only increases by 10 per cent, whereas the new WPI index presented in Chapter 9 exhibits nearly a 3-fold increase. We will also discuss this in further detail in a later paragraph.

The overall effect on the long-term price level is therefore, as shown in detail in Chapter 9.6, that according to the old HMS I version of the CLI, prices were only about 3.5 times higher in 1820 than in 1800, whereas the corresponding growth factor of the new WPI, as documented in Klovland (2013, 2014) and in Chapter 9, was 46. As a consequence we decided already in 2013 that the HMS I version of the CLI was incompatible with these findings, even taking into account a margin for a potential unsynchronized behaviour of consumer and wholesale prices. In light of this the HMS II version of the CLI was revised in 2013 in order to reflect these new insights. We also decided to use the revised HMS II version of the CLI when we finalised the work on *A Monetary History of Norway, 1816-2016* (MHN) in Eitrheim, Klovland and Øksendal (2016). These findings have later been confirmed by the revised HMFS version of the CLI-CPI which is documented in Chapter 10, as shown in Figure 14.1 above (Grytten, 2018, 2020).

But how can we be sure that our revised interpretations and insights about the Norwegian price history during the turbulent early years of the 19th century as outlined in Chapter 9 are the right ones? Does this story provide valid and reliable information about the main trends in the price level in this period?

We will now turn in more detail to the developments in the price indices during both the 18th century and the first three decades of the 19th century, zooming in on the inflationary shocks around the times of the Napoleonic war. We have already noted that this is the time window in which we have observed revisions in nominal price indices of a different order of magnitude compared with other improvements of these data. This also calls for a recalculation of wage indices during this turbulent time period, which we will discuss in Section 14.3 below.

We will provide two sets of cross-checks of the revised price and wage data. In the remaining part of this section we first cross-check the revised price indices against what we should expect from the theory of relative purchasing power parity (PPP), also known as the relative law of one price (LOP). The purpose is not to undertake formal tests of this hypothesis. Rather, we turn the hypothesis on

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its head, assuming that the PPP principle holds, we then ask whether the implied course of domestic prices corresponds to the performance of the new domestic price indices.³

Thereafter we make an indirect cross-check of the price indices using a set of revised wage indices, which we report in Section 14.3. These revised wage indices are first recalculated into units of riksdaler species, the main currency in the 18th century Dano-Norwegian monarchy. This allows for a cross-check of the revised wage indices against a set of observed wages, which were reported in a study of worker's living conditions at one of Norway's iron works in the 18th century (Fløystad, 1979).

³ There is a large body of evidence supporting the conclusion that the PPP relationship holds approximately in the long run, see, e.g., Froot and Rogoff (1995) and Taylor (2002). Empirical testing of this hypothesis on Norwegian data has previously been undertaken by Edison and Klovland (1987), who found considerable support for an augmented PPP hypothesis on a century of Norwegian-British data 1874–1971, taking into account productivity and real interest rate differentials.

Cross-checking the revised price indices against PPP

Figure 14.2 compare the revised CLI-CPI in HMFS with other price indices. These are the WPI documented in Chapter 9 (Klovland, 2018) for the period 1767-1920 and the CLIs reported in Ølmheim and Stubhaug (2018) and Dhawan and Langdal (2018) for the period 1736-1816.

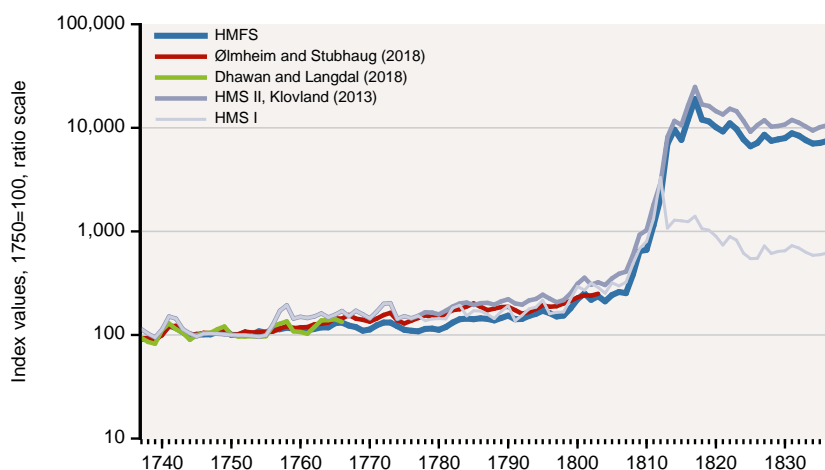


Figure 14.2 New price index in HMFS compared with alternative price indices, with Klovland 1767-1920 and with Ølmheim & Stubhaug and Dhawan & Langdal 1736-1816.

A comparison with foreign price indices, 1790-1830

Under the relative purchasing power parity (PPP) hypothesis the nominal exchange rate may be expressed as $S_t = kP_t/P_t^*$, where k is an arbitrary constant (for example 1), S_t is the nominal exchange rate, and P_t and P_t^* the domestic and the foreign price indices, respectively. Under this hypothesis we expect the real exchange rate SR_t to be stationary and fluctuate around a constant level k . Two types of proportionality conditions follows from this equation, and we will apply both in the rest of this section. There will be proportionality between the nominal exchange rate and the domestic price level relative to the foreign price level. There also will be proportionality between domestic prices and foreign prices when the latter are expressed in units of the domestic currency. This is obtained by multiplying the foreign price level P_t^* with the nominal exchange rate. The two proportionality assertions are shown below:

$$S_t \propto P_t/P_t^*$$

$$P_t \propto S_t P_t^*$$

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In the following we provide some illustrations of these forms of proportionality under the PPP-hypothesis.

Consumer prices indices have been constructed for all Scandinavian countries back to the 16th century. The new WPIs and revised CLI-CPIs for Norway have been briefly summarized in this chapter, and in chapter 9 and 10 respectively. We use the CLI-CPIs published by Abildgren (2010) for Denmark and by Edvinsson and Söderberg (2010) for Sweden. It should be noted that the indices for both countries have been constructed with consumption weights as a basis. Both the Danish and the Swedish indices are based on price material that were close to market prices, however.⁴ For the UK we use the wholesale price indices published in Gayer et al. (1953). For Germany we use the wholesale price indices published in Jacobs and Richter (1935).

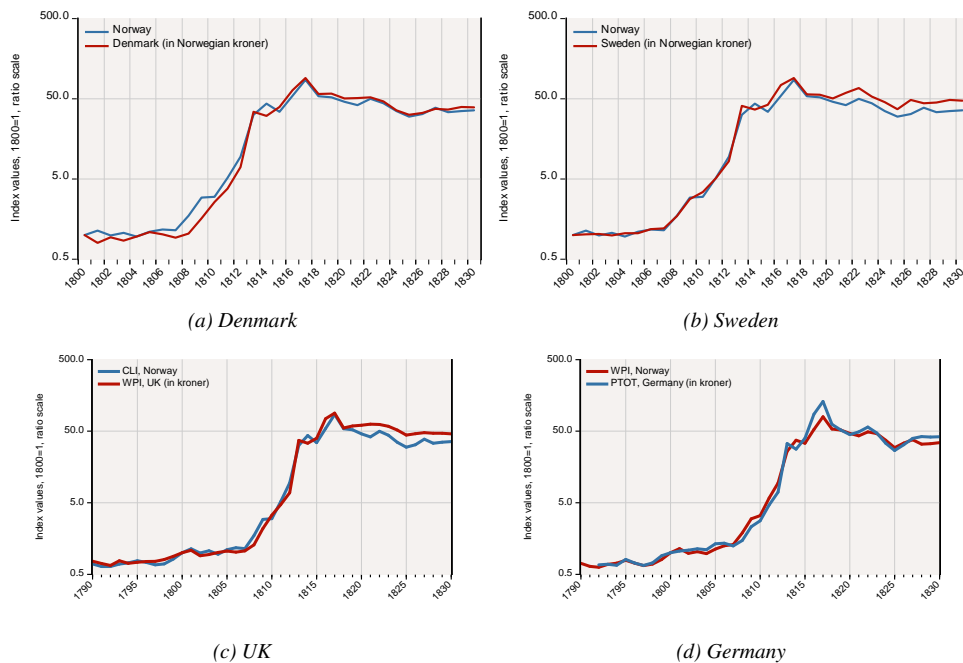


Figure 14.3 Pairwise comparisons between the revised CPI-CPI for Norway with historical CPI-CPIs for Denmark and Sweden (top row), and between the new WPI for Norway and WPIs for UK and Germany (bottom row). All prices are expressed in Norwegian kroner and have been normalized such that 1800=1.

Figure 14.3 shows pairwise comparisons of the new consumer price index presented in Chapter 10 with historical price indices for four other countries, notably Denmark, Sweden, UK and Germany, all converted into kroner using appropriate exchange rate indices. We see that this form of proportionality implied by the PPP hypothesis holds reasonably well over these turbulent decades. The five countries involved in this comparison were affected very differently by the Napoleonic wars.

⁴ The Danish data are derived from accounting records of estates and manors, which, according to Abildgren (2010, pp. 6-7) is "the closest one can come to transaction-based consumer prices for the pre-1800 period". For Sweden the data come from the regional market scales, which according to Edvinsson and Söderberg (2010, p. 414) were "semi-market prices".

Revisions and cross-checks of composite historical price and wage data

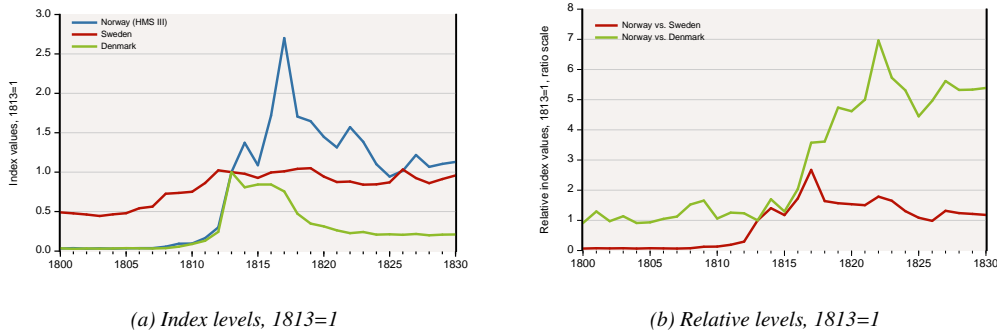
Whereas Norway and Denmark were directly involved and entered the war on the French side after the British attack on Copenhagen in 1807, Sweden maintained their neutrality throughout the war years. This had an obvious consequence for inflation in these countries. Norway also suffered from a period of trade blockade from 1807 onwards, which was subsequently removed only gradually. There were also other sources of inflation stemming from climate problems leading to bad harvests and, eventually, the end game of the Napoleonic wars led not only to the end of the Dano-Norwegian union but also to the collapse in the Norwegian monetary system.

Following the Norwegian exit from the Dano-Norwegian currency union in 1814, Norway and Denmark took very different paths in their efforts to restore the monetary system. Denmark continued with its already established national institutions including a national bank, Riksbanken, which had been established in 1813. Norway continued its path into a loose union with Sweden as decided in the Kiel Treaty of January 1814, after which a nation-building process was initiated which gave Norway its Constitution on 17 May 1814, followed by a short war with Sweden and a slightly revised Constitution on 4 November 1814. Norway established its key national institutions, during the course of the years 1814-1816, starting with the Parliament, the Supreme Court and the Office of the Auditor General in 1814 and Norges Bank two years later in 1816. Six Government departments were also soon established. This transition to become a sovereign country also entailed large costs.

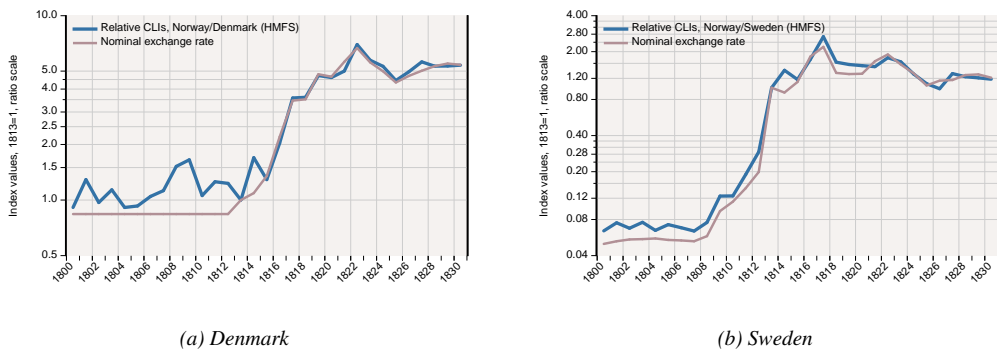
The sigmoid shapes of the figures we show in this section illustrate one aspect of these costs stemming from the two additional devaluations of the Norwegian currency, which came *after* the dissolution of the Dano-Norwegian union. The transition from the currency units used in 1814, *riksbankdaler*, to the new currency unit *speciedaler*, which followed the establishment of Norges Bank in 1816, also entailed a total devaluation of the Norwegian currency by additional 80 percent during these two years. Whereas Denmark experienced a notable deflation and falling prices starting already in 1814, Norway continued on a path with high rates of inflation, in particular in 1816 and 1817, before a deflationary policy kicked in from 1818 onwards. The thorny road to restore silver resumption of *speciedaler* at par silver values, as was promised in §6 in the 1816 Norges Bank Act, is discussed in detail in Eitrheim et al. (2016, Chapter 3). This long promise was first fulfilled in 1842, more than two decades later than what was originally promised. The adjustment process led eventually to a stabilization of Norwegian prices at a level around five times the Danish price level (Figure 14.4(a) and Figure 14.4(b)).

The first type of proportionality under the PPP-hypothesis is illustrated in Figure 14.5, which shows relative price indices between Norway and Denmark and Norway and Sweden, respectively, together with the appropriate exchange rate index. All series have been normalized and set equal to 1 in 1813. The comparison with Denmark in Figure 14.5(a) shows that the Norwegian exchange rate started to depreciate when Norway left the union with Denmark in 1814 and we see that the relative price level increased to a fivefold level compared with 1813, which is in line with the expected outcome under PPP after an 80% nominal currency depreciation. A similar relationship holds for a comparison with Sweden shown in Figure 14.5(b), but in this case the currency depreciation started already in 1808 after Denmark-Norway entered the war and the blockade started, and all this

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(a) Index levels, 1813=1 (b) Relative levels, 1813=1
 Figure 14.4 New Norwegian, Danish and Swedish CLI-CPIs, 1800-1830. Sources, Norway: see Chapter 10. Denmark: see Abildgren (2010, pp. 2-24), Sweden: see Edvinsson and Sørderberg (2011, pp. 270-292).



(a) Denmark (b) Sweden
 Figure 14.5 Relative consumer price indices, nominal exchange rates and real exchange rates (1813=1). The right figure shows relative price indices between Norway and Sweden based on both old and new Norwegian cost of living indices, denoted HMS I and HMFS, respectively.

developed into strong and later into borderline hyperinflation in 1812. Figure 14.5(b) also show a measure of the relative prices between Norway and Sweden based on the misspecified CLI-CPI for Norway from HMS I (2004). We see clearly that for this measure the stated proportionality with the exchange rate does not hold.

Because Norway and Denmark had a common currency until 1813, we would expect the two countries to experience approximately the same inflation history. Figure 14.4(a) shows clearly that this is the case. The price level edged up in both countries in the decades before the turn of the century, shifted upwards around the year 1800 and began to rise rapidly around 1807. The price level in Sweden rose a bit faster in the final decades of the 18th century, but in contrast to Denmark and Norway there was no extreme price inflation during the Napoleonic war period. When Norway got its own currency in 1813, the riksbankdaler, this did not create a more stable price level, as prices continued to rise until 1817. Denmark, on the other hand, managed to reverse the strongly rising price level. By 1817 the Norwegian price level had experienced a 97-fold increase from the year 1800, in Denmark the price level had increased by a factor of 22, while in Sweden prices had only doubled. These ratios are very close to the exchange rate changes over the same period. Against

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the silver-based Hamburg banco the Norwegian currency had increased (decreased in value) by a factor of 94, the Danish currency by a factor of 22, and the Swedish currency only by approximately 2.3.⁵

Figure 14.6 shows similar illustrations of the law of one price between grain markets in Norway, Sweden and Germany, which are based on annual averages of prices and exchange rates. Swedish grain prices have been collected from Jörberg (1972) and German grain prices from Strauss (1963).

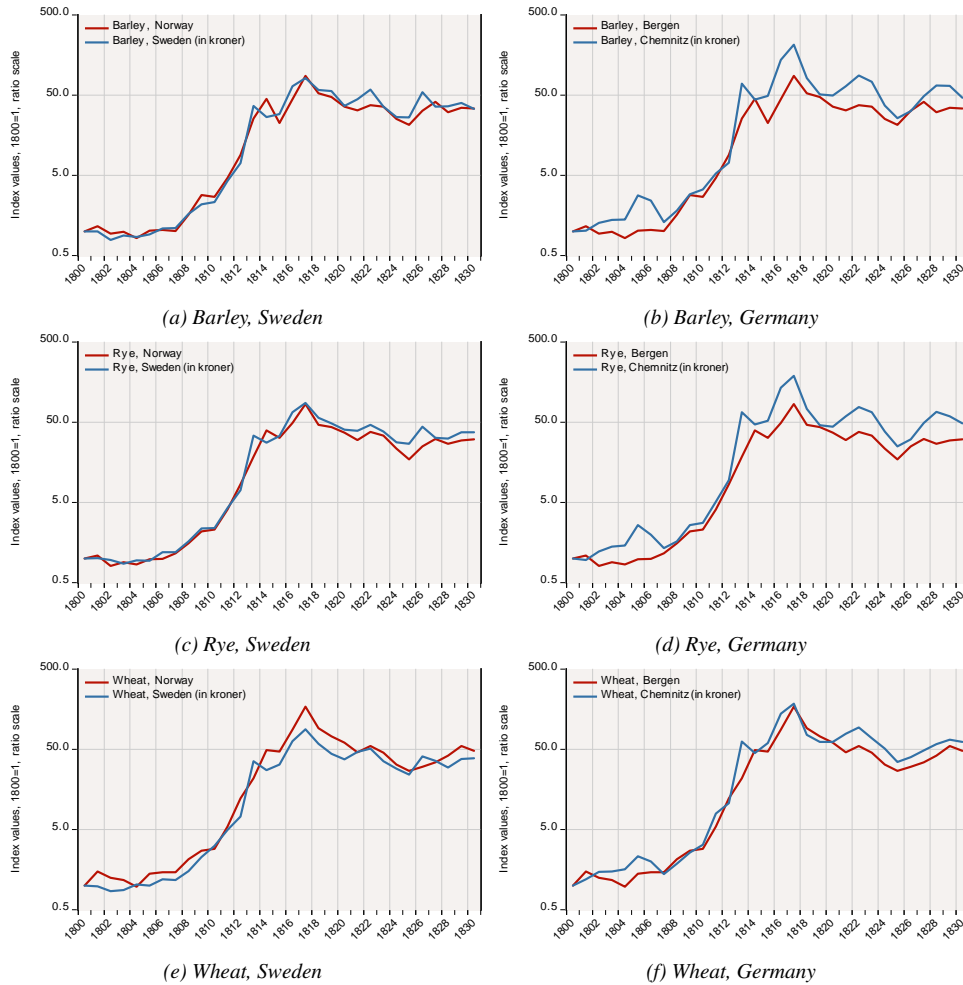


Figure 14.6 PPP in grain markets in Sweden (left) and Germany (right)

⁵ See Table 9.2 above, Svendsen (1968), Edvinsson (2010) and Bohlin (2010).

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Figure 14.8 shows similar illustrations based on monthly price indices between Norway and UK for wholesale prices, and between Bergen (Norway) and Chemnitz (Germany) for barley, rye and wheat, respectively. The monthly price indices for Norway are discussed in Klovland (2013, 2014), for German grain types in Strauss (1963) and for UK wholesale prices in Gayer et al. (1953). All prices are expressed in Norwegian kroner (1800=1).

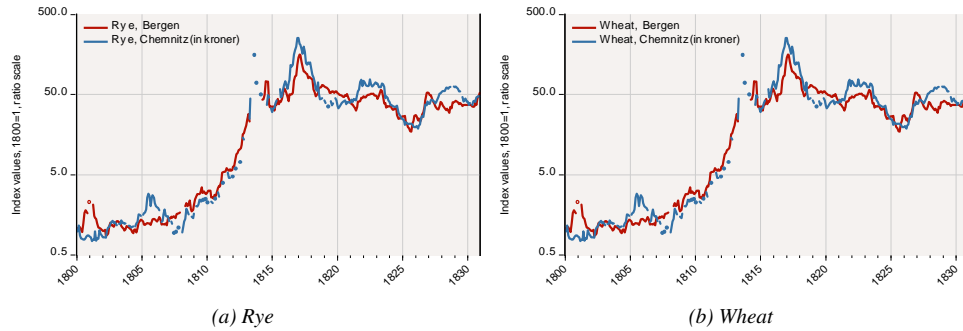


Figure 14.7 PPP between Bergen and Chemnitz Germany for two brands of grains, rye and wheat, all expressed in Norwegian kroner (1800=1).

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Figure 14.8 shows similar illustrations based on monthly price indices between Norway and UK for wholesale prices, producer prices and total supply prices and for imports, exports and domestic uses, respectively, all expressed in Norwegian kroner (1800=1).

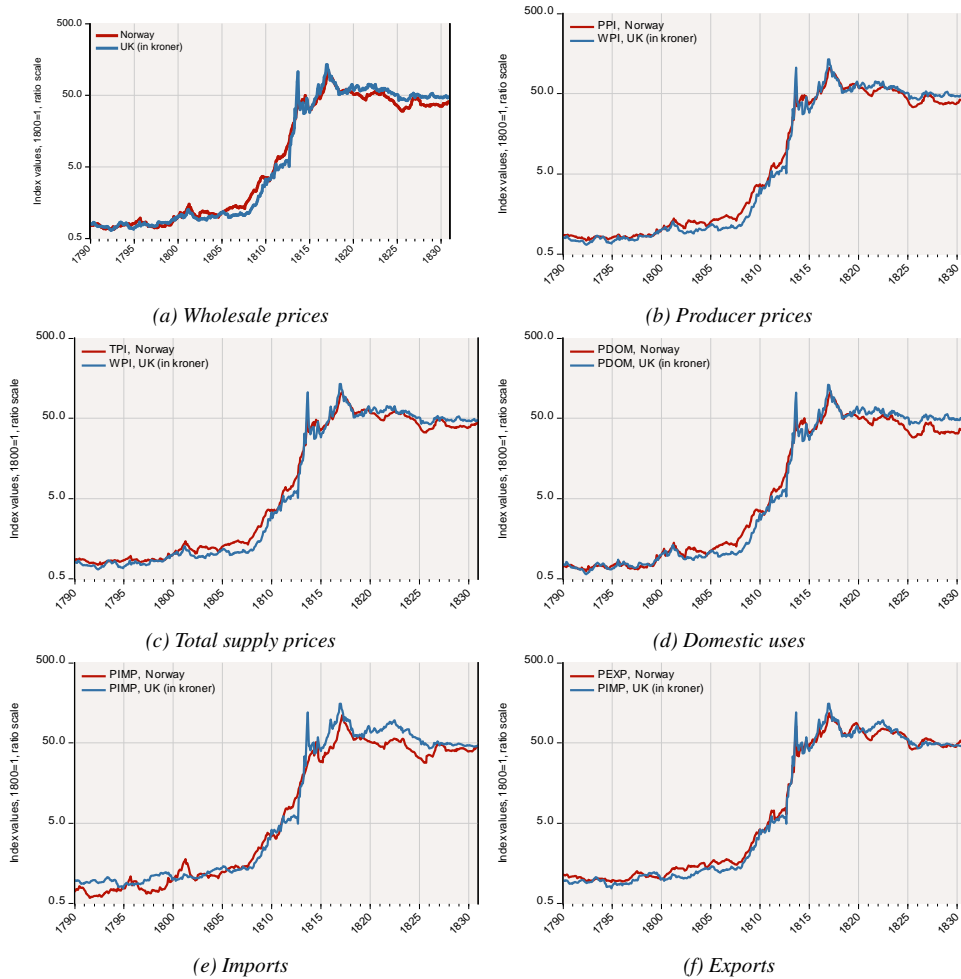


Figure 14.8 PPP in monthly price indices between Norway and UK for wholesale prices, producer prices and total supply prices and for imports, exports and domestic uses, respectively, all expressed in Norwegian kroner (1800=1)

14.3 Revisions in aggregated wage indices

This section gives a brief overview of the main changes and sources of revisions in these series in HMFS. The starting point for these revisions were the historical data for real wages presented in HMS I (2007) (Chapter 7) and the historical price data we have presented in earlier chapters in this book HMFS, notably, the new set of historical data for wholesale price indices presented in Chapter 9 and the extended and revised set of historical data for cost of living indices presented in Chapter 10 of this book.

Among the achievements in HMS I (2007) were two chapters on nominal wages, which were classified, respectively, by occupation and industry, (Grytten, 2007a,b) starting in 1726, which made it possible for us to calculate a corresponding set of historical data series for annual real wages from 1726 onwards. This was done by adjusting the nominal wage series for changes in the general price level by deflating them by the CLI-CPI documented in HMS I (Grytten, 2004).

Basic assumptions regarding real wage developments

Figure 14.9 shows the developments in GDP per capita from 1816 onwards in comparison with the aggregated real wage level in HMFS. Both series have been normalized and is set equal to 100 in 1970. From 1970 onwards we have also reported GDP per capita in the mainland economy, which excludes the oil sector. The level of real wages is available from 1726 onwards.

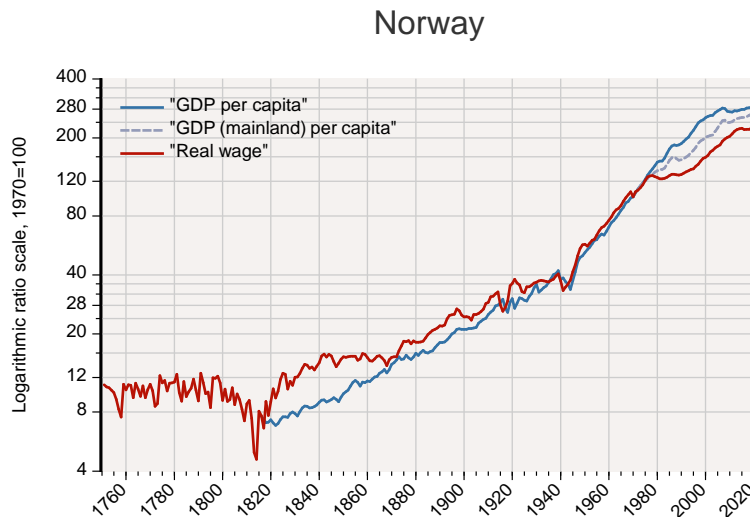


Figure 14.9 GDP per capita from 1816 onwards in comparison with the aggregated real wage level in HMFS 1726-2021 (1970=100, ratio scale).

When we recalculate nominal wages in light of the huge revisions of the data for the general price level during the early years of the 19th century we need to make a judgement whether there is also

Revisions and cross-checks of composite historical price and wage data

a need to make adjustments in the old real wage data for real wages in light of available revisions of historical data for GDP as documented in Chapter 8. We have concluded that the broad picture of real wage developments can be retained as it was published in HMS I (2007), with one exception for the years from 1813 to 1817. We will explain this in more detail in a later paragraph where we discuss the revisions we have made in the real wage data for these years.

Figure 14.10 shows the development in GDP per capita in comparison with aggregated real wages in the three Scandinavian countries and the UK 1700-2020. A couple of points are worth mentioning. Overall there is a strong positive association in all four countries between GDP per capita and the real wage level over the past three centuries. This reflects the extraordinary strong growth in productivity in all countries from the industrial revolution onwards. Although there are huge variations across production sectors in each country these productivity gains have resulted in strong growth in real wages over the past three centuries. There are also several caveats involved in the measurement of these variables and we refer readers to the country references listed in the legend of Figure 14.10 below for details.

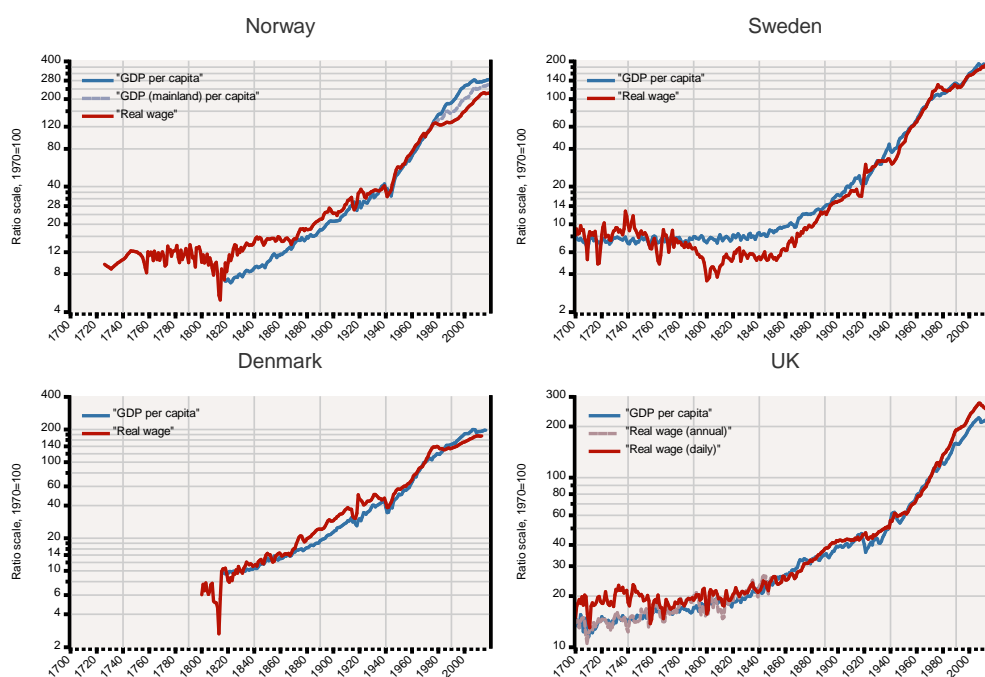


Figure 14.10 GDP per capita from 1816 onwards in comparison with aggregated real wages in the three Scandinavian countries and the UK 1700-2020 (1970=100, ratio scale). The sources of GDP per capita and real wages for the other Scandinavian countries and UK are, respectively, Abildgren (2017) (Denmark), Söderberg (2010), Prado (2010), Edvinsson and Söderberg (2010) Edvinsson (2014), Edvinsson (2013), (Sweden) and Thomas and Dimsdale (2017) drawing on Broadberry et al. (2015), Crafts and Mills (1994) and Humphries and Weisdorf (2017, 2019) (UK).

14.3 Revisions in aggregated wage indices

This section continues with the main steps in the revision process for the historical data for nominal wages. We provide as a cross-check of the revised wage data a comparison of the new wage estimates, expressed in units of riksdaler species, the main currency unit in the Dano-Norwegian currency union prior to the Napoleonic war, to micro observations of local wages observed at one of Norway's iron works at Baaseland/Næs in the southern part of the country during the 1700s (Fløystad, 1979).

Adjustments of real wage responses in Norway, 1800-1830

Adjustments in the data series for annual wages are based on maintaining previous estimates of real wages in HMS II, except for the period 1812-1821, which cover the years of hyperinflation. We have made adjustments in the real wage responses in Norway to the big shocks to inflation during the Napoleonic war and the first years after the end of the Dano-Norwegian monetary union in 1814. The real wage responses have been adjusted so they match closer what we have learned about real wage responses in Denmark in this period (Abildgren, 2017).

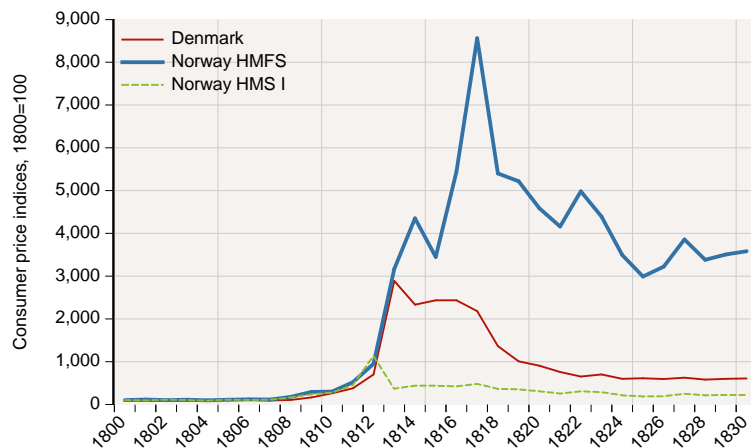


Figure 14.11 New and revised estimates of historical CLIs in HMFS 1800-1830, compared with old estimates in HMS I and data for Denmark (Abildgren, 2009). The data are normalized such that 1800=100.

Figure 14.11 shows revised estimates of historical CLIs in HMFS, compared with old estimates in HMS I, 1800-1830. For comparison we have included data for Denmark in the same period (Abildgren, 2009). The question is: What should we assume about the response in real wages to these massive shifts in the revised estimates of historical CLIs? Can we keep the assumption of maintaining the previous estimates of real wages also during this period with extreme inflation? Or, can we do better? We have looked to Denmark to find empirical evidence which can help us.

Figure 14.12 shows three alternatives for real wage responses in Norway during the early part of

Revisions and cross-checks of composite historical price and wage data

the 19th century, compared with data for Denmark in the same period reported in Abildgren (2017). Denmark experienced the largest positive shock to inflation in 1813 when inflation is measured to 312 percent. Figure 14.12 indicate that Danish real wages that year were reduced with 43 percent. It seems unlikely that Norwegian real wages would increase in response to similar large inflation shocks in two waves during the period 1813-1817. We have instead assumed that real wages in Norway responded more like those in Denmark during this period. Two such alternatives are shown in Figure 14.12 and we have selected the alternative indicated with the thick blue line, which shows a reduction in the real wage in Norway both in 1813 and 1814 as well as in the years 1816 and 1817 in response to substantial positive inflation shocks in these years. Based on these assumptions regarding the development in real wages during this period we have recalculated estimates of the nominal wages for all individual sectors and the national average wage level.

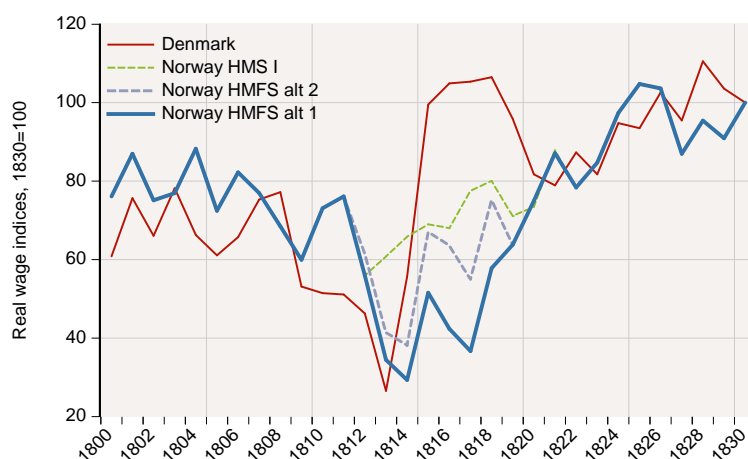


Figure 14.12 Three alternatives for real wage responses in Norway during the period 1812-1821, compared with data for Denmark in the same period (Abildgren, 2017). The data are normalized such that 1830=100.

Adjusted nominal wages compared with old estimates

Figure 14.13 shows the adjusted estimates of annual wages in HMFS, compared with old estimates in HMS I (2007), 1800-1830. We have normalized these wage indices and set them equal to 100 in 1800 in order to highlight the differences between them during the years with strong and borderline to hyperinflation in Norway during the years 1813-1817. The old wage level estimates in HMS I (2007) showed strong build up of wage growth in 1813-1814 and 1816-1817 before the wage level is reduced with around 50 percent in 1820. As we have stated above we think this is a quite unlikely scenario during these years with strong inflation and we have in light of this considered the two alternative scenarios shown in Figure 14.13. We have selected the scenario indicated by the thick

14.3 Revisions in aggregated wage indices

blue line. Armed with these revised real wage assumptions we may now compare the recalculated level of nominal wages with the old estimates in HMS I (2007).

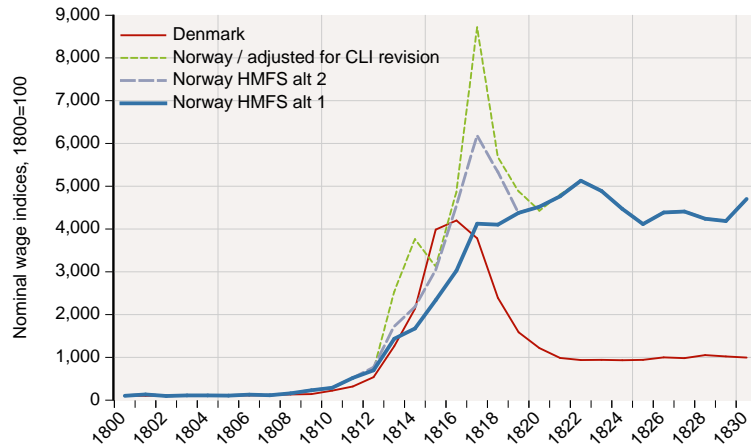


Figure 14.13 Revised estimates of annual wages in HMFS, compared with data for Denmark in the same period. The data are normalized such that 1800=100.

A cross-check of nominal wages and prices

Figure 14.14 shows adjusted estimates of the average wage level in HMFS, measured in kroner, in comparison with the wage estimates in HMS I Grytten (2007b), 1726-1850. As we would expect the recalculated level of wages are of a completely different order of magnitude in the 18th century and early 19th century prior to the Napoleonic war changed the course of history after the British navy attacked Copenhagen in September 1807.

In order to achieve a more relevant basis for comparison with observed wages in the 18th century we have recalculated the wage indices from kroner to the official currency unit in this period *riksdaler species*. Figure 14.15 shows the adjusted wage estimates measured in riksdaler species, cross-checked with wages reported at Baaseland/Næs iron works in the period 1726-1805 by Fløystad (1979). We have also recalculated the old wage estimates in HMS I (2007) from kroner to riksdaler species. These estimates are shown by the grey line in the upper part of Figure 14.15 and we note that these estimates are of a different order of magnitude and many times higher than the rest of the wage observations in this figure.

The recalculated estimates of the wage levels seems to be of an order of magnitude which is more in line with the wage levels observed for different types of labour groups, in this example at Baaseland/Næs iron works in the period from 1726 to 1800. We take this as a confirmation that the recalculated wage estimates are reasonable in comparison with wages as these are recorded in the

Revisions and cross-checks of composite historical price and wage data

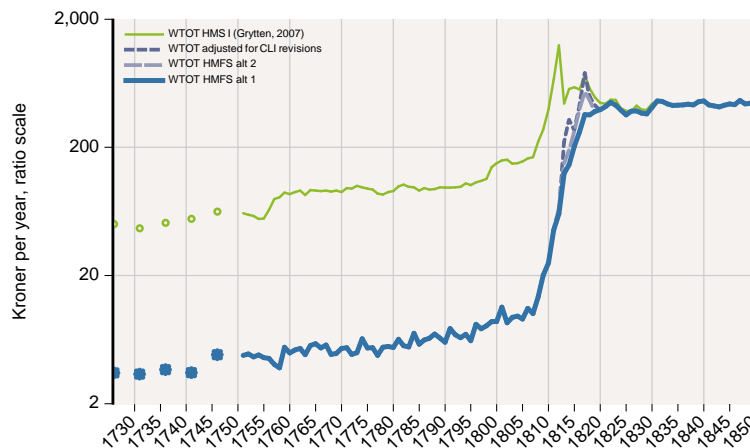


Figure 14.14 Revised estimates of the average wage level in HMFS, in kroner, compared with old wage estimates in HMS I, 1726-1850. For the period 1812-1821 three alternatives have been considered. Alternative 1 is highlighted (blue line)

iron work's archives. This is also an indirect confirmation that the revisions of the aggregated CLI-CPIs we have discussed earlier in this chapter and in chapters 9 and 10 in this book can be regarded as quite reasonable.

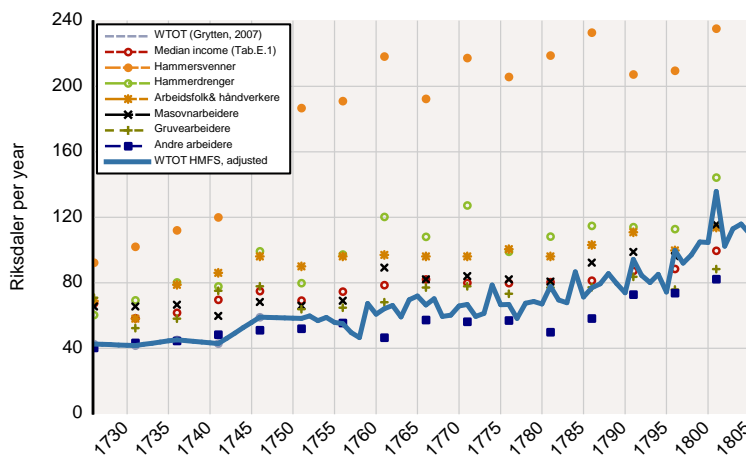


Figure 14.15 Revised estimates of the average wage level in HMFS, in riksdaler, cross-checked with wages reported at Baaseland/Næs iron works in Fløystad (1979), 1726-1805.

Finally, we see from Figure 14.16 that if we make similar adjustments and recalculate the estimates of sectoral wage levels we may draw a picture of the wage dispersion between the different sectors

14.3 Revisions in aggregated wage indices

in HMFS, measured in riksdaler species, which are located in the corridor marked with black solid lines in Figure 14.16. Again, when we compare the wage dispersion between the different sectors in HMFS with the observed wage dispersion reported at Baaseland/Næs iron works during the period 1726-1805 in Fløystad (1979), we find the latter to be more dispersed, and this is in particular due to the high wages reported for one group of iron workers (Hammersvenner). Admittedly, the range of groups in HMFS for which we have wage observations back to the 1700s is somewhat limited and we regard these calculations of wage dispersion as a quite informal exercise. On the other hand it is a common finding in the literature of the distribution of labour earnings that the distribution of earnings is typically skewed upwards and display long tails in the upward direction.

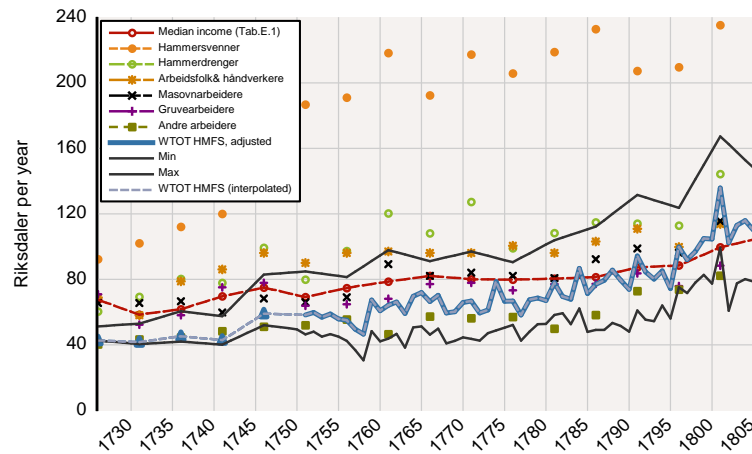


Figure 14.16 Revised estimates of sectoral wage dispersion in HMFS, in riksdaler species, cross-checked with wages reported at Baaseland/Næs iron works in Fløystad (1979), 1726-1805. The wage dispersion is illustrated with the min-max boundaries of revised estimates of sector wages in riksdaler species (black lines).

The overall conclusion from this informal cross-check is that it confirms what we have already stated above, that the revisions made in the CLI-CPIs seems to be fully reasonable, both when we cross-check against observed exchange rates under the maintained assumption that PPP holds and when we cross-check against observed wage levels at Baasland/Næs iron works during three fourths of the 18th century.

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14.A Appendix, Improving numerical precision in monthly data for historical CLI-CPIs and WPIs

The numerical precision of index numbers in CLI-CPIs or WPIs may be of course be overstated. When Statistics Norway release their CPI-numbers on the 10th every month the index number is quoted in levels with one decimal point which corresponds to one tenth of a unit when measured at the base level 100. As an example, consider the CPI published on 10 May 2021 for April 2021, which was quoted at 115.0, with a 0.3 percent increase since March 2021 and a 3.0 percent increase since April 2020. The year 2015 is the current base year of normalization in which the annual average is set equal to $\text{CPI} = 100$. For completeness, note that the March 2021 number is 114.6 and the April 2020 number is 111.7, thus, the exact rate of change last month and over the past 12 months can be expressed more precisely, with three decimals, as 0.349 (instead of 0.3) percent and 2.954 (instead of 3.0) percent, respectively.

The CPI-levels will never be revised and the precision of one tenth of a unit change at this level, say, from 115.0 to 115.1 will remain constant relative to the 2015 basis, at $0.087 (= 0.1 * 100/115.0)$ percent of 115.0. This looks very different if we move back in time and note, for example that 90 years ago, the CLI of those times is now quoted at the level 2.9 in April 1931 in Table 08981 from Statistics Norway, which also uses 2015 as base year.

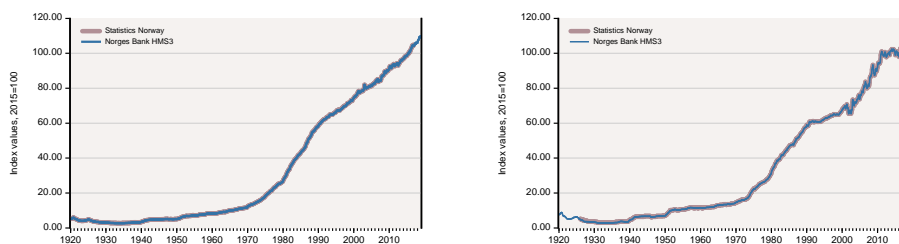
But the value of one tenth of a unit change at this level, say from 2.9 to 3.0 is a much larger change of $0.1 * 100/2.9 = 3.448$ percent of the index value 2.9. Hence the value of one tenth of a unit change in the index in April 1931 is around 40 times higher than the value of one tenth of a unit change in April 2021 when the CPI is set equal to 100 in 2015. This is a reflection of the fact that the price level has increased 40-fold from 2.9 in April 1931 to 115.0 in 2021.

We have made an attempt to restore the original level of precision in the monthly CLI-CPIs from Statistics Norway as this was stated when the CLI-CPIs were published for the first time, in units of an index which had a base year fairly close in time to the year of publication. We have used Statistics Norway's publications Historical Statistics as a source for this exercise, retrieving monthly price index data with higher level of precision, and the results are shown in the figures below. We have also conducted a similar exercise on aggregated WPIs (Wholesale Price Indices).

Figure 14.17 illustrates that the long run trends in the price levels of CLI-CPIs as well as WPIs seems to be quite unaffected by the type of imprecision we discuss here. The measurement errors are small relative to the general level of inflation, which has determined the positive trend in the price level since the early 1920s.

But the devil hides among the details. When we zoom in on the different sub-periods shown in Figure 14.18 below, some ugly details emerge which reveals a lack of tender love and care in the preservation and caretaking of historical price index data. We note from the inspection of Figure 14.18 that there seem to be quite substantial distortions hidden in the month-to-month changes of historical price data in these sub-periods, both in the case of the CLI-CPIs (left panel) and the WPIs

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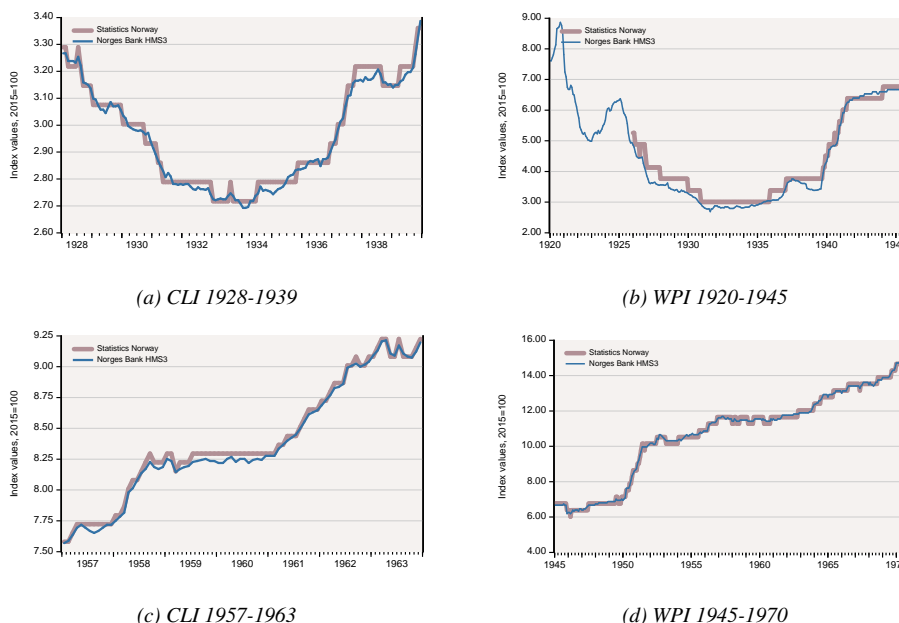
(a) Cost of living indices

(b) Wholesale price indices

Figure 14.17 Overview of monthly CLI-CPIs (left) and WPIs (right). 2015=100

(right panel) when we compare the data series we retrieve from Statistics Norway with the revised series we have produced as part of this exercise.

The revised data series show a picture of the monthly developments in the CLI-CPI, we claim, in which we have restored a level of precision comparable to that of the original publications of the price indices by Statistics Norway. This seems to be in stark contrast with the distorted picture of month-to-month developments which emerges as a result of repeated re-basing of historical CLI-CPI-series, while adhering strictly to a principle of only including one decimal in published versions of these re-based historical series. The loss of precision is substantial – and quite unnecessary.



(a) CLI 1928-1939

(b) WPI 1920-1945

(c) CLI 1957-1963

(d) WPI 1945-1970

Figure 14.18 Enhancing numerical precision in monthly cost of living and wholesale price indices. A more detailed view of the subperiods 1928-1939 and 1957-1963 for CLIs (left) and 1920-1945 and 1945-1970 for WPIs (right).

14.B Appendix, Revisions in annual wage data by industry, 1726-1900

Table 14.B.1 *Wages by industry, 1726-1900*

Code	Industry name
1.0	Primary industries
1.1	Agriculture and forestry
2.0	Secondary industries
2.1	Construction
2.2	Manufacturing
2.2.1	Textile
2.2.2	Engineering
2.3	Crafts
3.0	Transport and communication
3.1	Merchant fleet
3.2	Domestic transport
3.3	Communications
4.0	Private services
4.1	Domestic services
4.1.1	Housekeeping
5.0	Public services
5.1	Public administration
5.2	Education
6.0	Total adjusted for CLI revisions

Table 14.B.1 provides an overview of the industries for which we need to revise the historical estimates of annual wage data that were reported in HMS I (Grytten, 2007b). The revised historical estimates for the period 1726-1830 are shown in Table 14.B.2. From 1831 until 1900 we report the old data from HMS I (Grytten, 2007b). Data for annual wages by industry are here reported in kroner. The data are also shown in Figure 14.19.

Table 14.B.3 show revised historical estimates of nominal and real wages in kroner for the period 1726-2021. From 1816 until 1876 we have also reported wages in *speciedaler* (1 *speciedaler* = 4 kroner), from 1813 to 1816 the currency unit was *riksbankdaler* (1 *speciedaler* = 10 *riksbankdaler*) and before 1813 the currency unit was *riksdaler species*. For a complete conversion table between these Norwegian currencies, see Figure 1.2 in Chapter 1 on page 14.⁶ The data for nominal wages in the four different currencies (*kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*) are shown in Figure 14.20.

⁶ The conversion to *riksdaler species* is slightly more complicated since we need first to make a conversion from *riksbankdaler* to the paper currency unit *riksdaler courant* (1 *riksbankdaler* = 6 *riksdaler courant*). In step two we make the conversion from *riksdaler courant* to *riksdaler species* (1 *riksdaler species* = 12/15 (0.8) *riksdaler courant* 1795-1813 and 9.25/11.33 (0.816) *riksdaler courant* before 1795).

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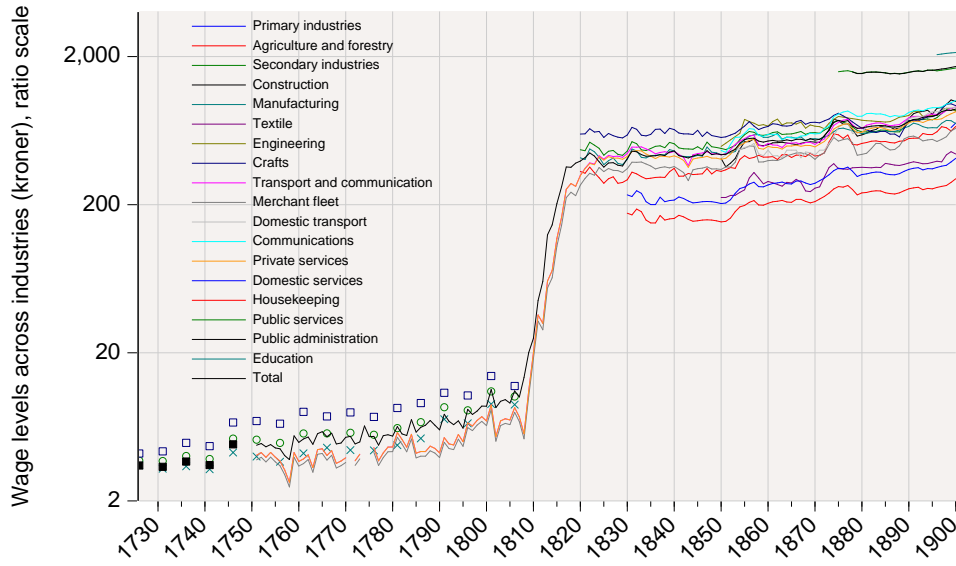


Figure 14.19 Revised historical estimates of annual wages by industry, 1726-1900, logarithmic ratio scale.

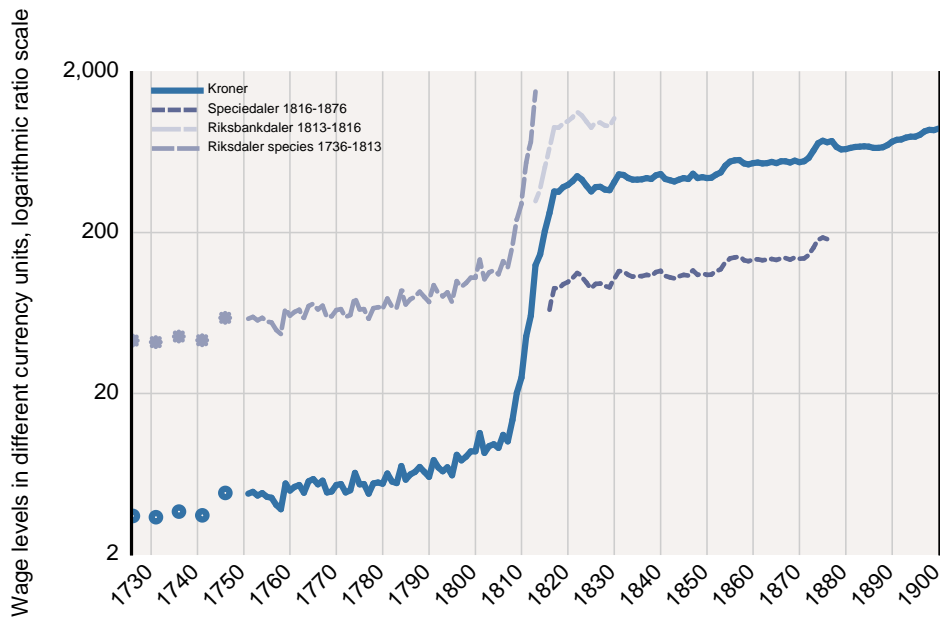


Figure 14.20 Revised historical estimates of nominal wages, 1726-1900, logarithmic ratio scale. The data for nominal wages are reported in the four official currencies (*kroner*, *speciedaler*, *rikbankdaler* and *rikdaler species*), which have been in use during this period.

Table 14.B.2: Revised estimates of annual wages by industry, in kroner, 1726-1900.

Year	Industry sectors. Code definitions are shown in Table 14.B.1.																			
	1.0	1.1	2.0	2.1	2.2	2.2.1	2.2.2	2.3	3.0	3.1	3.2	3.3	4.0	4.1	4.1.1	5.0	5.1	5.2	6.0	
1726			3.7		3.5			4.2												3.5
1727																				
1728																				
1729																				
1730																				
1731			3.7		3.3			4.3												3.4
1732																				
1733																				
1734																				
1735																				
1736			4.0		3.4			4.9												3.7
1737																				
1738																				
1739																				
1740																				
1741			3.8		3.3			4.7												3.5
1742																				
1743																				
1744																				
1745																				
1746			5.3		4.2			6.8												4.8
1747																				
1748																				
1749																				
1750																				
1751			5.2		4.0			6.9	4.1	3.8			4.1							4.8
1752									4.2	3.9			4.2							4.9
1753									3.9	3.7			3.9							4.6
1754									4.2	4.0			4.2							4.8
1755									3.9	3.7			3.9							4.6
1756			4.9		3.7			6.6	3.7	3.5			3.7							4.5
1757									3.2	3.0			3.2							4.0
1758									2.7	2.5			2.7							3.8
1759									4.2	3.9			4.2							5.5
1760									3.7	3.4			3.7							5.0

Table 14.B.2: Revised estimates of annual wages by industry, in kroner, 1726-1900.

Year	Industry sectors. Code definitions are shown in Table 14.B.1.																			
	1.0	1.1	2.0	2.1	2.2	2.2.1	2.2.2	2.3	3.0	3.1	3.2	3.3	4.0	4.1	4.1.1	5.0	5.1	5.2	6.0	
1761			5.7		4.2			8.0	3.8	3.6			3.8							5.2
1762									4.1	3.8			4.1							5.4
1763									3.4	3.1			3.4							4.8
1764									4.4	4.1			4.4							5.7
1765									4.5	4.2			4.5							5.9
1766			5.7		4.6			7.4	4.1	3.8			4.1							5.4
1767									4.4	4.1			4.4							5.7
1768									3.6	3.3			3.6							4.8
1769									3.7	3.5			3.7							4.9
1770									3.9	3.6			3.9							5.4
1771			5.8		4.4			7.9												5.5
1772									3.7	3.5			3.7							4.8
1773									4.1	3.8			4.1							5.0
1774																				6.4
1775																				5.4
1776			5.6		4.4			7.4	4.6	4.3			4.6							5.5
1777									3.7	3.5			3.7							4.8
1778									4.2	3.9			4.2							5.5
1779									4.6	4.3			4.6							5.6
1780									4.6	4.3			4.6							5.5
1781			6.2		4.8			8.5	5.8	5.4			5.8							6.4
1782									5.2	4.8			5.2							5.7
1783									4.6	4.3			4.6							5.5
1784									5.6	5.2			5.6							7.1
1785									4.2	3.9			4.2							5.8
1786			6.8		5.3			9.2	4.3	4.0			4.3							6.3
1787									4.3	4.0			4.3							6.5
1788									4.7	4.4			4.7							7.0
1789									4.5	4.2			4.5							6.5
1790									4.2	3.9			4.2							6.0
1791			8.6		7.1			10.7	5.3	5.0			5.3							7.7
1792									4.9	4.5			4.9							6.9
1793									4.8	4.4			4.8							6.5
1794									5.6	5.2			5.6							6.9
1795									5.0	4.7			5.0							6.2

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Table 14.B.2: Revised estimates of annual wages by industry, in kroner, 1726-1900.

Year	Industry sectors. Code definitions are shown in Table 14.B.1.																			
	1.0	1.1	2.0	2.1	2.2	2.2.1	2.2.2	2.3	3.0	3.1	3.2	3.3	4.0	4.1	4.1.1	5.0	5.1	5.2	6.0	
1796			8.2		6.7			10.3	6.7	6.3			6.7							8.3
1797									6.4	6.0			6.4							7.7
1798									7.0	6.5			7.0							8.1
1799									7.4	6.9			7.4							8.7
1800									6.9	6.4			6.9							8.7
1801			11.0		9.0			13.9	8.9	8.3			8.9							11.3
1802									5.4	5.1			5.4							8.5
1803									6.9	6.5			6.9							9.4
1804									7.2	6.7			7.2							9.7
1805									7.0	6.5			7.0							9.2
1806			10.1		8.9			11.9	8.5	7.9			8.5							11.1
1807									7.4	6.9			7.4							10.1
1808									5.7	5.2			5.7							13.6
1809									11.1	10.2			11.1							20.1
1810									20.0	18.3			20.0							25.1
1811									36.0	32.7			36.0							45.2
1812									31.6	28.6			31.6							60.7
1813									61.0	54.8			61.0							125.1
1814									71.9	64.2			71.9							146.1
1815									118.3	105.1			118.3							203.6
1816									164.3	145.2			164.3							263.9
1817									254.0	223.2			254.0							359.5
1818									277.8	242.7			277.8							357.7
1819									266.2	230.0			266.2							381.6
1820		335.3	470.1		414.5			599.6	315.7	271.3			314.1							393.9
1821		326.0	462.8		403.3			601.7	352.0	300.9			350.2							415.4
1822		358.8	528.3		475.6			651.3	383.3	325.9			379.5							447.2
1823		328.6	504.3		455.3			618.5	375.8	316.1			372.1							426.0
1824		304.0	480.3		418.5			624.5	428.2	356.4			421.8							389.5
1825		279.0	431.5		372.6			568.8	406.0	334.4			399.9							358.6
1826		299.3	458.9		396.2			605.2	430.7	351.0			422.0							382.5
1827		308.5	464.7		413.2			584.8	422.9	341.2			412.3							384.2
1828		278.8	437.5		380.3			571.1	425.4	339.8			412.6							369.5
1829		282.6	430.8		373.5			564.6	417.4	330.1			404.9							365.0
1830		294.6	460.2		404.2			591.0	443.3	350.4			423.0	232.9	175.1					410.1

Table 14.B.2: Revised estimates of annual wages by industry, in kroner, 1726-1900.

Year	Industry sectors. Code definitions are shown in Table 14.B.1.																			
	1.0	1.1	2.0	2.1	2.2	2.2.1	2.2.2	2.3	3.0	3.1	3.2	3.3	4.0	4.1	4.1.1	5.0	5.1	5.2	6.0	
1831		331.7	532.4		475.2			665.8	489.9	387.3				456.5	227.0	170.7				460.0
1832		323.0	516.2		460.7			645.6	488.8	386.4				463.4	248.5	186.8				455.3
1833		309.2	468.8		417.4			588.8	491.1	388.3				461.6	238.5	179.3				435.6
1834		299.3	464.5		413.7			582.9	476.3	376.5				439.8	209.4	157.5				424.7
1835		301.8	479.1		428.8			596.5	461.8	365.0				425.3	200.3	150.6				425.9
1836		305.5	495.4		431.2			645.1	441.0	348.6				409.5	200.3	150.6				427.7
1837		306.7	499.6		436.0			647.9	450.5	356.1				425.5	224.8	169.0				434.8
1838		305.5	485.1		433.8			604.7	455.6	360.2				424.0	209.4	157.5				429.1
1839		333.7	526.6		471.1			656.1	448.1	354.3				419.6	213.3	160.3				453.7
1840		351.9	515.5		461.1			642.5	457.6	361.7				427.4	214.8	161.5				460.8
1841		311.2	483.6		429.7			609.3	437.5	345.9				415.9	225.5	169.6				428.6
1842		311.9	476.9		423.7			601.0	416.6	329.3				398.0	220.2	165.5				421.0
1843		325.1	475.7		422.0			601.0	367.6	290.6				357.4	211.7	159.2				413.5
1844		319.4	473.5		421.1			595.5	434.8	343.7				406.6	205.6	154.6				426.1
1845		321.3	492.4		430.8			636.3	442.8	350.0				413.3	207.1	155.7				435.1
1846		323.1	470.9		425.2			577.4	446.6	353.0				417.0	209.4	157.5				430.2
1847		350.6	528.9		490.4			618.7	455.5	360.1				424.1	210.2	158.0				463.5
1848		322.5	492.4		452.4			585.6	440.7	348.4				412.6	209.4	157.5				435.4
1849		340.7	486.8		448.0			577.4	441.3	348.8				412.1	207.0	155.6				441.7
1850		335.7	479.7	409.9	435.4	223.8	495.0	568.8	434.1	345.9	412.2	464.7	405.4	203.5	153.0					435.0
1851		344.0	471.0	360.0	440.1	223.8	520.0	574.1	441.5	359.7	432.9	451.2	411.6	205.2	154.3					437.9
1852		356.4	485.6	381.4	448.0	230.8	548.0	590.8	471.0	358.8	456.3	511.0	438.1	216.1	162.4					456.7
1853		351.6	502.4	409.9	456.9	231.4	576.0	607.7	510.1	386.9	479.6	569.5	476.2	238.6	179.4					472.1
1854		404.4	551.4	474.3	510.3	242.3	607.1	642.1	537.3	471.5	471.8	571.7	503.6	257.1	193.3					520.4
1855		428.4	593.4	531.4	547.6	252.1	753.5	678.7	558.5	481.0	487.4	606.2	521.9	262.9	197.7					550.5
1856		410.1	624.0	532.9	579.5	302.7	728.6	727.3	582.8	497.6	492.6	652.7	545.1	275.8	207.4					559.6
1857		417.2	616.4	556.7	592.0	329.9	709.9	679.3	589.6	496.5	518.5	646.6	553.1	283.6	213.2					562.9
1858		430.9	590.8	505.2	594.8	302.7	685.0	643.1	503.0	388.2	440.7	587.2	480.1	264.7	199.0					537.4
1859		418.7	587.6	500.2	570.0	276.6	694.3	662.3	495.5	388.8	427.8	578.6	474.0	263.8	198.4					529.0
1860		419.4	594.5	508.5	569.6	286.9	678.7	675.4	518.6	396.7	466.7	596.7	494.6	271.8	204.3					538.1
1861		422.2	614.4	523.2	584.1	280.9	728.6	703.9	506.1	399.0	427.8	598.4	487.3	278.2	209.2					543.4
1862		403.7	620.5	524.5	605.8	273.8	756.6	697.8	503.9	397.2	427.8	594.1	486.5	280.6	210.9					536.7
1863		434.7	596.0	527.6	554.1	266.8	691.2	681.7	486.6	409.0	414.8	547.6	474.6	284.3	213.8					539.0
1864		435.0	599.5	521.2	571.2	283.1	713.0	678.6	520.3	427.8	466.7	571.7	497.9	277.4	208.6					547.8
1865		416.4	600.8	516.0	571.3	280.4	713.0	685.2	521.0	436.9	466.7	564.8	497.9	275.9	207.4					539.8

Revisions and cross-checks of composite historical price and wage data

Table 14.B.2: Revised estimates of annual wages by industry, in kroner, 1726-1900.

Year	Industry sectors. Code definitions are shown in Table 14.B.1.																		
	1.0	1.1	2.0	2.1	2.2	2.2.1	2.2.2	2.3	3.0	3.1	3.2	3.3	4.0	4.1	4.1.1	5.0	5.1	5.2	6.0
1866		432.4	611.4	509.4	562.0	296.7	700.5	726.6	523.8	446.7	466.7	563.1	504.6	288.8	217.2				552.6
1867		431.1	623.9	519.1	574.0	283.1	722.3	741.4	512.0	447.6	414.8	581.2	495.7	289.0	217.3				553.2
1868		422.2	597.0	526.7	540.9	247.7	656.7	697.9	525.3	441.3	453.7	585.5	502.7	280.1	210.6				542.7
1869		444.6	611.8	531.9	556.6	245.0	690.8	718.1	527.3	429.0	448.5	607.9	501.8	273.5	205.6				557.3
1870		426.7	612.7	529.4	558.4	258.6	677.7	720.4	510.9	404.9	432.9	601.0	491.3	279.1	209.8				546.2
1871		429.6	607.4	526.8	553.0	264.0	672.4	713.5	533.9	433.0	466.7	604.4	513.0	290.5	218.4				552.7
1872		448.1	637.9	586.7	571.0	307.6	651.4	736.7	556.1	446.9	466.7	652.7	534.3	302.4	227.4				580.3
1873		529.6	664.1	634.1	587.7	356.6	709.2	758.2	605.8	510.5	518.5	678.5	578.1	318.5	239.5				642.7
1874		601.3	723.2	754.7	621.3	378.4	753.9	801.6	686.5	568.4	578.1	787.8	647.5	339.6	255.3				716.8
1875		592.2	740.7	738.7	651.9	350.1	788.0	828.5	718.3	537.4	666.3	818.0	676.4	352.6	265.1	1 580.0			742.1
1876		561.1	720.7	700.4	657.6	348.1	780.1	795.6	744.4	550.2	700.0	844.7	695.2	349.4	262.7	1 595.0			726.6
1877		590.9	704.9	704.1	644.0	346.8	769.6	764.9	754.5	558.0	707.8	857.6	706.2	358.5	269.5	1 605.0			739.2
1878		510.3	668.9	640.9	631.2	355.0	761.7	723.9	693.9	524.1	604.1	824.9	651.9	336.4	252.9	1 579.0	1 575.0		678.6
1879		506.3	635.1	581.0	617.5	356.3	753.9	687.8	653.3	431.3	614.4	790.4	611.3	309.8	232.9	1 539.8	1 535.6		656.4
1880		518.6	620.8	592.0	603.5	357.7	743.3	656.7	655.6	437.3	614.4	791.3	616.6	319.6	240.3	1 539.8	1 535.6		659.2
1881		525.6	619.7	607.3	607.6	356.3	738.1	639.8	688.6	444.8	666.3	824.0	642.9	322.7	241.8	1 567.8	1 563.8		669.4
1882		536.3	622.8	632.9	614.6	355.0	735.5	624.1	701.2	478.0	666.3	827.4	654.7	328.6	246.3	1 573.4	1 569.4		678.0
1883		539.1	623.9	644.2	619.9	357.7	730.2	614.3	712.2	518.8	666.3	818.8	664.4	332.2	248.1	1 574.5	1 570.5		681.6
1884		532.2	638.0	677.2	624.6	356.3	727.6	625.4	712.3	517.2	666.3	820.5	664.2	331.4	247.5	1 566.7	1 562.6		685.0
1885		534.1	636.8	666.2	629.6	380.1	722.3	624.4	697.7	489.2	666.3	806.8	650.0	323.1	240.6	1 554.3	1 550.3		681.9
1886		525.3	624.9	668.3	622.3	375.5	727.6	598.8	682.4	468.2	666.3	784.4	636.9	319.2	237.7	1 534.2	1 530.0		670.2
1887		522.0	620.4	644.8	625.0	370.1	751.2	599.9	689.2	471.7	666.3	799.9	641.7	318.1	236.1	1 542.0	1 537.9		669.0
1888		536.3	620.4	664.5	639.1	367.9	780.1	573.0	695.0	499.4	666.3	789.6	648.3	324.0	240.5	1 531.9	1 527.8		676.2
1889		539.6	668.0	701.3	658.9	374.1	788.0	654.9	733.0	556.0	707.8	799.9	681.7	335.9	248.5	1 545.4	1 541.3		698.6
1890		559.3	721.5	762.3	676.2	382.3	801.1	738.7	772.4	575.0	759.6	839.5	715.5	346.1	256.1	1 567.8	1 563.8		731.3
1891		562.3	751.3	822.6	710.7	389.7	853.7	744.1	788.7	580.9	777.8	861.0	730.2	352.2	259.7	1 590.2	1 586.3		752.7
1892		562.3	749.4	844.7	697.3	384.5	853.7	737.3	789.9	565.5	785.5	871.3	732.3	355.6	262.2	1 601.4	1 597.5		757.1
1893		605.0	751.1	852.4	672.6	377.7	788.0	761.0	776.4	538.9	785.5	859.3	717.6	343.4	252.4	1 589.1	1 585.1		777.2
1894		595.1	758.5	868.5	659.3	379.0	801.1	782.6	802.9	547.3	821.8	888.6	740.4	350.5	257.6	1 620.5	1 616.6		785.7
1895		594.6	747.8	815.5	662.3	386.1	801.1	786.6	819.1	552.0	847.7	903.2	752.3	349.1	255.8	1 620.5	1 616.6		788.3
1896		621.4	774.8	895.6	660.4	393.2	801.1	806.8	813.3	534.3	847.7	904.1	750.7	357.1	261.6	1 601.5	1 631.3	2 060.0	807.3
1897		672.6	825.0	905.9	709.2	389.1	879.9	884.6	822.7	552.7	847.7	912.7	760.4	364.0	265.8	1 618.6	1 649.3	2 080.6	849.9
1898		661.5	874.1	949.8	741.4	433.9	893.1	953.6	864.0	575.3	899.6	954.0	793.8	369.0	269.4	1 634.2	1 665.0	2 101.2	867.7
1899	663.5	628.9	892.6	1 019.3	738.2	455.9	893.1	959.5	891.5	630.2	899.6	978.1	821.9	388.7	282.9	1 654.2	1 689.8	2 116.7	865.4
1900	712.0	674.9	864.2	995.1	705.6	439.6	853.7	932.6	914.2	654.5	907.4	1 010.0	847.4	411.2	299.3	1 673.6	1 714.5	2 130.0	884.6

Table 14.B.3: Revised estimates of annual nominal wages in different currencies (kroner, speciedaler, riksbankdaler and riksdaler species) from 1726 onwards. The table also report data for consumer price indices and real wages from 1726, population from 1735 and GDP and GDP per capita from 1816 onwards.

Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1726	3.47			42.48	0.0187	18 591				
1727					0.0202					
1728					0.0174					
1729					0.0180					
1730					0.0166					
1731	3.40			41.61	0.0153	22 175				
1732					0.0167					
1733					0.0168					
1734					0.0180					
1735					0.0177				0.616	
1736	3.69			45.15	0.0166	22 175			0.622	
1737					0.0169				0.627	
1738					0.0170				0.630	
1739					0.0164				0.634	
1740					0.0195				0.638	
1741	3.49			42.75	0.0228	15 287			0.635	
1742					0.0217				0.622	
1743					0.0196				0.613	
1744					0.0178				0.616	
1745					0.0187				0.622	
1746	4.82			59.00	0.0188	25 624			0.629	
1747					0.0188				0.635	
1748					0.0199				0.638	
1749					0.0211				0.639	
1750					0.0186				0.642	
1751	4.75			58.18	0.0186	25 596			0.646	
1752	4.88			59.75	0.0196	24 930			0.651	
1753	4.64			56.77	0.0188	24 721			0.657	
1754	4.80			58.78	0.0200	23 967			0.664	

The following conversion rules apply between the four official currencies *kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*.
 1 speciedaler = 4 kroner, 1 speciedaler = 10 riksbankdaler, 1 riksbankdaler = 6 riksdaler courant (paper note currency), 1 riksdaler species = 12/15 (0.8) riksdaler courant 1795-1813 and 9.25/11.33 (0.816) riksdaler courant before 1795. For a complete conversion table between these Norwegian currencies, see Figure 1.2 in Chapter 1 on page 14.

Table 14.B.3: Revised estimates of annual nominal wages in different currencies (kroner, speciedaler, riksbankdaler and riksdaler species) from 1726 onwards. The table also report data for consumer price indices and real wages from 1726, population from 1735 and GDP and GDP per capita from 1816 onwards.

Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1755	4.56			55.79	0.0195	23 328			0.671	
1756	4.50			55.04	0.0209	21 542			0.676	
1757	4.05			49.52	0.0211	19 199			0.683	
1758	3.80			46.53	0.0217	17 506			0.690	
1759	5.50			67.32	0.0214	25 704			0.695	
1760	4.97			60.81	0.0207	24 055			0.701	
1761	5.24			64.13	0.0205	25 530			0.708	
1762	5.40			66.08	0.0212	25 420			0.715	
1763	4.82			59.01	0.0220	21 935			0.717	
1764	5.69			69.62	0.0218	26 035			0.717	
1765	5.87			71.83	0.0241	24 314			0.720	
1766	5.43			66.46	0.0243	22 324			0.722	
1767	5.74			70.22	0.0227	25 229			0.727	
1768	4.85			59.34	0.0221	21 980			0.733	
1769	4.92			60.20	0.0204	24 140			0.739	
1770	5.38			65.82	0.0209	25 731			0.745	
1771	5.45			66.74	0.0229	23 818			0.751	
1772	4.85			59.37	0.0244	19 841			0.754	
1773	5.00			61.26	0.0244	20 490			0.745	
1774	6.41			78.54	0.0225	28 477			0.736	
1775	5.43			66.48	0.0208	26 106			0.741	
1776	5.45			66.76	0.0203	26 880			0.747	
1777	4.76			58.22	0.0200	23 734			0.754	
1778	5.51			67.49	0.0212	26 016			0.762	
1779	5.59			68.48	0.0214	26 143			0.767	
1780	5.48			67.05	0.0207	26 399			0.771	
1781	6.35			77.80	0.0220	28 944			0.777	
1782	5.67			69.37	0.0243	23 342			0.783	
1783	5.53			67.69	0.0262	21 111			0.787	

The following conversion rules apply between the four official currencies *kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*.
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Table 14.B.3: Revised estimates of annual nominal wages in different currencies (kroner, speciedaler, riksbankdaler and riksdaler species) from 1726 onwards. The table also report data for consumer price indices and real wages from 1726, population from 1735 and GDP and GDP per capita from 1816 onwards.

Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1784	7.07			86.60	0.0267	26 527			0.790	
1785	5.82			71.30	0.0262	22 253			0.790	
1786	6.28			76.88	0.0267	23 508			0.790	
1787	6.48			79.38	0.0264	24 561			0.795	
1788	6.98			85.51	0.0255	27 339			0.798	
1789	6.49			79.44	0.0270	23 993			0.800	
1790	6.04			73.89	0.0286	21 131			0.803	
1791	7.69			94.15	0.0263	29 244			0.809	
1792	6.90			84.48	0.0263	26 193			0.817	
1793	6.54			80.07	0.0284	22 998			0.825	
1794	6.95			85.03	0.0296	23 494			0.835	
1795	6.20			74.36	0.0318	19 510			0.843	
1796	8.30			99.66	0.0300	27 709			0.851	
1797	7.67			92.00	0.0278	27 571			0.859	
1798	8.08			96.99	0.0286	28 265			0.867	
1799	8.73			104.80	0.0335	26 107			0.875	
1800	8.72			104.60	0.0410	21 269			0.881	
1801	11.31			135.72	0.0465	24 304			0.883	
1802	8.52			102.30	0.0406	20 989			0.883	
1803	9.41			112.88	0.0437	21 501			0.885	
1804	9.65			115.84	0.0391	24 662			0.888	
1805	9.15			109.82	0.0452	20 250			0.893	
1806	11.05			132.65	0.0481	22 980			0.900	
1807	10.06			120.75	0.0468	21 504			0.907	
1808	13.64			163.64	0.0712	19 143			0.910	
1809	20.09			241.12	0.1199	16 758			0.904	
1810	25.05			300.60	0.1227	20 423			0.896	
1811	45.17			542.03	0.2124	21 263			0.897	
1812	60.72			728.64	0.3884	15 633			0.900	

The following conversion rules apply between the four official currencies *kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*.
1 speciedaler = 4 kroner, 1 speciedaler = 10 riksbankdaler, 1 riksbankdaler = 6 riksdaler courant (paper note currency), 1 riksdaler species = 12/15 (0.8) riksdaler courant 1795-1813 and 9.25/11.33 (0.816) riksdaler courant before 1795. For a complete conversion table between these Norwegian currencies, see Figure 1.2 in Chapter 1 on page 14.

Table 14.B.3: Revised estimates of annual nominal wages in different currencies (kroner, speciedaler, riksbankdaler and riksdaler species) from 1726 onwards. The table also report data for consumer price indices and real wages from 1726, population from 1735 and GDP and GDP per capita from 1816 onwards.

Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1813	125.12		312.798	1 501.43	1.2990	9 632			0.902	
1814	146.11		365.281		1.7837	8 192			0.900	
1815	203.61		509.020		1.4137	14 403			0.905	
1816	263.94	65.984	659.842		2.2298	11 837	215	15 045	0.919	16 367
1817	359.54	89.885	898.847		3.5085	10 248	336	14 738	0.933	15 790
1818	357.69	89.423	894.231		2.2138	16 157	206	14 342	0.946	15 163
1819	381.56	95.391	953.911		2.1394	17 835	204	14 585	0.957	15 237
1820	393.92	98.480	984.803		1.8798	20 955	180	15 212	0.970	15 681
1821	415.40	103.851	1 038.506		1.7057	24 354	174	14 853	0.984	15 093
1822	447.20	111.799	1 117.994		2.0421	21 899	195	14 643	0.998	14 675
1823	426.04	106.509	1 065.089		1.8002	23 666	198	15 188	1.013	14 997
1824	389.53	97.382	973.818		1.4309	27 223	185	16 195	1.028	15 752
1825	358.58	89.644	896.442		1.2250	29 272	180	16 941	1.044	16 225
1826	382.49	95.622	956.222		1.3208	28 959	181	17 251	1.062	16 246
1827	384.15	96.039	960.385		1.5806	24 304	204	17 406	1.079	16 138
1828	369.50	92.374	923.742		1.3857	26 666	189	18 447	1.093	16 873
1829	365.03	91.259	912.586		1.4366	25 410	192	19 042	1.108	17 180
1830	410.06	102.516	1 025.159		1.4672	27 948	202	18 935	1.124	16 850
1831	459.95	114.988			1.6416	28 018	211	18 659	1.137	16 404
1832	455.28	113.821			1.5582	29 219	202	19 858	1.150	17 261
1833	435.58	108.895			1.4058	30 985	206	20 940	1.163	18 002
1834	424.74	106.185			1.3080	32 471	196	21 666	1.175	18 443
1835	425.93	106.482			1.3220	32 218	201	21 823	1.188	18 367
1836	427.73	106.933			1.3784	31 031	212	21 673	1.202	18 025
1837	434.80	108.700			1.3825	31 449	218	21 963	1.214	18 093
1838	429.10	107.274			1.4094	30 445	229	22 385	1.224	18 286
1839	453.71	113.427			1.4272	31 791	233	23 015	1.233	18 671
1840	460.83	115.208			1.3913	33 122	241	23 912	1.241	19 266
1841	428.60	107.151			1.1949	35 868	215	24 812	1.254	19 780

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Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1842	420.99	105.249			1.1494	36 628	208	25 152	1.271	19 795
1843	413.52	103.381			1.1676	35 416	221	24 876	1.286	19 341
1844	426.06	106.516			1.1673	36 498	231	25 458	1.302	19 556
1845	435.12	108.781			1.2135	35 857	247	26 251	1.319	19 899
1846	430.23	107.557			1.2814	33 575	262	27 157	1.337	20 316
1847	463.50	115.874			1.4666	31 604	298	26 981	1.351	19 966
1848	435.41	108.853			1.3228	32 915	256	26 445	1.363	19 396
1849	441.66	110.415			1.2781	34 555	252	28 162	1.377	20 457
1850	434.97	108.741			1.2241	35 532	261	29 706	1.392	21 342
1851	437.90	109.476			1.2395	35 330	279	30 669	1.409	21 768
1852	456.70	114.175			1.2868	35 492	293	31 620	1.425	22 182
1853	472.14	118.035			1.3200	35 768	323	33 542	1.440	23 297
1854	520.38	130.095			1.4546	35 776	383	35 411	1.457	24 304
1855	550.51	137.628			1.5390	35 771	414	36 789	1.479	24 879
1856	559.61	139.902			1.6441	34 038	433	36 543	1.501	24 352
1857	562.88	140.720			1.6244	34 652	402	35 396	1.521	23 275
1858	537.40	134.351			1.4576	36 868	386	37 677	1.543	24 415
1859	528.97	132.243			1.4496	36 492	383	38 032	1.570	24 227
1860	538.08	134.519			1.5313	35 138	427	39 475	1.596	24 732
1861	543.40	135.850			1.6026	33 907	445	39 651	1.614	24 569
1862	536.75	134.187			1.5882	33 797	467	41 089	1.627	25 255
1863	539.01	134.751			1.5551	34 660	455	42 690	1.646	25 929
1864	547.76	136.940			1.5327	35 738	467	43 462	1.668	26 052
1865	539.81	134.953			1.5017	35 948	489	45 763	1.690	27 077
1866	552.57	138.143			1.5764	35 053	500	47 045	1.707	27 556
1867	553.15	138.289			1.6262	34 015	521	48 574	1.717	28 292
1868	542.73	135.683			1.6950	32 019	536	46 917	1.725	27 197
1869	557.26	139.315			1.6246	34 302	546	48 908	1.731	28 255
1870	546.16	136.541			1.5471	35 303	562	52 185	1.737	30 045

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Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1871	552.72	138.180			1.5545	35 556	595	53 504	1.746	30 638
1872	580.30	145.076			1.6345	35 504	653	55 545	1.757	31 615
1873	642.70	160.676			1.6867	38 104	714	58 066	1.769	32 816
1874	716.84	179.209			1.7781	40 315	745	56 947	1.787	31 874
1875	742.10	185.526			1.7398	42 656	744	57 845	1.808	31 997
1876	726.60	181.651			1.7157	42 350	756	61 222	1.829	33 475
1877	739.16				1.7205	42 961	760	60 110	1.852	32 465
1878	678.56				1.6420	41 326	683	59 690	1.877	31 804
1879	656.38				1.5326	42 828	672	62 402	1.902	32 806
1880	659.20				1.5643	42 141	726	65 630	1.919	34 199
1881	669.44				1.5881	42 154	718	64 273	1.923	33 424
1882	678.04				1.6057	42 226	746	66 352	1.920	34 563
1883	681.61				1.5976	42 664	749	67 994	1.919	35 426
1884	685.03				1.5443	44 360	716	66 709	1.929	34 581
1885	681.91				1.4784	46 124	681	66 824	1.944	34 376
1886	670.24				1.4188	47 240	671	68 279	1.958	34 866
1887	668.98				1.3809	48 446	666	69 367	1.970	35 215
1888	676.21				1.3779	49 075	709	72 426	1.977	36 642
1889	698.63				1.4007	49 877	771	74 839	1.984	37 715
1890	731.30				1.4333	51 023	785	77 526	1.997	38 823
1891	752.69				1.4791	50 887	804	78 091	2.013	38 803
1892	757.14				1.4675	51 595	791	79 228	2.026	39 105
1893	777.21				1.4003	55 503	775	81 835	2.038	40 158
1894	785.72				1.3596	57 788	790	85 005	2.057	41 332
1895	788.32				1.3545	58 202	822	89 421	2.083	42 927
1896	807.30				1.3801	58 498	871	92 217	2.112	43 670
1897	849.88				1.3615	62 421	930	97 015	2.142	45 298
1898	867.74				1.4229	60 985	1 000	99 254	2.174	45 659
1899	865.43				1.4924	57 990	1 053	100 010	2.204	45 375

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	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
1900	884.64				1.5590	56 746	1 135	101 292	2.230	45 413
1901	875.18				1.5399	56 832	1 119	102 329	2.255	45 381
1902	870.60				1.5421	56 455	1 105	104 144	2.275	45 768
1903	857.66				1.5708	54 600	1 120	104 748	2.288	45 786
1904	908.28				1.5580	58 296	1 120	105 751	2.297	46 029
1905	925.49				1.5875	58 298	1 161	107 174	2.309	46 424
1906	944.44				1.6010	58 991	1 246	113 294	2.319	48 851
1907	988.43				1.6373	60 371	1 347	116 093	2.329	49 847
1908	1 013.47				1.6295	62 194	1 405	119 553	2.346	50 970
1909	1 057.78				1.5953	66 306	1 419	122 089	2.367	51 569
1910	1 104.59				1.6410	67 313	1 524	128 675	2.384	53 982
1911	1 173.52				1.6337	71 831	1 642	133 414	2.401	55 571
1912	1 239.21				1.7123	72 369	1 802	137 800	2.423	56 867
1913	1 310.62				1.7622	74 373	1 954	146 178	2.447	59 741
1914	1 386.32				1.8203	76 158	2 031	149 137	2.472	60 320
1915	1 453.61				2.2347	65 048	2 734	154 842	2.498	61 992
1916	1 703.63				2.8146	60 529	3 984	163 197	2.522	64 705
1917	2 383.66				3.7625	63 352	4 627	148 363	2.551	58 169
1918	3 152.17				4.6114	68 355	5 336	142 653	2.578	55 340
1919	3 981.89				4.8681	81 796	6 145	162 305	2.603	62 356
1920	4 656.53				5.5525	83 864	7 210	171 496	2.635	65 092
1921	4 523.15				5.1298	88 174	5 361	155 028	2.668	58 109
1922	3 605.35				4.2742	84 351	5 032	166 090	2.695	61 633
1923	3 340.69				4.0403	82 683	5 019	177 918	2.713	65 577
1924	3 377.54				4.4201	76 413	5 468	177 355	2.729	64 995
1925	3 394.14				4.5015	75 400	5 364	175 259	2.747	63 805
1926	3 079.52				3.8117	80 791	4 622	174 882	2.763	63 292
1927	2 784.90				3.4475	80 780	4 356	185 338	2.775	66 792
1928	2 644.04				3.2131	82 290	4 337	192 590	2.785	69 161

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1929	2 592.89				3.0709	84 435	4 485	206 452	2.795	73 862
1930	2 540.90				2.9855	85 107	4 489	215 796	2.807	76 866
1931	2 450.45				2.8261	86 706	3 979	198 150	2.824	70 169
1932	2 411.28				2.7664	87 163	3 976	204 555	2.842	71 988
1933	2 361.00				2.7265	86 594	3 950	211 452	2.858	73 977
1934	2 350.01				2.7331	85 983	4 145	216 611	2.874	75 364
1935	2 389.19				2.7934	85 531	4 499	227 355	2.889	78 691
1936	2 496.77				2.8661	87 115	4 982	238 917	2.904	82 285
1937	2 709.42				3.0701	88 252	5 754	251 607	2.919	86 204
1938	2 903.20				3.1716	91 538	6 018	256 239	2.936	87 281
1939	3 018.86				3.2118	93 994	6 430	267 009	2.954	90 376
1940	3 238.77				3.7478	86 419	7 340	242 339	2.973	81 511
1941	3 390.61				4.3929	77 184	9 131	248 214	2.990	83 008
1942	3 752.04				4.6567	80 573	9 251	238 569	3.009	79 288
1943	3 974.57				4.7706	83 314	9 214	233 811	3.032	77 103
1944	4 224.38				4.8293	87 475	8 839	221 601	3.060	72 414
1945	4 734.33				4.9165	96 295	9 912	248 284	3.091	80 320
1946	5 260.93				5.0391	104 402	10 802	278 396	3.127	89 033
1947	5 881.73				5.0642	116 143	12 641	316 151	3.165	99 889
1948	6 358.14				5.0299	126 408	13 842	337 587	3.201	105 463
1949	6 669.69				5.0361	132 437	14 906	347 229	3.234	107 361
1950	7 056.54				5.2998	133 147	16 483	364 638	3.265	111 677
1951	7 988.00				6.1395	130 108	20 500	381 082	3.296	115 624
1952	9 010.46				6.6922	134 640	22 709	395 544	3.328	118 863
1953	9 533.07				6.8272	139 634	23 117	416 019	3.361	123 783
1954	10 038.32				7.1299	140 792	25 150	437 459	3.394	128 882
1955	10 660.70				7.1909	148 253	26 849	446 246	3.428	130 169
1956	11 630.82				7.4621	155 866	30 411	469 266	3.461	135 596
1957	12 398.46				7.6676	161 700	32 522	484 732	3.492	138 815

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1958	13 241.55				8.0415	164 665	32 603	483 172	3.523	137 148
1959	13 943.35				8.2175	169 678	34 638	509 587	3.553	143 430
1960	14 528.97				8.2436	176 246	37 052	539 474	3.581	150 639
1961	15 487.89				8.4559	183 161	40 455	573 285	3.610	158 813
1962	17 129.60				8.8990	192 489	43 795	592 612	3.639	162 854
1963	18 243.03				9.1326	199 758	47 123	616 903	3.667	168 252
1964	19 574.77				9.6469	202 912	51 875	648 043	3.694	175 415
1965	21 121.17				10.0572	210 010	57 331	683 633	3.723	183 616
1966	22 916.47				10.3894	220 576	62 060	711 901	3.753	189 688
1967	24 956.04				10.8455	230 104	68 039	757 729	3.785	200 217
1968	26 752.88				11.2284	238 261	72 740	776 666	3.816	203 503
1969	28 518.56				11.5735	246 412	79 421	815 050	3.848	211 827
1970	29 700.00				12.7992	232 046	91 530	832 345	3.876	214 756
1971	33 500.00				13.5977	246 365	102 897	879 559	3.903	225 352
1972	36 600.00				14.5790	251 045	114 362	926 445	3.933	235 557
1973	40 500.00				15.6647	258 543	129 928	968 440	3.961	244 518
1974	45 900.00				17.1403	267 790	150 379	1 006 432	3.985	252 539
1975	53 900.00				19.1430	281 565	171 849	1 056 272	4.007	263 586
1976	61 300.00				20.8986	293 321	196 119	1 117 804	4.026	277 636
1977	67 600.00				22.7928	296 585	220 968	1 164 313	4.043	287 968
1978	73 500.00				24.6512	298 159	243 888	1 209 365	4.059	297 971
1979	76 000.00				25.8278	294 257	269 067	1 262 244	4.073	309 942
1980	83 400.00				28.6421	291 180	318 279	1 319 861	4.086	323 050
1981	93 400.00				32.5566	286 885	365 013	1 340 956	4.100	327 086
1982	104 100.00				36.2494	287 177	404 325	1 344 112	4.115	326 654
1983	113 500.00				39.2983	288 816	449 657	1 397 511	4.128	338 509
1984	122 100.00				41.7659	292 344	506 486	1 482 094	4.140	357 985
1985	131 300.00				44.1323	297 515	562 402	1 564 400	4.153	376 735
1986	143 200.00				47.3040	302 723	581 913	1 627 637	4.167	390 568

Revisions and cross-checks of composite historical price and wage data

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1987	155 700.00				51.4317	302 732	634 875	1 656 176	4.187	395 561
1988	165 000.00				54.8768	300 673	664 084	1 651 947	4.209	392 434
1989	172 200.00				57.3767	300 122	708 635	1 669 099	4.227	394 875
1990	180 500.00				59.7366	302 160	749 860	1 701 353	4.241	401 123
1991	189 600.00				61.7800	306 895	790 087	1 753 835	4.262	411 531
1992	197 000.00				63.2270	311 576	813 093	1 816 524	4.286	423 788
1993	203 700.00				64.6632	315 017	855 400	1 868 210	4.312	433 259
1994	209 900.00				65.5675	320 128	897 243	1 962 656	4.337	452 578
1995	216 900.00				67.1781	322 873	963 138	2 044 214	4.359	468 944
1996	226 600.00				68.0243	333 116	1 054 672	2 146 996	4.381	490 032
1997	237 500.00				69.7792	340 359	1 141 340	2 260 456	4.405	513 139
1998	253 000.00				71.5154	353 770	1 163 178	2 319 780	4.431	523 479
1999	266 600.00				73.1840	364 287	1 265 689	2 366 474	4.462	530 372
2000	278 700.00				75.4425	369 421	1 507 283	2 442 319	4.491	543 829
2001	293 500.00				77.7188	377 643	1 564 306	2 492 992	4.514	552 310
2002	309 400.00				78.7200	393 039	1 561 026	2 529 047	4.538	557 285
2003	323 300.00				80.6686	400 775	1 620 364	2 552 064	4.565	559 068
2004	334 600.00				81.0440	412 862	1 783 020	2 653 366	4.592	577 835
2005	345 700.00				82.2776	420 163	1 989 987	2 723 029	4.623	588 981
2006	359 900.00				84.1964	427 453	2 216 317	2 788 376	4.661	598 277
2007	379 300.00				84.8102	447 234	2 350 173	2 871 867	4.709	609 848
2008	403 200.00				88.0043	458 159	2 607 090	2 885 548	4.768	605 164
2009	420 200.00				89.9112	467 350	2 428 481	2 835 714	4.829	587 259
2010	435 700.00				92.0684	473 235	2 591 479	2 855 616	4.889	584 060
2011	453 800.00				93.2662	486 564	2 792 683	2 883 643	4.953	582 191
2012	472 000.00				93.9277	502 514	2 964 053	2 961 590	5.019	590 126
2013	490 600.00				95.9299	511 415	3 071 224	2 992 215	5.080	589 000
2014	505 600.00				97.8726	516 590	3 140 814	3 051 148	5.137	593 906
2015	519 800.00				100.0000	519 800	3 111 168	3 111 168	5.190	599 467

The following conversion rules apply between the four official currencies *kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*.
1 speciedaler = 4 kroner, 1 speciedaler = 10 riksbankdaler, 1 riksbankdaler = 6 riksdaler courant (paper note currency), 1 riksdaler species = 12/15 (0.8) riksdaler courant 1795-1813 and 9.25/11.33 (0.816) riksdaler courant before 1795. For a complete conversion table between these Norwegian currencies, see Figure 1.2 in Chapter 1 on page 14.

Table 14.B.3: Revised estimates of annual nominal wages in different currencies (kroner, speciedaler, riksbankdaler and riksdaler species) from 1726 onwards. The table also report data for consumer price indices and real wages from 1726, population from 1735 and GDP and GDP per capita from 1816 onwards.

Year	Nominal wage levels				Consumer prices, real wages, population, GDP and GDP per capita					
	Kroner	Speciedaler	Riksbankdaler	Riksdaler species	Consumer prices 2015=100	Real wage 2015-kroner	Nominal GDP mill. kroner	Real GDP 2015-prices	Population in million inhabitants	Real GDP per capita 2015-kroner
2016	528 900.00				103.5500	510 768	3 098 148	3 144 506	5.236	600 538
2017	541 000.00				105.4917	512 837	3 295 382	3 217 561	5.277	609 737
2018	556 300.00				108.4083	513 152	3 553 900	3 253 561	5.312	612 502
2019	575 700.00				110.7583	519 780	3 563 484	3 277 826	5.348	612 919
2020	593 500.00				112.1833	529 045	3 410 399	3 254 318	5.379	604 951
2021	614 300.00				116.0917	529 151	4 144 134	3 381 974	5.408	625 328

The following conversion rules apply between the four official currencies *kroner*, *speciedaler*, *riksbankdaler* and *riksdaler species*.
 1 speciedaler = 4 kroner, 1 speciedaler = 10 riksbankdaler, 1 riksbankdaler = 6 riksdaler courant (paper note currency), 1 riksdaler species = 12/15 (0.8) riksdaler courant 1795-1813 and 9.25/11.33 (0.816) riksdaler courant before 1795. For a complete conversion table between these Norwegian currencies, see Figure 1.2 in Chapter 1 on page 14.

Sources: Grytten (2007b), Chapter 10, Statistics Norway:

Table 09786, Annual earnings, average for all employees, 1970 onwards (<https://www.ssb.no/en/statbank/table/09786>),
 Table 03013, Consumer Price Index, 1979M01 onwards (<https://www.ssb.no/en/statbank/table/03013>).

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