STAFF MEMO

The downs and ups of mark-ups

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The downs and ups of mark-ups*

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Abstract

Based on sectoral National accounts data and estimates of the implicit rental rate of capital, we calculate price mark-ups for 42 Norwegian industries for the period 1980-2019. The results indicate a broad-based increase in mark-ups over the sample period, with an average increase of roughly 20 percentage points. Taken at face value, the secular rise in mark-ups have added almost 0.5 percentage points to GDP inflation each year since 1 980. As part of the analysis, we also trace out movements in factor shares. Our results indicate a widespread decline in capital shares, and more so than for labor shares. Hence, our findings cast doubt on factor substitution as an important explanation for the decline in the aggregate labor share and instead point to increased corporate market power as the main culprit.

*The views expressed in this paper are those of the authors and do not necessarily reflect those of Norges Bank. We thank Per Espen Lilleås for comments on an earlier draft of the paper. Any remaining errors and shortcomings are our own responsibility.

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1 Introduction

In recent years, a number of studies have emerged documenting a secular rise in average price mark-ups, most notably in the US, but also in other advanced countries. The price mark-up, i.e. the wedge between market prices and marginal costs, is often taken as a proxy for the degree of corporate market power. Hence, a positive trend in mark-ups could suggest an increase in firms' market power – with potentially important implications for welfare and inequality.

Persistent increases in mark-ups may also affect the transmission of monetary policy. In textbook monetary policy models, where product markets are characterized by monopolistic competition, an increase in the steady state mark-up (lower demand elasticities) would make inflation more responsive to changes in marginal costs. In other words, the Phillips curve becomes steeper. In this case, as pointed out by e.g. Aquilante et al. (2019), optimal monetary policy dictates a higher relative weight on output-smoothing in the face of trade-off shocks (cost push).

Increased market power could potentially also affect investment rates, and, thereby, the natural rate of interest, which is central to the conduct of monetary policy. As one theory goes, increased market power potentially reduces firms' incentives to innovate and invest in new, and more productive technology, leading to a fall in real interest rates. Conversely, however, firms' also have an intrinsic incentive to invest and innovate in order to gain market power and reap potential monopoly rents (escaping competition) through innovations. Aghion et al. (2005) suggest that for lower levels of market power the 'competition escape' effect is more important, creating an 'inverse-U' relationship between market power and investment. So far, however, the empirical evidence on the link between mark-ups and investment rates is inconclusive.

Despite growing evidence of a secular increase in mark-ups, both the magnitude and whether it indeed reflects increasing market power, is still open to debate. Hence, in this paper we set out to provide complementary evidence on the evolution of mark-ups in recent decades, based on Norwegian data. In particular, we use sectoral National Accounts data to estimate mark-ups for 42 industries, covering the whole private sector of the Norwegian economy, except the petroleum sector.

The literature covers a number of different methods to estimating price mark-ups, using both national, industry and firm-level data. In this paper, we follow the "accounting

approach" employed by Barkai (2020) and Autor et al. (2020), calculating mark-ups as the ratio of value added to factor costs. The method assumes a constant-returns-to-scale (CRS) production technology and cost minimizing behavior, but does not require the explicit estimation of the production function, as in e.g. Loecker and Eeckhout (2018).

One challenge relating to the calculation of factor costs, concerns the fact that National accounts data do not distinguish between capital costs and pure profits. Capital service costs are only recorded to the extent that capital goods are leased, in which case they will be counted as intermediate inputs. In most instances, however, firms own the capital stock used in production. To overcome this challenge, we follow Barkai (2020), and use the implicit (theoretical) rental rate as a proxy for the cost of capital services. This also allows us to calculate the capital shares and pure profits shares, in addition to labor shares, for all the industries covered in our data set.

Over the period 1980-2019, we find that the average mark-up for the private sector overall (expect petroleum production) increased by roughly 20 percentage points. However, our results indicate a more modest increase than reported by both Loecker and Eeckhout (2018) and Butenschøn (2019), who for roughly the same period, using firm-level data covering all publicly traded firms (i.e. including the oil sector), estimate that the aggregate mark-up increased by 74 percentage points and 32 percentage points, respectively. Furthermore, the secular rise in mark-ups appear to be fairly broad-based across industries, with 5 out of 6 industries recording a positive trend change over the sample period. Only three industries experienced a significant trend decrease.

Our results on mark-ups are mirrored by corresponding increases in profit shares, which, given our approach, are simply monotonic, albeit non-linear, transformations of the mark-ups. We confirm the overall findings reported in previous studies on Norwegian data, indicating that the aggregate labor share, adjusted for the share of self-employed, decreased from 1980 to 2019, especially during the first part of the 2000's. The trend estimates at the industry level varies considerably, but for the median industry we do not find any evidence of secular changes in the labor share. Hence, the aggregate result mainly reflects developments in a few large industries and compositional effects.

One potential explanation for a negative trend in the aggregate labor share, could be that firms increasingly have been substituting expenditure on labor with expenditure on capital, driven by e.g. falling relative investment prices, capital augmenting technology

improvements or automation.[1] Our estimates of capital shares, however, do not support an hypothesis of factor substitution. On the contrary, we find broad-based evidence of a falling trend in capital shares over the sample period. Hence, our results are consistent with the evidence reported in Barkai (2020) on US data. In other words, to the extent that labor shares have fallen, this must be attributed to an increase in pure profits, or equivalently increasing mark-ups, and is not a result of firms substituting labor for capital.

The rest of the paper is organized as follows: In section 2, we briefly discuss the underlying assumptions and analytical framework. The sectoral data used in the analysis are presented in Section 3. In Section 4, we convey the estimated mark-ups and factor shares, and Section 5 concludes.

2 Preliminaries

We start by postulating that firms produce output, Y, using labor, L, and capital, K, as inputs, i.e.:

$$Y_t = F\left(L_t, K_t\right) \tag{1}$$

Furthermore, assuming that firms choose factor inputs in order to minimize factor costs, treating factor prices as exogenous, and allowing for the possibility that firms charge a mark-up, μ, over marginal costs, the following two conditions must hold:

$$\mu_t W_t = P_t F'_{L,t} \tag{2}$$

$$\mu_t R_t^K = P_t F'_{K,t} \tag{3}$$

where P denotes the product price. Assuming that F is a homogenous function with returns to scale of degree θ, equation (2) and (3) imply that we can express the mark-up in terms of factor shares as follows:

$$\mu_t = \frac{\theta_t}{\omega_t^L + \omega_t^K} \tag{4}$$

[1]For falling relative investment prices and capital-augmenting technology to increase the capital expenditure share, the elasticity of substitution between labor and capital needs to be above 1, which is higher than what is typically found in the empirical literature on factor substitution.

where $\omega_t^L = \frac{W_t L_t}{P_t Y_t}$ and $\omega_t^K = \frac{R_t^K K_t}{P_t Y_t}$ denote the labor share and capital share, respectively. Hence, we can measure the mark-up with a fairly minimal set of assumptions. Equation (4) will hold regardless of how the mark-up is determined. Thus, we do not need any further information regarding firms pricing policies, which could be hard to uncover.

Revenue can be divided into rental payments for labor and capital, and pure profits, Π, whenever income from production exceeds factor costs. This yields the following identity:

$$\omega_t^L + \omega_t^K + \omega_t^{\Pi} = 1 \tag{5}$$

where $\omega_t^{\Pi} = \frac{\Pi_t}{P_t Y_t}$ is the profit share. Equation (5) states that the labor share, the capital share, and the profit share must sum to one. For example, this implies that the downward trend in the labor share over the last 40 years or so, witnessed in many advanced countries, must reflect a positive trend in either the capital share or the profit share – or both.

Intuitively, an increase in pure profits is associated with the presence of market power and increasing markups. Based on equation (4) and (5), we can derive a simple monotonic mapping between the profit share and the price markup on factor costs (for given returns to scale) as follows:

$$\mu_t = \frac{\theta_t}{1 - \omega_t^{\Pi}} \tag{6}$$

Equation (6) also indicates that to the extent firms have increasing returns to scale, i.e. $\theta_t > 1$, it is possible to simultaneously observe a positive mark-up ($\mu_t > 1$) and profits close to zero. This situation could for example arise in industries characterized by high fixed costs and low marginal costs, forcing firms to charge a mark-up over marginal costs in order to recover overheads. Hence, in the presence of increasing returns to scale, the mark-up is generally a more accurate measure of market power than profits (Basu (2019)).

In this paper, however, we rule out the possibility of increasing returns to scale and stick to the assumption that returns to scale are constant.[2] By imposing $\theta_t = 1$ in equation (4), we arrive at the mark-up expression that forms the basis for the empirical analysis in this paper. It expresses the mark-up simply as the inverse of the sum of factor shares (relative to value added).

Obtaining measures of the two factor shares is not straightforward. Labor costs are commonly reported in the national accounts. However, for self-employed, all income from

[2]See e.g. Basu and Fernald (1997) for industry level estimates of the degree of returns to scale for US industries

hours worked is registered as capital income. This leads to an under-reporting of actual labor costs and introduces a negative bias in the estimates of the labor share. This would not necessarily be a problem if the share of hours worked by self-employed relative to total hours is more or less constant. However, this share has been falling over time, inducing an increasing trend in the measured labor share if not corrected for.

Still, the biggest challenge relates to disentangling capital rentals from pure profits. National accounts only report operating profits, which is the sum of capital rentals and pure profits. Most capital is owned by the firms and not rented. Hence, rental payments to capital must be imputed. The user cost of one unit of capital type i, R_i^K, is given by

$$R_{it}^K \equiv r_{it}^K P_{it}^K \tag{7}$$

where P_{it}^K is the price of one unit of capital of type i and r_{it}^K is the corresponding rental rate. The implicit rental rate can be interpreted as the required return of one unit of money invested in capital type i. In order to obtain an estimate of the rental rate, r_{it}^K, we use the formula of Hall and Jorgenson (1967):

$$r_{it}^K = \left[(1-\tau_t)\, r_t + \delta_{it} - E_t \pi_{it+1}^K\right] \frac{(1 - z_{it}\tau_t)}{1-\tau_t} \tag{8}$$

where r_t is the cost of capital, δ_{it} denotes the depreciation rate of capital type i, π_{it+1}^K is the price change of capital type i between t and $t+1$, and τ_t represents the corporate tax rate, and z_{it} the present value of the depreciation allowances for capital of type i. If we assume that firms deduct a constant rate, $\bar{\delta}_i$, each year (over an infinite horizon), the present value of the depreciation allowance can be written as:

$$z_{it} = \frac{\bar{\delta}_i}{(1-\tau_t)\, r_t + \bar{\delta}_i} \tag{9}$$

In a neoclassical model of optimal capital accumulation, the right hand side of equation (8) (times the price of capital, P_{it}^K) would equate the marginal return on capital services. Furthermore, given that firms are indifferent between renting and owning capital goods, this would also correspond to the rental in a hypothetical rental market.

Equipped with estimates of rental rates of different types of capital, we can calculate

the capital share of any given industry, ω_t^K, as:

$$\omega_t^K = \frac{\sum_{i=1}^{I} R_{it}^K K_{it}}{P_t Y_t}. \tag{10}$$

3 Data

In this paper, we estimate mark-ups and factor share for 42 industries, and various aggregates thereof, for the period 1980 to 2019. The lion's share of the data we employ are taken from the Norwegian National accounts.[3] The focus of the analysis is on the mainland business sector. Hence, we exclude the public sector, petroleum production and dwelling services. From the National accounts, we obtain data on wage costs, hours, the capital stock, depreciation rates and value added for each sector.

Wage costs relate to all compensation of employees plus employer's tax and pension contributions. In the National accounts, all income accruing to the self-employed is recorded as profits. At the same time, hours worked by self-employed is also recorded. Hence, we impute the wage costs of self-employed based on hours worked and the average hourly wage cost of employees in the respective industries. Total wage costs in each sector are given as the sum of wage costs of employees and the imputed wage costs for the self-employed.

The national account provides measures of the capital stock, the depreciation rate of capital and corresponding price deflators for 4 types of capital: non-residential structures, machinery and equipment, transport equipment and intangible capital (including R&D). There are measurement issues related to the national account numbers on the capital stock and depreciation. One concern is that intangible capital is under-recorded. Still, the National accounts data are most likely better than firm level capital stock data, where capital is often valued at book values and where depreciation rates also reflects tax considerations.

To calculate the rental rate according to equation (8), we also need data on the cost of capital, corporate tax rates, tax allowance and the expected capital price inflation. Corporate tax rates are taken from the OECD Tax Database, and the tax allowance rates are from the Norwegian Tax Administration. Allowance rates are only publicly

[3]Taken from the vintage published in Q3 2022.

available for the period 2014-2019, during which rates have been constant. Numbers reported in Aarbu (1992) indicate that allowance rates have changed only marginally since the major tax revision in 1992. Hence, as a crude approximation, we assume that current allowance rates are applicable for the whole sample. The allowance rates used in this study are reported in Table 1. Type-specific expected capital inflation is calculated as a three-year moving average of realized capital inflation, based on year-on-year growth rates in the capital price deflators.

Table 1: Tax allowance rate assumptions 1980-2019 (per cent)

Dwellings, other buildings and structures	2
Machinery and equipment	30
Transportation equipment	20
Intangible fixed assets	52

The cost of capital will in general depend on how investments are financed. To the extent that capital is financed by borrowing, an appropriate lending rate would reflect the cost of capital. If on the other hand, investments are mainly financed through equity, a riskless interest rate plus an equity premium would be the theoretically correct measure. In Norway, the overall split between borrowing and equity financing is roughly 60/40. This would suggest that for the macro firm the total cost of capital would be a weighted soum of the cost of borrowing and the cost of equity – with weights equal to 0.6 and 0.4, respectively. Calculating the cost of equity, however, involves estimating equity risk premia for each industry, which seems like a daunting task. As a simplification, we assume that the cost of capital can be reasonably well approximated by an average lending rate, which we take from Statistics Norway.

There is a large international literature on measuring the equity risk premium. For the period we consider here, most studies report either a constant or falling risk premium. In the case of constant risk premia, not including the risk premia would likely merely imply a level bias, i.e. we would likely underestimate the level of the true rental rate somewhat. With falling risk premia, the level bias would decrease, but we would instead overestimate the trend in rental rates over the sample period. Hence, we would overestimate the trend in capital shares and underestimate the trend in profit shares and mark-ups. In other words, with falling risk premia, the upward trend in mark-ups would be steeper than

what we report in this paper.

4 Results

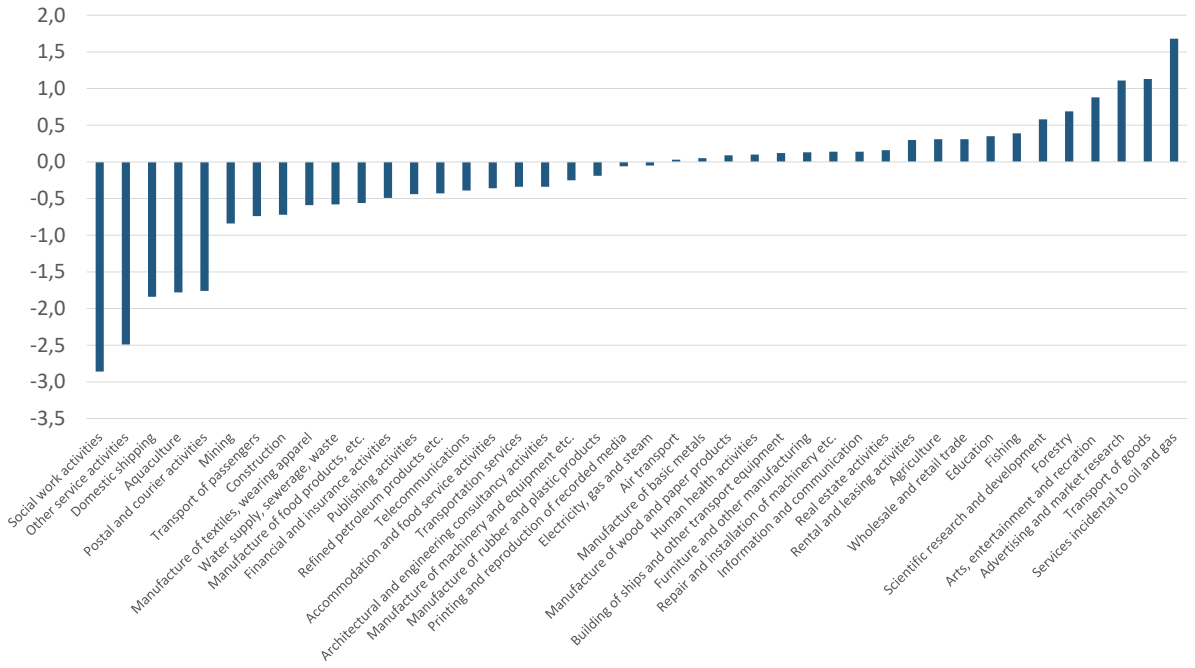
4.1 Labor shares

We start by reporting estimates of labor shares. Developments in factor shares have potentially important implications for production technologies, inequality and macroeconomic dynamics. For a long period of time the overall stability of the labor (and capital) share was viewed as one of the most well-established empirical facts in macroeconomics (Elsby et al. (2013) and Karabarbounis and Neiman (2014)). However, since the mid 80s, a number of advanced countries have experienced a steady decline in the share of value added accruing to workers. As a matter of arithmetics, a falling labor share implies that real wages increase less than labor productivity. To the extent that this is driven by firms substituting labor with capital, induced by e.g. capital-augmenting technology gains or cheaper capital goods (in relative terms), a shift towards a lower labor share is simply reflecting a more efficient allocation of resources. However, the opposite would be the case if a falling labor share is driven by an increase in pure profits due to e.g. higher mark-ups.

Trend developments of labor shares in Norway are already well-documented in a number previous studies (se e.g. Hagelund et al. (2017)). We complement earlier studies by employing a more granular level of aggregation. In figure A.1, we plot calculated labor shares over the period 1980-2019 for all 42 industries, and in figure 1 we depict the trend growth rates over the same period. The results reveal significant heterogeneity across industries. We find evidence of av falling trend in roughly half the industries. The remaining half is evenly split between industries where the labor share has been fairly stable, and industries that have experienced a significant positive trend in labor shares over the sample period. However, in most industries were a downward trend is recorded, labor shares seem to have stabilized or even reversed somewhat from the mid 00's and onwards.

In Figure 2, we summarize labor share developments for various industry aggregates. With the exception of Retail and wholesale, aggregate labor shares display a clear negative trend in all sub-sectors over the sample period. The drop in labor share has been

Figure 1: Trend growth in labor shares



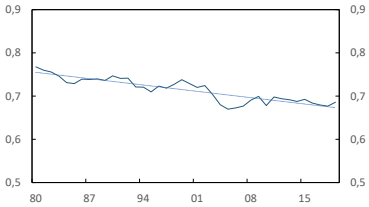
Note: The implied annual percentage point change in labor shares along a fitted linear trend (OLS).

most pronounced in the primary industries, mainly driven by Agriculture and Aquaculture, respectively. Whereas labor shares in the Primary industries have fallen markedly through the whole sample period, the corresponding shares in Services, Construction and Manufacuring seem to have reached a trough during the 00's and have since stabilized or increased.

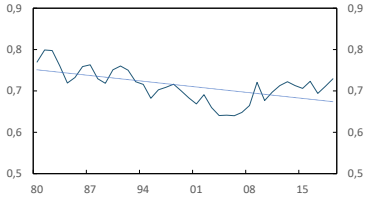
Aggregating over all private firms, we note that the overall labor share closely follows the labor share in the Service sector. This is not surprising given the fact that this sector employs the majority of all labor. The aggregate labor share cannot, however, be fully accounted for by trends in labor shares within each industry. Relative changes in employment between industries will also affect the aggregate labor share. A shift analysis isolating the between and within contributions from each industry, reveals that a reduction in the employment share in the Agriculture industry, where the labor share is high, has contributed significantly to the downward trend in the overall labor share. Likewise, there has also been negative composition (between) effects from increasing employment shares in both Financial services and Real Estate Services, two industries characterized by low labor shares.

Figure 2: Labor shares

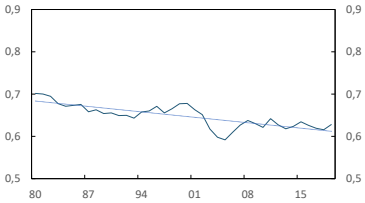
(a) All private firms



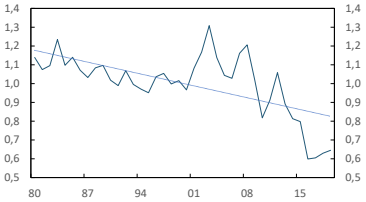
(b) Manufacturing



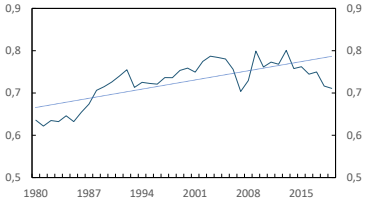
(c) Services



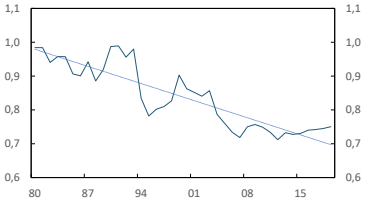
(d) Primary industries



(e) Retail and Wholesale



(f) Construction

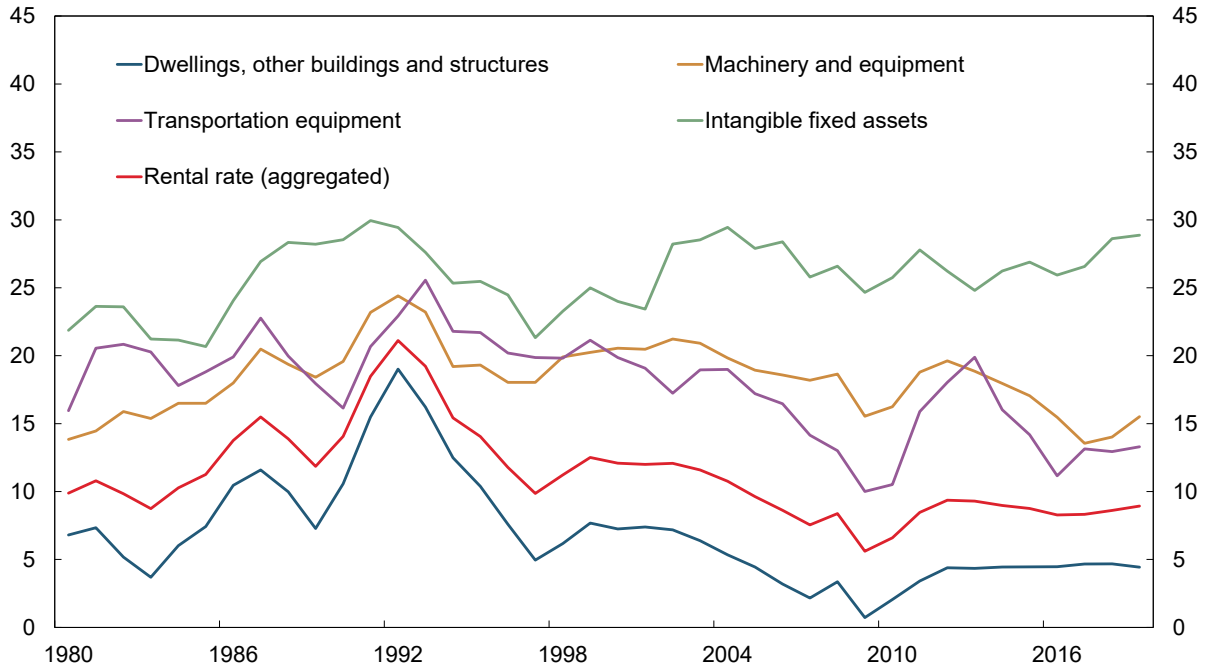


4.2 Capital shares

Before turning to the calculated capital shares, we report estimates of the implied rental rate based on equation (8). At the industry level, rental rates are both type and industry specific. Here we focus on the implied rental rates for the private sector as a whole. In figure 3, we plot implied aggregate rental rates for the four different types of capital and the corresponding weighted average. Overall, the imputed rentals appear fairly stable over the sample period. All estimates show an increase up until 1992, when interest rates reached an historic high. From 1993 onward, with the exception of the rental related to intangible capital, rental rates have exhibited a downward trend. We also note that there is a marked difference in estimated rentals across capital types. According to our estimates, the required return on Intangible fixed assets investments is roughly 25 percentage points higher than for Buildings and structures at the end of the period. This discrepancy is mainly driven by a marked difference in depreciation rates. Whereas the annual depreciation rate of Buildings and structures has remained fairly stable around 3.5 percent over the sample period, the corresponding rates for intangible fixed assets was 28 percent in 2019, up from 18 percent in 1980.

The rental rate in any given industry will be a weighted average of the rentals of the different capital types, using the corresponding value shares as weights. Hence, developments in industry specific rental rates will in addition to fundamental factors, like e.g. borrowing rates and depreciation rates, also depend on structural changes in the composition of capital types within each industry over time. In Figure 4, we plot the

Figure 3: Rental rates by capital type

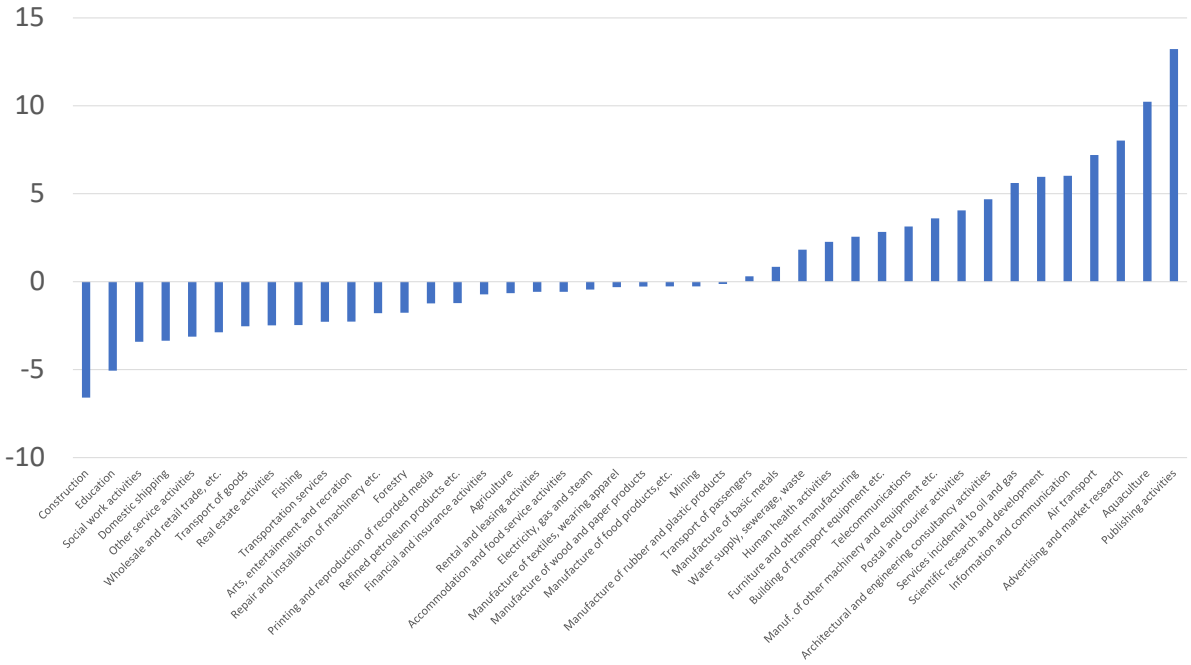


change in the estimated rental rates over the sample period for all industries. We note that there is a significant degree of heterogeneity across industries. The estimated rental rate in Construction dropped by roughly 7 percentage points from 1980 to 2019, whereas aquaculture and publishing activities experienced an increase in the required rate of return of 10 and 13 percentage points, respectively. The majority of industries have seen a drop in rental rates. Still, the median change is close to zero at (-0.5 percentage points).

In Figure 5, we show the overall rental rate aggregated across industries, together with an approximate decomposition into its main underlying drivers: the borrowing rate (net of interest rate deductions), the depreciation rate and expected capital inflation. It is clear that the secular downward trend in borrowing rates has weighted on rentals. On the other hand, both higher depreciation rates, partly driven by an increased share of immaterial capital, and lower expected capital inflation has dampened the reduction in the rental rate.

Based on estimates for the required rate of return, we can calculate industry-specific capital shares using equation (10). In figure 6, we plot the percentage point year-on-year trend change in capital shares from 1970 to 2019. Figure 6 reveals that there has been a secular downward trend in the vast majority of industries over over the sample period. Still, there are significant differences across industries. The trend decrease in capital

Figure 4: Change in rental rates



Note: The overall percentage point change in rental rates in various industries over the period 1980-2019.

Figure 5: Decomposition of aggregate rental rate

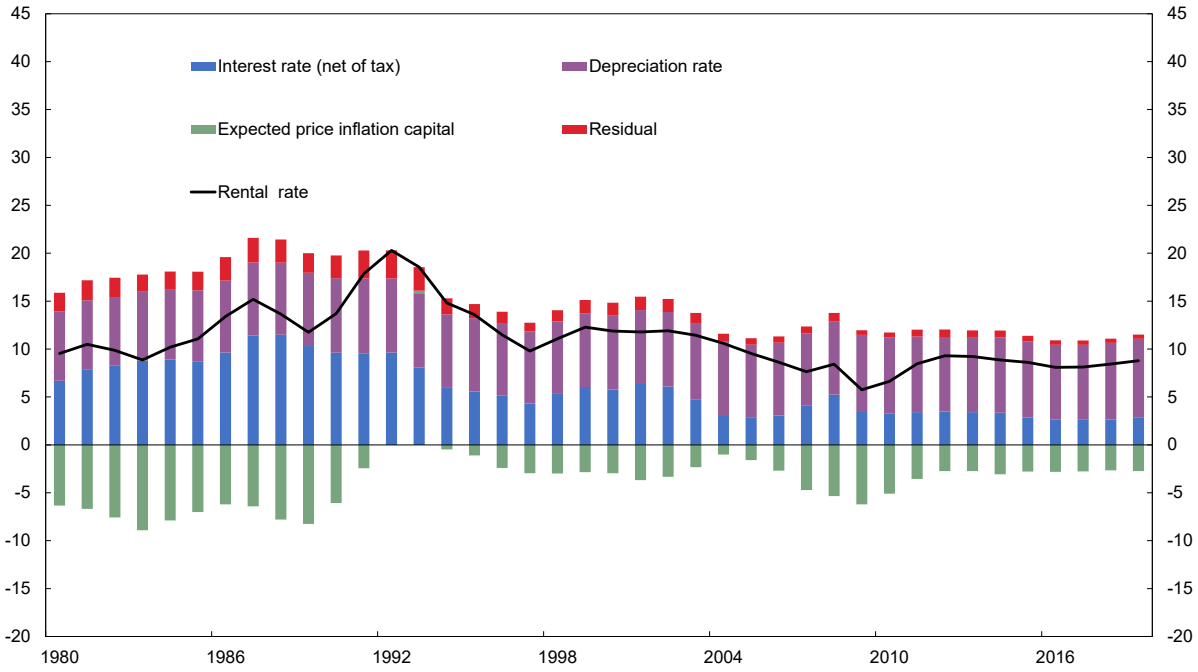
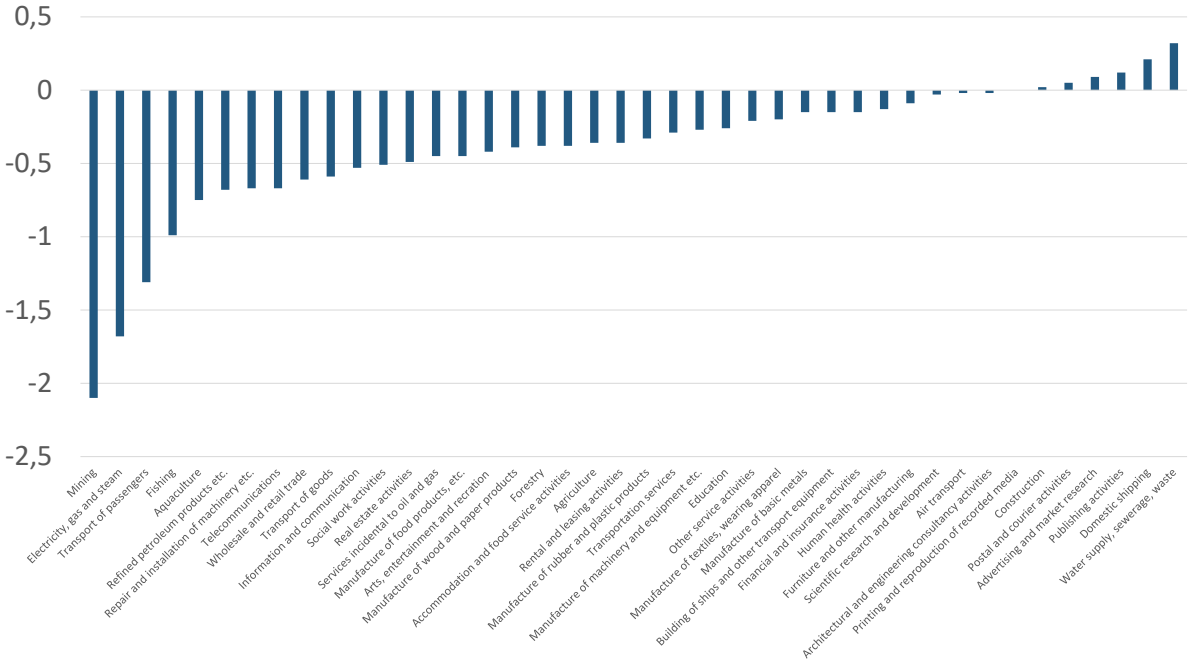


Figure 6: Trend change in capital shares



Note: The implied annual percentage point change in capital shares along a fitted linear trend (OLS).

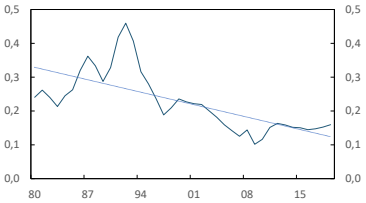
shares have been most notable in Mining, Electricity, and Transport of passengers. We also note that there has been a significant decline in the capital share in the Retail and wholesale industry. Conversely, the strongest trend increase is found in the Water supply, sewage and waste sector. In order to get a better sense of the trend developments, it is useful to plot the whole time series. The estimated capital shares for all industries are depicted in figure A.2.

The impression of a downward trend in capital shares is, maybe not surprisingly, also apparent at a more aggregate level. In figure 7, we depict estimated capital shares for various sub-aggregates. With the exception of Construction, there is evidence of a falling trend for all sub-aggregates, as well as for the private (non-petroleum) sector as a whole. Hence, we do not find any immediate evidence of falling wages shares being mirrored by an increase in capital shares. Closer inspection shows that there are only three industries where a fall in labor shares have moved alongside an increase in capital shares.

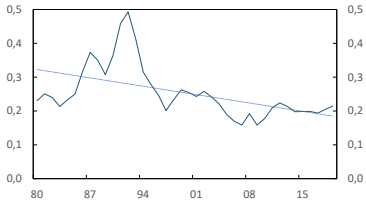
To shed further light on what is driving trends in capital shares, we decompose changes in the capital share into changes in the real user cost of capital and capital intensity, i.e.

Figure 7: Capital shares

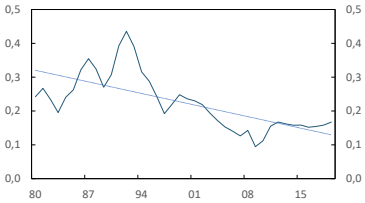
(a) All private firms



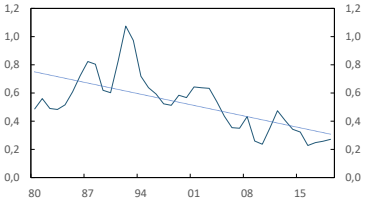
(b) Manufacturing



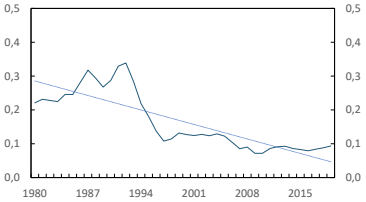
(c) Services



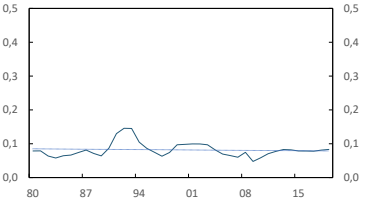
(d) Primary industries



(e) Retail and Wholesale



(f) Construction



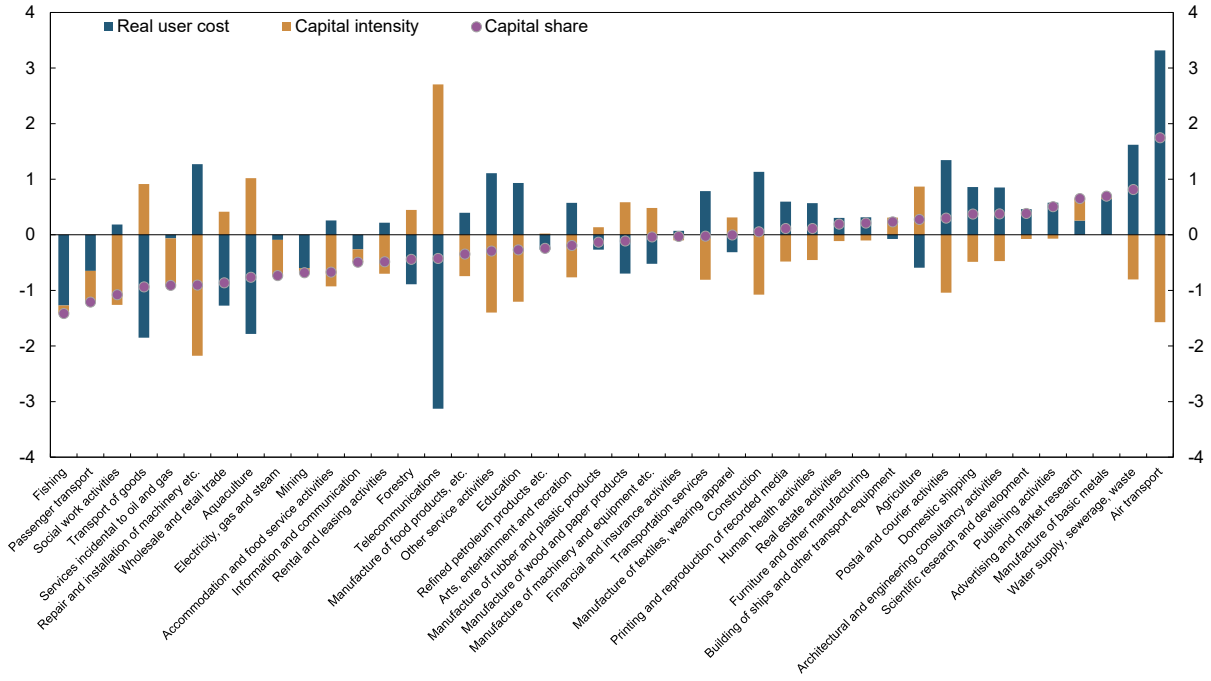
the ratio of capital to GDP. Defining the real user cost of capital as

$$\bar{R}_t^K = \sum_{i=1}^{I} r_{it}^K \frac{P_{it}^K}{P_t} \frac{K_{it}}{K_t}, \tag{11}$$

it follows from equation (10) that the capital share can be expressed as the product of the real user cost of capital and capital intensity. Hence, the percentage change (log change) in capital shares is the sum of the relative change in the user cost and capital intensity. The resulting decomposition is depicted in Figure 8. Changes in real user costs (blue bars) and capital intensity (orange bars) sum to changes in capital shares (purple dots) The ranking will differ somewhat from Figure 6, where we report the percentage year-on-year trend changes. The results show that changes over the sample period in both user costs and capital intensity differ substantially across industries. Overall, there does not seem to be a consistent mechanical, positive co-movement between user costs and capital shares. The calculated correlation is close to zero. On the other hand, the corresponding correlation between changes in capital shares and capital intensity is 0.62, confirming the visual impression that there has been a fairly strong positive association between changes in capital shares and capital intensity over the sample period.

We also note that in most industries, user costs and capital intensity have moved in opposite directions. This is an indication of factor substitution. However, the extent to which a change in user costs lead to a change in capital shares in the opposite direction would depend on the potential for substitution between labor and capital. In particular,

Figure 8: Decomposition of capital shares



Note: The displyed changes in capital shares refer to annualized percentage point changes over the sample period, which differs somewhat from the trend changes reported in figure 6.

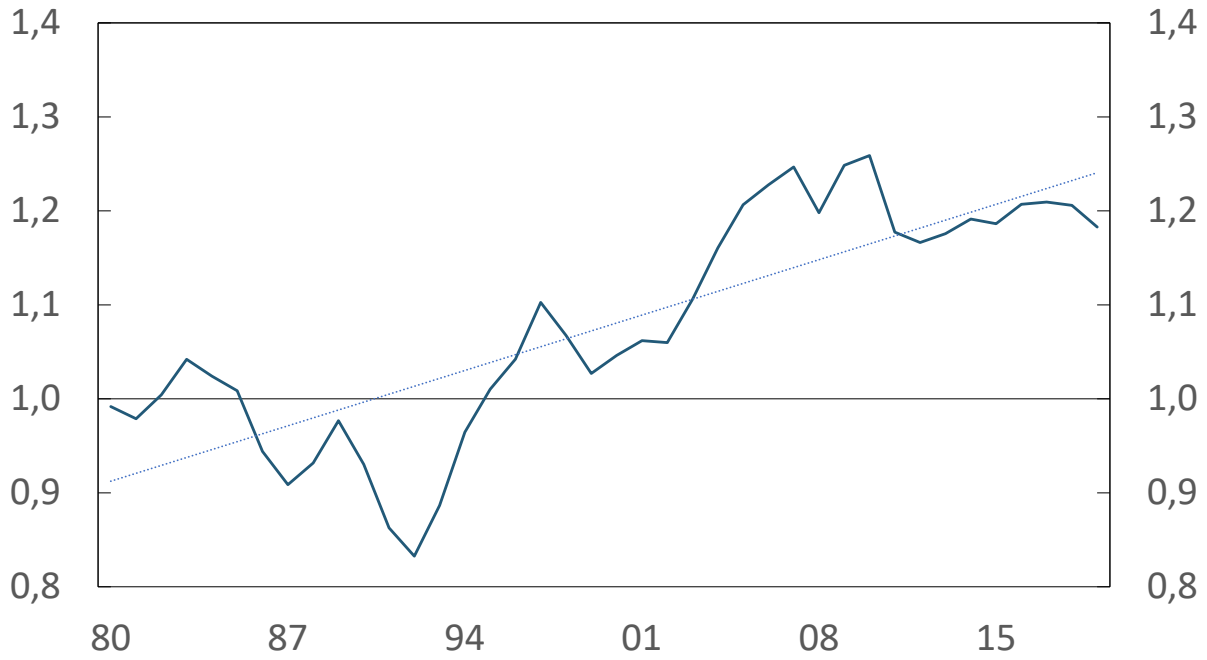
this requires the elasticity of substitution to be above 1.

As argued above, the share of value added (GDP) that is not recorded as expenditure on either labor or capital, can be viewed as a measure of pure profits. Equipped with estimates of both labor and capital shares (relative to GDP), we can use (5) to calculate the industry specific profit shares. A trend decrease in both labor and capital shares would thus point to an overall increase in pure profits shares. Instead of pursuing a discussion of profit shares, we focus on price mark-ups which, as alluded to above, are given as a monotonic transformation of profit shares.

4.3 Markups

In Figure 9, we present the overall mark-up for the aggregate of all private firms in Mainland Norway. The results indicate an increase in the overall mark-up of roughly 20 percentage points over the sample period. To put the numbers in perspective, at taken at face value, the estimates would indicate that the secular rise in mark-ups added roughly 0.5 percentage points to overall inflation (GDP deflator) each year since 1980. After reaching a trough during the banking crises, mark-ups increased rapidly until reaching a peak around the time of the financial crisis. Taken at face value our results imply

Figure 9: Aggregate markup



negative profits during parts of the 80's and, most markedly, the early 90's. During the period 1990-1992, Norway experienced the worst recession since the Great Depression and unemployment reached record highs. This was a period of high foreclosure rates and depressed business conditions in general. Hence, finding evidence of negative profits, i.e. gross mark-ups below one, is not utterly implausible. Although we do believe that the estimated mark-ups give a reasonable account of relative changes in profits over the sample period, some caution is warranted when interpreting the magnitudes of the estimated mark-up levels.

In recent years, a small number of studies have emerged documenting the evolution of mark-ups for the Norwegian economy. In contrast to the approach taken in this paper, all these studies are based on firm level data. Results relating to aggregated mark-ups are reproduced in table 2, showing the percentage point change in mark-ups over the indicated period. The study by Loecker and Eeckhout (2018) reports aggregate mark-ups for a large number of countries, including Norway. Based on firm level data for all publicly traded companies,[4] they find that the aggregate mark-up in Norway increased by more than 70 percentage points over the period 1980-2016. Using the same universe of firms and methodology, Butenschøn (2019) arrive at roughly half the magnitude of Loecker and

[4]Hence, their data universe also includes the petroleum production sector, which is not part of our sample.

Eeckhout (2018). Without further information it is hard to pinpoint the sources of this discrepancy, but different approaches to data cleaning is a plausible candidate. Eide et al. (2019) use firm level data from the Brønnøysund Register center, which includes balance sheets and income statements from all Norwegian firms. The authors report an increase in the aggregate mark-up of roughly 12 percentage points over the period 1992-2018. However, a number of industries are excluded from the data set prior to calculating the (sales weighted) average mark-up. Also employing administrative data, but averaging over a slightly different set of industries, Berg et al. (2020) do not find any economically significant increase in the aggregate mark-up between 1995 and 2018.

Table 2: Various mark-up estimates for Norway

	Change in mark-up	Period
Loecker and Eeckhout (2018)	0.74 (0.86-1.60)	1980-2017
Butenschøn (2019)	0.32 (1.35-1.67	1980-2017
Eide et al. (2019)	0.12 (1.09-1.21)	1992-2018
Berg et al. (2020)	0.02*	1995-2018

) Based on an index where the level in 1995 is set to 100. In other words, the results indicate an increase over the sample period of a mere 2 percentage points.

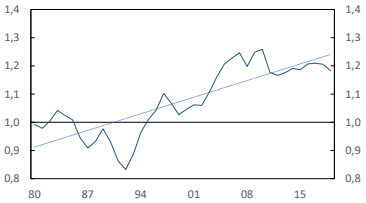
As should be clear from the discussion above, the findings reproduced in table 2 are not readily comparable. Both the set of industries and firms used as basis for calculating the reported aggregated mark-ups differ. This makes any comparison challenging. Another issue relates to the fact that our mark-up concept is based on value-added, while the studies using firm-level data rely on gross production (or sales). Using similar assumptions regarding production technologies, it can be shown that mark-ups based on value added will always be higher than the corresponding mark-ups based on gross production.[5] This means that our level estimates are not comparable to the level estimates underlying the results reported in table 2. This should, however, not affect the qualitative conclusions regarding secular trends. Hence, overall, the available evidence point to an increase in aggregate mark-ups in Norway over the recent decades. The size of the increase is, however, still open to debate.

To gain some further insights into the movements of the aggregate mark-up, it can be useful to take a closer look at some of the underlying sub-aggregates. In Figure 10, we

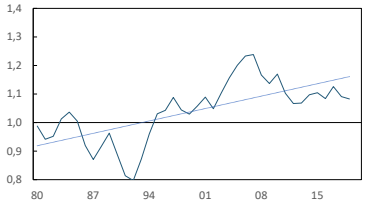
[5]See e.g. Basu (2019)

Figure 10: Markups

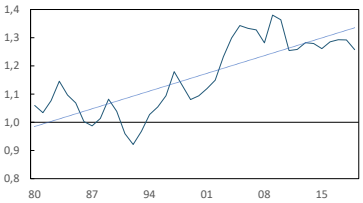
(a) All private firms



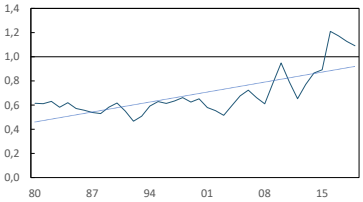
(b) Manufacturing



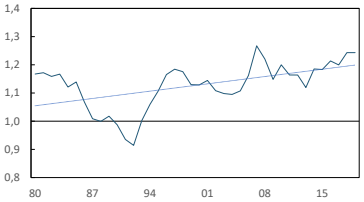
(c) Services



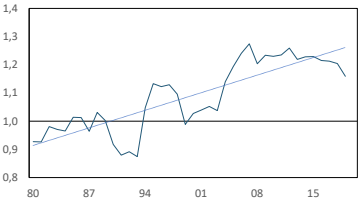
(d) Primary industries



(e) Retail and Wholesale



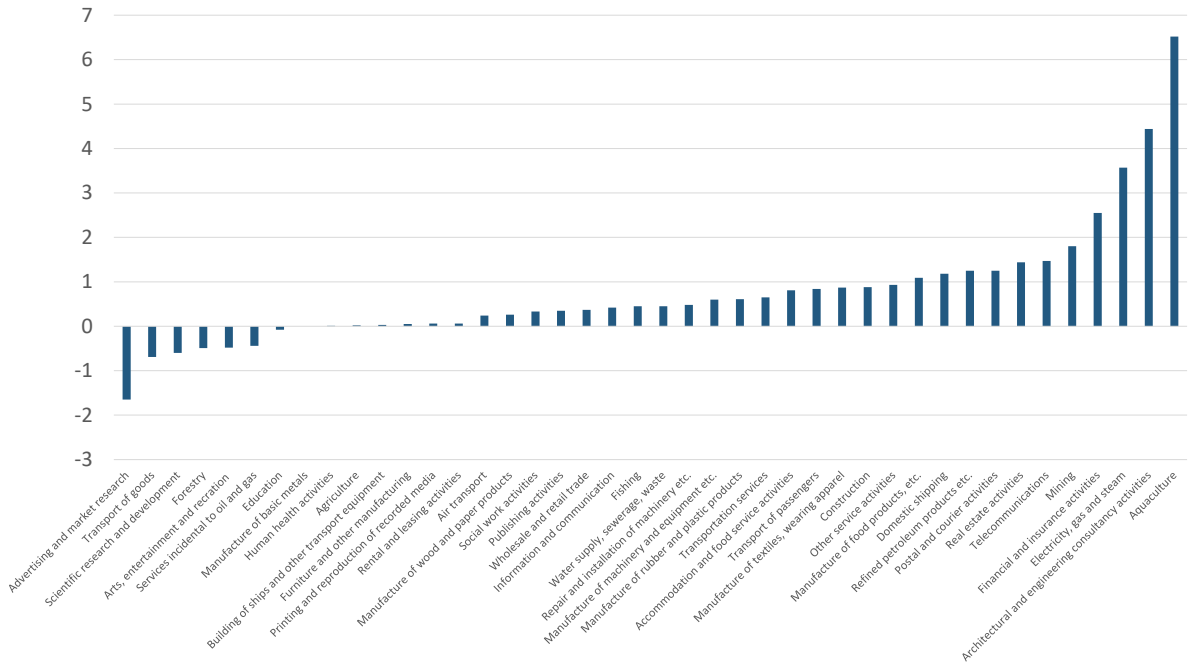
(f) Construction



depict the estimated mark-ups for a set of broad sectors of the Norwegian economy. The results indicate a clear positive secular trend in mark-ups in all sectors. Although the magnitudes differ, it seems evident that changes in the aggregate mark-up to a large extent mirror movements in the mark-up of the Service sector (ex. Retail). Again, this reflects the relative importance of the Service sector as a share of Mainland GDP. However, the secular increase in mark-ups is not monotonic. Mark-ups were low relative to trend during the banking crises and relatively high around the time of the financial crisis. Since the financial crisis, mark-ups appear to have stabilized or fallen in all the main sectors except in the primary industries. The cyclical behavior of mark-ups is a much studied topic in the literature. Although there does not appear to be a clear consensus, empirical studies predominantly find evidence of either pro-cyclical or non-cyclical behavior. In theoretical models, however, the cyclicality of mark-ups depend on the nature of the shocks. In New Keynesian models with sticky prices, for example, a typical demand shock will lead to a counter-cyclical response in mark-ups. At the risk of over-interpretation, one could argue the estimated mark-ups appear to be somewhat pro-cyclical before the financial crisis, whereas this is overall less evident in more recent years. The latter observation could also reflect the more subdued business cycle developments following the financial crisis.

In figure A.3, we present the estimated mark-ups for all 42 industries for the period 1980-2019. Visual inspection shows that, more often than not, mark-ups have exhibited a secular increase over the sample period. In figure 11, we depict the annual percentage point trend change in mark-ups from 1980 to 2019, ordered from the industry with largest

Figure 11: Change in mark-ups

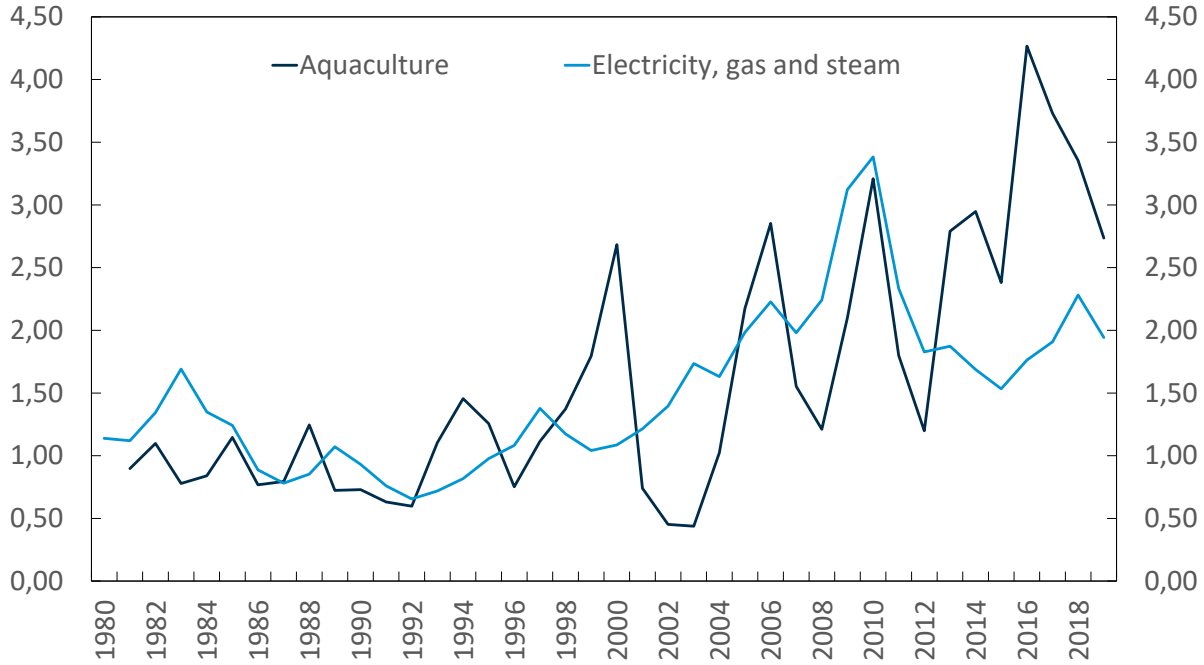


Note: The implied annual percentage point change in mark-ups along a fitted linear trend (OLS).

negative increase to the industry with the highest positive increase. Roughly 5 in 6 industries recorded an overall, although in some cases modest, year-on-year trend increase in mark-ups over the sample period.

For some of the industries included in our sample, the estimated mark-ups are not necessarily reflecting market power. In Agriculture, for example, sales prices will typically be lower than the true marginal costs. Hence, the recorded profits and mark-ups are negative. The flip side of this is that the agriculture sector heavily relies on government subsidies, which are not reflected in value added. In other sectors, like e.g. Education and Social welfare activities, there are elements of regulatory restrictions on profits. However, for the large majority of industries, assuming that firms can, and do, set prices to maximize profits, seems like a reasonable first order approximation. There are also sectors, where profits, and thus mark-ups, include a large element of resource rent. Two examples are shown in figure 12, where we depict the mark-ups in Aquaculture and Hydro-power (Electricity, gas and steam), two industries where economic rent clearly is a factor. Since 1980 the gross price mark-up in the electricity sector has increased by 100 percentage points, whereas the corresponding number for Aquaculture is roughly 170 percentage points. With mark-ups of around 2 and 2.7, respectively, both industries appear the be extremely profitable by any standard. Since 2001, licenses to use parts of the sea and

Figure 12: Mark-ups in Aquaculture and Electricity production



fjords for aquaculture have been distributed through auctions. This should in principle allow the Government to reap some of the resource rent. Still profits in aquaculture has risen dramatically since then. Hence, recently the Government proposed a new resource rent tax for the aquaculture industry, directly targeting profits.

One industry where it seems reasonable to suspect that market power might be present, is Telecommunications services. The market for telecommunication services, which includes firms that provide mobile phone services, is characterized by a handful of suppliers and only 3 independent networks. The estimated mark-up for the Telecommunication services is shown in figure 13. Up until 1993, the landline phone service was supplied by a non-profit state monopoly. The introduction of the mobile phone gradually added new players to the market, and in 2000 new regulation was put in place to allow companies without its own network to rent capacity from existing infrastructure. This should in principle have increased competition and weighted on prices. However, as is clear from figure 13, mark-ups in telecommunications have increased significantly since 2000.

In Financial services, which includes banks and insurance companies, profit margins have historically been high. This is confirmed by our mark-up estimates, which are depicted in figure 14. Our calculations indicate that the mark-up in the financial industry

Figure 13: Mark-ups in Telecommunications

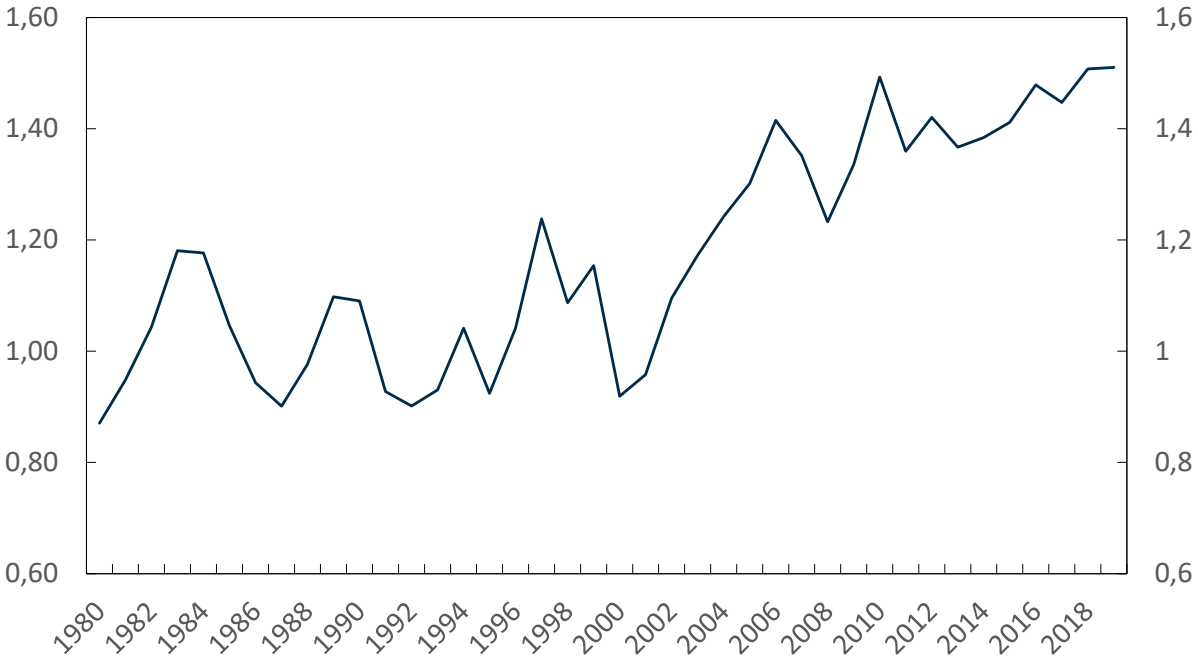
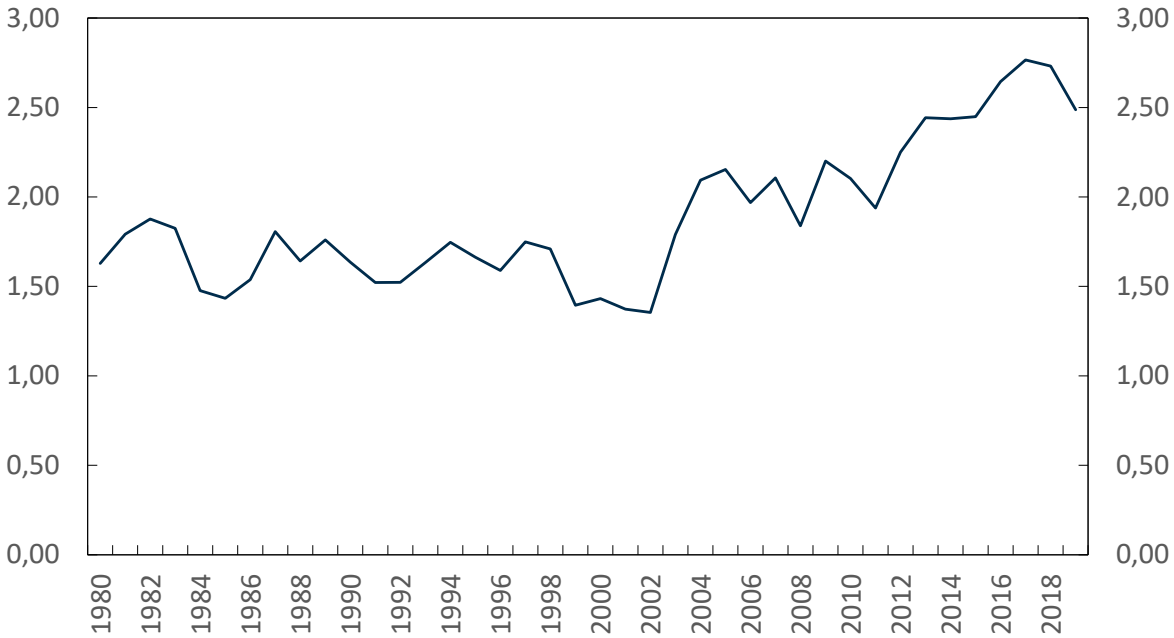


Figure 14: Markups in Financial services



overall was relatively stable, albeit at a high level, up until det beginning of the 00's. Since then, mark-ups have increased by roughly 100 percentage points on average. For the years leading up to the financial crisis, the up-tick in mark-ups most likely entailed a cyclical component. In most industries we find that mark-ups stabilize or even fall after the financial crises. This is not the case in financial services. Whether this is due to an increase in market power or other factors is hard to say. Stricter capital requirements in the aftermath of the financial crisis could be a possible explanation, forcing banks to shore up equity through retained profits.

5 Concluding remarks

In this paper, we document that price mark-ups in Norway overall have increased since 1980. This is true at the industry level, for sub-aggregates and in the aggregate. Increasing mark-ups could be an indication of increased market power and reduced competition, with potentially negative implications for economic welfare. The secular trend in mark-ups is mirrored by an increase in the pure profits share, which implies that the share of value added accruing to labor and capital has decreased over the sample period. Although our results confirm earlier studies documenting a negative trend in the overall labor share since 1980, the broad-based increases in sector-specific mark-ups is to a large extent reflecting negative trends in capital shares.

Some caveats, however, are in order. Over the sample period, many of the industries investigated have undergone profound structural changes. One broad structural trend has been the gradual decline in state ownership in many industries. Hence, in some industries, at least in the early part of the sample period, profit maximization was not necessarily a prominent feature of the firm or industry objective. Many firms also relied heavily on public subsidies and transfers, which potentially manifests itself in negative net mark-ups. Although we believe that the empirical evidence presented in this paper strongly points to a secular trend increase in mark-ups overall, we are less confident regarding the actual level estimates. This is partly due to the fact that we abstract from equity risk in the calculation of rental rates.

In a number of industries, however, like for example telecommunications, our results are consistent with and supporting concerns expressed by the governmental anti-trust

body. In these sectors, mark-ups appear to be at elevated levels, indicating impediments to competition. Our analysis, however, stops short of identifying the underlying drivers of the secular increase in mark-ups, which we leave for future research.

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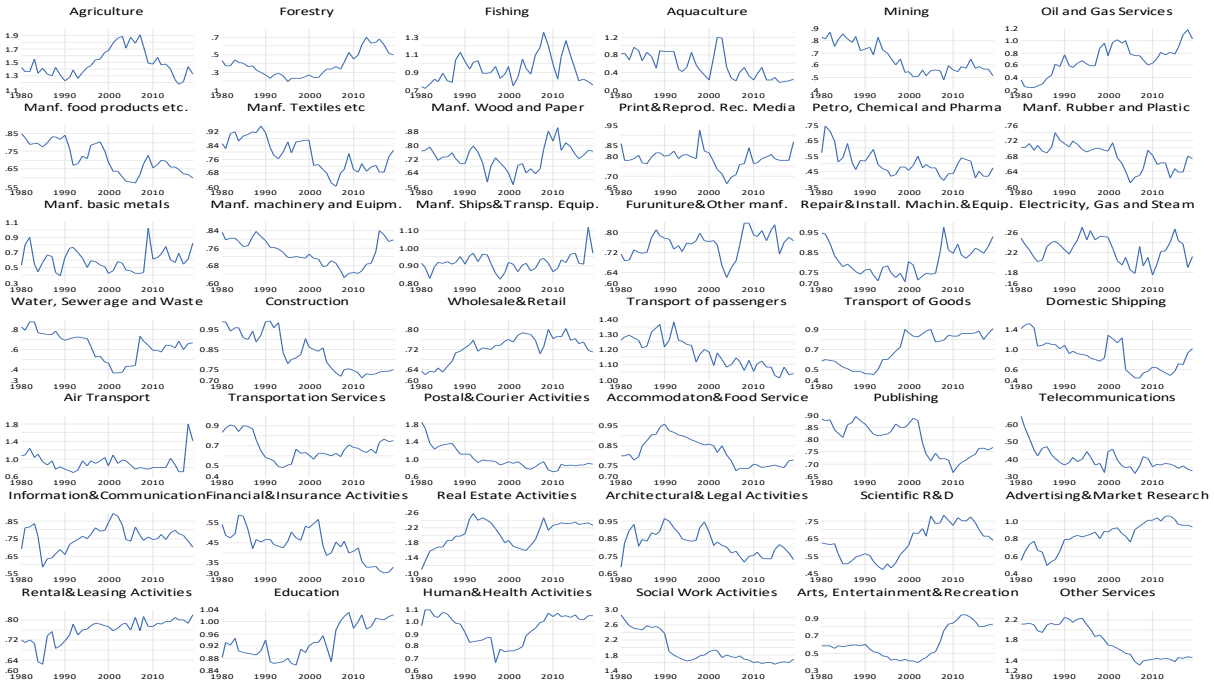
A Appendix

Figure A.1: Labor shares



Note: Labor shares including imputed wage income for self-employed

Figure A.2: Capital shares

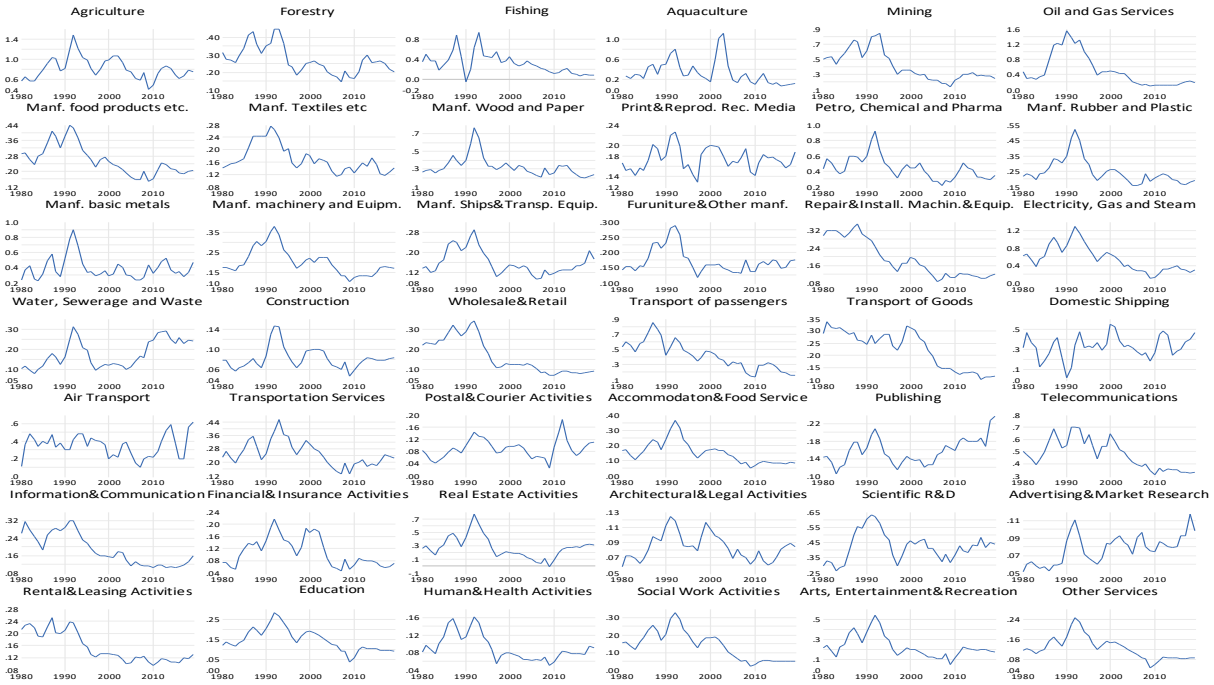


Figure A.3: Markups