

STAFF MEMO

Developments in housing affordability

NO. 4 | 2019

KJERSTI-GRO
LINDQUIST AND
BJØRN HELGE VATNE



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ISSN 1504-2596 (online only)

ISBN 978-82-8379-093-1 (online only)

Developments in housing affordability*

Kjersti-Gro Lindquist and Bjørn Helge Vatne
Financial stability. Norges Bank[†]

April 11, 2019

Housing affordability can have an impact on housing demand. We analyse housing affordability by measuring the distribution of selling prices in the housing market against the distribution of household capacity to debt-finance a home. The latter is calculated based on household debt-servicing income, banks' residential mortgage rates, principal payments and debt-servicing capacity requirements. When calculating debt-servicing income, ordinary consumption expenditure is withdrawn. Household wealth and equity are not included. For large groups of households, affordability has remained stable over time, in spite of higher house prices. Housing affordability varies with interest rate changes and with income growth and house price inflation. In Oslo, developments in affordability have been relatively weak in recent years compared with other cities and Norway as a whole.

1 Introduction

As most households finance a home purchase by taking out a substantial mortgage, debt-servicing capacity is important for housing affordability. House prices have long been rising faster than household disposable income. This indicates weakened affordability, in the sense that an average household has less room for manoeuvre in the housing market, and could be a sign of an imbalance (see Norges Bank (2019)) on key indicators of financial imbalances). Historically, house prices have often risen faster than disposable income in the run-up to periods of instability and falling house prices (see Norges Bank (2013) including references). House prices rising more rapidly than income could also have distributional implications. This analysis explores developments in housing affordability, with an emphasis on households' capacity to debt-finance a home purchase.

Disposable income is income available for consumption and not income available to debt-finance a home. In the literature, there are several alternatives to the *house-price-to-disposable-income ratio* as a measure of housing affordability. Regularly published indexes for estimated housing affordability often focus on the median household. In the US, the *Housing Affordability Index*, published by the National Association of Realtors, is used as a measure of household affordability. This index shows the relationship between median incomes and the debt-servicing costs of a mortgage on the median home (see Federal Reserve Bank of San Francisco (2003)). (For other similar indexes, see NUMBEO (2019) and alternatives described in Quigley and Raphael (2004), see also Barlindhaug and Astrup (2012)). Another strand of research into housing affordability explores to what extent low-income

*The views and conclusions expressed in this publication are those of the authors and do not necessarily represent those of Norges Bank. We would like to thank Henrik Borchgrevink, Torbjørn Hægeland, Nina Larsson Midthjell, Elif C.A. Saxegaard, Haakon Solheim and Erlend E. Bø as well as other participants at the workshop entitled "Norsk bolig- og urbanforskning" [Norwegian housing and urban research] at OsloMet 2019 for valuable comments and input.

[†]Contact person Bjørn Helge Vatne: bjorn-helge.vatne@norges-bank.no

households can qualify for a mortgage (see for example the Norwegian "sykepleierindeksen" (literally the "nurse index", an index measuring the housing a single nurse could afford and would be able to debt-finance), Eiendom Norge (2018). Studies focusing on low-income households often aim to shed light on housing policy measures (see eg Gabriel et al. (2005), including references, and Aarland (2012) for an analysis on Norwegian data.

The choice of affordability measure depends on the purpose of the measure and can influence the conclusion drawn. The price-to-disposable income ratio and several other measures have important limitations (see eg Stone (2006) and Gan and Hill (2009)). These studies emphasise that measures of housing affordability should take account of households' capacity to pay for consumption of other non-housing goods and services and that higher-income households must be expected to be able to use a larger share of their income on housing than lower-income households. The studies also point out that calculations on aggregated data, for the median household, or for selected households can conceal distributional features of housing affordability that are important for a more consistent assessment.

One challenge in housing affordability analyses is the scaling of the maximum income available for servicing debt to achieve the amount a household actually can and will use for this purpose. Past experience of, for example, the banking crisis in Norway around 1990 shows that most households will give priority to their mortgage payments and are willing to considerably reduce other expenses if they experience unexpected financial events. At the same time, Norwegian consumer survey figures suggest that most households normally want to delimit their housing expenses to allow for a level of consumption that is higher than what might be regarded as a rather sober level. This suggests that the income spent on servicing debt in this analysis should be scaled. International studies also find that households do not normally spend at the margin when they buy a home (see for example Gan and Hill (2009)). A range of information sources including consumer surveys, housing benefit regulations and poverty studies have been used in the calibration of this scaling parameter.

This analysis largely follows Gan and Hill (2009) and calculates a housing affordability measure that reflects households' capacity to debt-finance home purchases given their income after tax and reasonable consumption expenses. It follows from this method that the share of income after tax that can be spent on housing expenses increases with income. The calculation applies the entire distribution of households. Household wealth is not part of the analysis. Analyses of housing affordability do not generally include wealth. In order to estimate the share of income spent by a household on housing, Gan and Hill (2009) use information from consumer surveys. Our approach focuses on *the capacity* to debt-finance a home purchase, and our scaling is based on regulatory requirements relating to debt-servicing capacity (see Lovdata (2018)).

We are particularly interested in how developments in house prices, interest rates and income after ordinary consumption expenditure have influenced housing affordability over time. The computed housing affordability indicator allows us to decompose affordability trends in terms of these factors.

The housing market comprises a large number of geographical market segments in which price levels can vary considerably. The price level is generally higher in the cities. At the same time, there is substantial heterogeneity in household incomes. The correlation between house price and income heterogeneity influences housing affordability. We therefore analyse the development for

the country as a whole, for Oslo and for other cities, ie Bergen, Trondheim and Stavanger including Sandnes.

The results of this analysis nuance the impression of weakened housing affordability and housing market imbalances based on the relationship between house prices and disposable income. The analysis finds that with lower interest rates, income growth and a weak rise in the price of ordinary consumption, housing affordability has remained stable over time for large groups of households despite higher house prices. For households in the lower half of the distribution, however, housing affordability has declined for a long period. Housing affordability for the median household in Oslo has also shown relatively weak developments in recent years.

Section 2 describes the data, method and calculation of housing affordability. Section 3 presents analyses of housing affordability, while Section 4 concludes.

2 Data and method

Information on income after tax, debt and interest expenses at the household level is from Statistics Norway's income and wealth statistics (see Statistics Norway (2016)). The data are based on annually submitted household tax returns for the period 2004-2016. Stock figures such as debt, are measured at the end of the year.

The self-employed are not included in the analysis.¹ Households that do not have a positive income after tax and households aged below 30 and above 60 are excluded.² After the delimitation, the data set contains 1.2-1.3 million households per year.

The age delimitation removes young households with situation-dependent low income, such as students, who can expect strong income growth. Many older households are pensioners, with relatively low incomes, and there are few potential homebuyers in this group. As many low-income households are excluded, estimated housing affordability is higher than if these households had not been removed from the data.

Estimated non-housing living expenses are based on the reference budget for ordinary consumption expenditure drawn up by the National Institute for Consumer Research (SIFO) (see SIFO (2018)). SIFO's consumption figures represent reasonable consumption, but are not a measure of minimum household consumption. In the calculation of ordinary consumption expenditure at the household level, we take account of the size and composition of the household. When the household includes smaller children, fixed expenses for childcare are included. Consumption figures do not vary with income or place of residence.

Purchase prices in housing transactions and details about the property sold are taken from the deeds registered with the Norwegian Mapping Authority and delivered by Ambita. As from 2007, these statistics also cover housing cooperative apartments. The data set comprises close to 100 000 transactions per year.

Ideally, we would have included prices for all homes advertised for sale, but these prices are not

¹According to Statistics Norway's Labour Force Survey, around 7 percent of all employed persons aged 15-74 in our analysis period are self-employed.

²Less than 1 percent of households are excluded per year based on the income requirement, while the age delimitation reduces the data set by close to 45 percent.

available. There may be a number of reasons why a property advertised for sale is not sold. In addition, the number of unsold homes, and the time taken to sell a home, typically vary over the business cycle. If this cyclical nature has a greater impact on some parts of the distribution of house prices, housing affordability calculations could be affected. We have no information to indicate that some price segments are affected more than others.

We use banks' average interest rate on outstanding residential mortgages for households as the interest rate in the analysis as data showing interest rates on new residential mortgages is not available (see Statistics Norway (2018)). The applied interest rate is available as from 2008, which we choose as the starting point of our analysis. The share of fixed-rate mortgages has increased over much of the analysis period. The interest rate on such loans is normally higher than the floating rate. Selecting banks' average interest rate on outstanding mortgages may mean that the interest rate on new mortgages is somewhat underestimated and that housing affordability is thereby overestimated.

The method we apply to calculate housing affordability comprises three stages:

1. First, we calculate the maximum income a household can spend on servicing debt, *debt-servicing income*, by deducting ordinary consumption expenditure from post-tax income. Consumption expenditure varies with household size and composition. The share of income a household can spend on servicing debt increases with income.
2. Then we calculate the household's *borrowing capacity* as the most expensive home the household is able to debt-finance. This capacity depends on debt-servicing income and the share of this income the household can spend on servicing debt, ie on interest and principal payments. Given our focus on the capacity to debt-finance a home purchase, ie debt-servicing capacity, we scale debt-servicing income based on regulatory requirements regarding debt-servicing capacity. The calculations utilise average mortgage rates, the regulatory requirement for borrowers to be able to service debt in the event of a 5 percentage point interest rate increase and an assumption that the mortgage is a 30-year amortising mortgage.

The calculations show debt-servicing costs in the form of the sum of interest and principal payments.³

3. Finally, *housing affordability* is calculated by measuring the distribution of borrowing capacity against the distribution of prices for homes sold. Housing affordability is defined as the share of homes sold (grouped by selling price) where a given household (grouped by borrowing capacity) can debt-finance a home purchase.

³Equity requirements are not included in this analysis. Other analyses of housing affordability generally include such a requirement using a simple parameter. This approach implicitly assumes that the equity requirement has been met. The way in which equity capital is financed is not assessed. Such a method increases a household's housing affordability as measured by the most expensive home the household is able to debt-finance. An alternative to such a simple parameterisation, is to rank households by both their debt-financing ability and total equity. However, this is challenging as there are measurement errors in the estimated market value of many homes and cottages in household tax returns, and the value of unlisted securities is difficult to estimate. A two-dimensional distribution is also more complicated. Analyses where equity or how it is financed are omitted must be interpreted with some caution.

2.1 Husholdningenes gjeldsdisponible inntekt

The calculation of *debt-servicing income*, I^D , which is stage 1 in the method outlined above, is shown in equation (1).

$$I_{i,t}^D = \text{Total income after tax}_{i,t} - \tau_t \cdot \text{Interest expenses}_{i,t} - \text{SIFO}_{i,t} \quad (1)$$

where i and t denote household and year respectively, τ is the tax rate on ordinary income used in the calculation of realised tax-deductible interest (the rate varies over time but not across households) and SIFO is estimated consumption expenditure.

Household debt-servicing income rose between 2008 and 2015. There was a general decline in debt-servicing income in 2016 owing to weak income growth. SIFO expenditure has shown moderate growth over time. This expenditure accounts for a relatively large share of income for lower income households, and has contributed to a percentage growth in debt-servicing income that has been highest at lower levels of the income distribution. The distribution of debt-servicing income is skewed and came to a good NOK 300 000 for the median household in 2016, NOK 135 000 for the 25th percentile and NOK 515 000 for the 75th percentile.

2.2 Household borrowing capacity

We will now calculate the most expensive home the household is able to debt- finance, *borrowing capacity*, given the household's debt-servicing income. This is stage 2 in the method outlined above. In this stage, we take account of the debt-servicing capacity requirement in Section 3 of the residential mortgage loan regulation (see Lovdata (2018))⁴:

The financial institution shall calculate the borrower's debt-servicing capacity based on the borrower's income and all relevant expenses, including interest and principal payments and normal living expenses.

In the assessment of the borrower's debt-servicing capacity, the financial institution shall include a five percentage point increase on the current interest rate level. (...) If the borrower does not have sufficient funds to cover normal living expenses after such an interest rate increase, the loan shall not be approved.

We have already taken normal living expenses into account by deducting SIFO expenditure in our calculation of debt-servicing income. To establish a household's borrowing capacity, we must calculate the household's capacity to service debt even with an interest rate increase of five percentage points. We start by calculating total debt-servicing costs, C^D , ie the sum of interest and principal payments. The amortisation formula in equation (2) shows debt-servicing costs at debt level D_t , where r^* is banks' average interest rate on households' outstanding residential mortgages plus five percentage points and N is the repayment period in years, set at 30.⁵

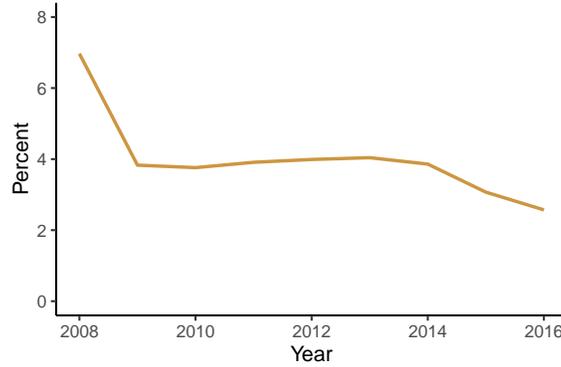
⁴Requirements related to banks' credit standards, including debt-servicing capacity, were in the form of guidelines, set in 2010, and then a regulation, issued in 2015. Before 2010, banks also generally assessed borrowers' debt-servicing capacity before approving a mortgage. However, it was to a greater extent up to the individual bank to set the criteria.

⁵The residential mortgage loan regulation does not specify a general requirement for the maximum loan term, but for mortgages with an LTV ratio of more than 60 percent, the regulation requires principal payments equivalent to

$$C_t^D = \frac{r_t^*}{1 - (1 + r_t^*)^{-N}} \cdot D_t = \rho_t D_t, \quad (2)$$

where $\rho_t = \frac{r_t^*}{1 - (1 + r_t^*)^{-N}}$.

Chart 1: Average bank interest rate on residential mortgages for households. Percent. 2008 - 2016



Sources: Statistics Norway and Norges Bank

Banks' mortgage rates have declined in the analysis period (see Chart 1). Lower interest rates reduce debt-servicing costs.

Household debt-servicing income should be sufficient to cover debt-servicing costs. To obtain an expression for the level of debt a household can take on given the debt-servicing requirements, we replace the debt-servicing costs in equation (2) with debt-servicing income adjusted for the tax deduction for interest expenses (see equation (3)).

$$C_{i,t}^D = \rho_t D_{i,t} \leq I_{i,t}^D + r_t^* \cdot \tau_t \cdot D_{i,t} \quad (3)$$

Then we solve the equation with regard to debt (see equation (4), which shows the relationship between debt, $D_{i,t}$, debt-servicing income and debt-servicing costs and debt-servicing requirements).

$$D_{i,t} \leq \frac{I_{i,t}^D}{\rho_t - r_t^* \cdot \tau_t} \quad (4)$$

The most expensive home a household can debt-finance, ie its *borrowing capacity*, is then given by

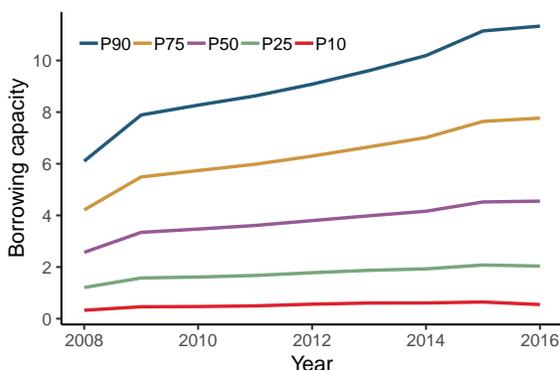
$$P_{i,t}^* = \frac{I_{i,t}^D}{\rho_t - r_t^* \cdot \tau_t} \quad (5)$$

2 1/2 percent of the mortgage loan or the principal payments that would apply to a 30-year amortising mortgage. Calculating principal payments for serial loans with LTVs of more than 60 percent rather than amortising loans is complicated in this analysis and therefore not chosen. LTV ratios can only be identified when housing affordability is calculated by measuring the full distribution of households against the full distribution of homes sold.

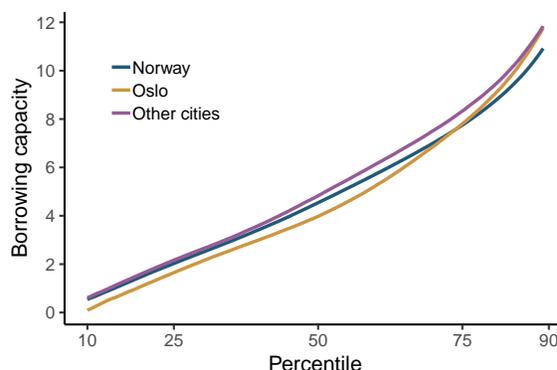
For most of the percentiles we consider, household borrowing capacity has increased over time (see Chart 2a). While the capacity of the median household to debt-finance a home was NOK 2.6 million in 2008, it was NOK 4.6 million eight years later. This reflects household income growth, a very moderate rise in the cost of ordinary consumption and a decrease in residential mortgage rates from 7 to 2.5 percent.

Chart 2: The most expensive home a household can debt-finance. In millions of NOK ¹⁾

(a) Borrowing capacity by year. 2008-2016



(b) Borrowing capacity by area. 2016



1) Other cities are Bergen, Trondheim and Stavanger including Sandnes.
Sources: Ambita, SIFO, Statistics Norway and Norges Bank

The distribution of borrowing capacity is skewed, and the 10th percentile household does not have the capacity to service a mortgage, while the 25th percentile has the capacity to service a mortgage of a good NOK 2 million in 2016 given the conditions in the calculations. Borrowing capacity increased most for the highest percentiles both as a percentage and in NOK terms. The borrowing capacity pattern largely reflects the pattern of debt-servicing income.

A comparison of household borrowing capacity across geographical areas shows that borrowing capacity in other cities is generally higher than in Norway as a whole, while it is lower in Oslo for all percentiles up to the 75th percentile (see Chart 2b). Other cities are Bergen, Trondheim and Stavanger including Sandnes. Borrowing capacity is also higher in Oslo than in Norway as a whole for the highest percentiles. The distribution of borrowing capacity is more skewed in cities, particularly Oslo, than in Norway as whole. Oslo has a relatively large share of lower-income households, partly because of a larger share of one-person, single income households.

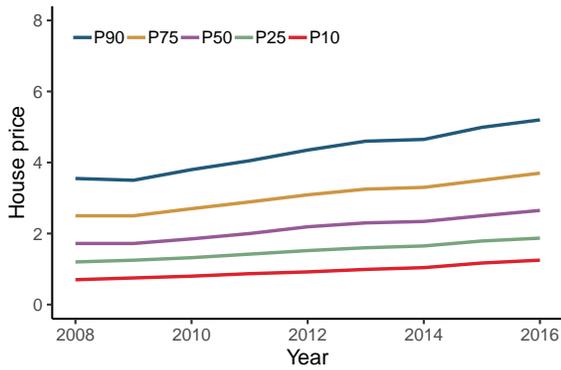
2.3 Housing affordability

Household affordability depends on prices for available homes for sale. We let registered purchase prices for homes sold on the open market represent prices for available housing (see Kartverket (2019)).

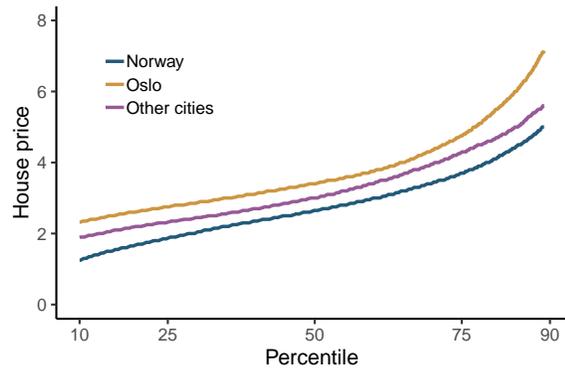
House prices have increased substantially over time (see Chart 3a). The rise has been sharpest at the lower percentiles and the cheapest homes have become relatively more expensive, particularly the 10th percentile price, which rose by close to 80 percent from NOK 700 000 in 2008 to NOK 1.4

Chart 3: House prices. In millions of NOK ¹⁾

(a) By year. 2008-2016



(b) By area. 2016



1) Other cities are Bergen, Trondheim and Stavanger including Sandnes.
Sources: Ambita, SIFO, Statistics Norway and Norges Bank

million in 2016. The price of the median home rose from NOK 1.7 million to NOK 2.8 million.

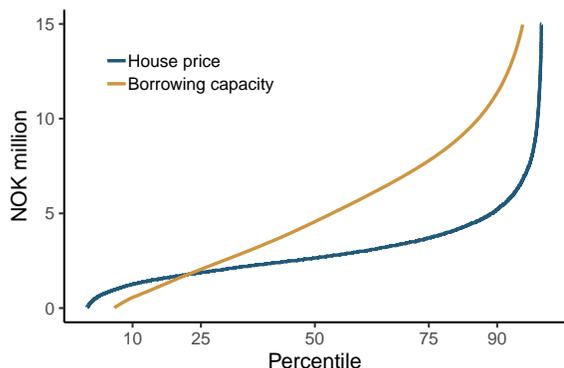
The distribution of purchase prices across market segments shows that Oslo in particular stands out, with considerably higher prices than the country as a whole (see Chart 3b. In 2016, the price of the median home was NOK 3.4 million, while the 90th percentile home was NOK 7.5 million. The distribution of prices for homes sold is more skewed in Oslo than in other cities and Norway as a whole. Prices for the most expensive homes in Oslo in particular are relatively high.

The calculation of housing affordability for the households in our sample is based on the distribution of households by borrowing capacity and the distribution of house prices as shown in Chart 4a. Let $P_{p,t}^*$ be the borrowing capacity of the p -percentile household in this distribution. The median in 2016 is given by $P_{50,2016}^* = \text{NOK}4.6$ million. The distribution of house prices $P_{p,t}$ shows that NOK 4.6 million is equivalent to the 85th percentile in this distribution, $P_{85,2016} = \text{NOK}4.6$ million. The median household in the distribution of borrowing capacity is able to debt-finance a home from among 85 percent of houses sold. Housing affordability for the median household is 85 percent.

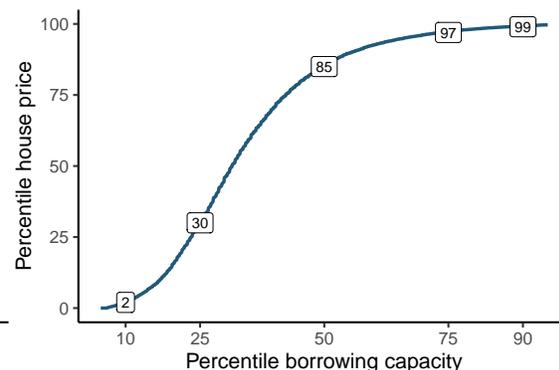
This comparison of the distribution of borrowing capacity and house prices is used to derive the curve showing housing affordability for all households by borrowing capacity percentile (see Chart 4b). While the 10th percentile household in our sample has the capacity to debt-finance a home purchase from among 2 percent of the lowest priced homes, housing affordability for the 25th percentile household is 30 percent, and the 75th percentile household can purchase a home as expensive as up to the 95th percentile home. Households with borrowing capacity higher than the 25th percentile are able to debt-finance the purchase of a home from among a relatively large share of the homes sold, while households with lower borrowing capacity are able to debt-finance the purchase of a home from among a relatively small share of the homes sold. Households with medium to high housing affordability have considerable freedom of choice in the housing market and can choose to purchase a home at a far lower price than they have the capacity to debt-finance. For households with lower affordability, their affordability is more often likely to restrict their choice.

Chart 4: Distribution of house prices, borrowing capacity and housing affordability. 2016

(a) Distribution of house prices and borrowing capacity



(b) Housing affordability



Sources: Ambita, SIFO, Statistics Norway and Norges Bank

Table 1: Rise in house prices, debt-servicing income and borrowing capacity by percentile. Average annual rise 2008-2016

	Percentile				
	10	25	50	75	90
House prices	7.5	5.7	5.6	5.0	4.9
Debt-servicing income	2.7	2.7	3.3	3.9	4.0
Borrowing capacity	6.7	6.8	7.4	8.0	8.1

Sources: Ambita, SIFO, Statistics Norway and Norges Bank

This reflects the clear differences between the two distributions of borrowing capacity and house prices. The distribution of prices for homes sold are relatively flat over much of the distribution, and many homes are sold within a limited price range.

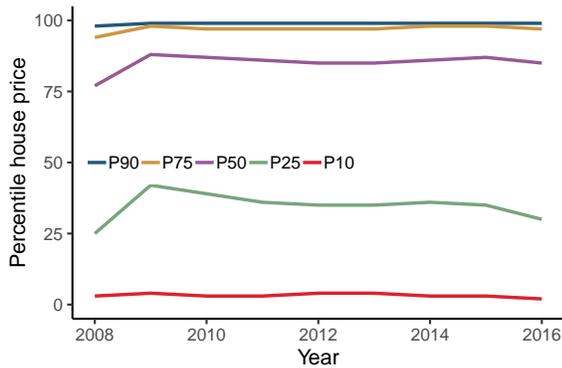
3 Analysis

A comparison of average annual house price inflation, debt-servicing income and borrowing capacity in the period 2008-2016 shows that house prices in general have risen more than debt-servicing income, but less than borrowing capacity, except at the 10th percentile (see Table 1). This may suggest that housing affordability in general has not weakened.

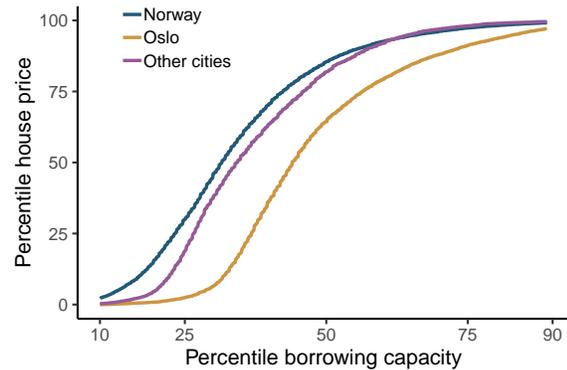
The calculations providing the basis for assessments of housing affordability are shown in Chart 5. Over time, housing affordability has remained relatively stable for large groups of households (see Chart 5a). As a result of high interest rates and continued high house prices after a substantial rise prior to the financial crisis, housing affordability was weak for many households in 2008. With lower interest rates in 2009 and falling house prices combined with continued solid income growth, housing affordability rebounded. With weak income growth in 2016, housing affordability fell back somewhat. The calculations show that housing affordability for the 10-percentile household is persistently low, ie

Chart 5: Household affordability. Percent¹⁾

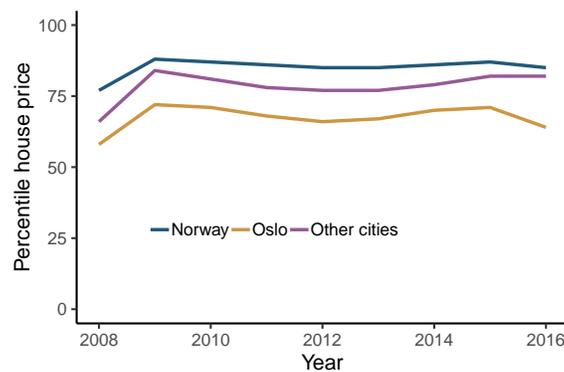
(a) By year. 2008-2016



(b) By area. 2016



(c) By year and area. Median household. 2008-2016



1) Other cities are Bergen, Trondheim and Stavanger including Sandnes.
Sources: Ambita, SIFO, Statistics Norway and Norges Bank

this household has low capacity to service housing debt relative to prices for even the least expensive homes sold. For the 25th percentile household, housing affordability is 12 percentage points lower in 2016 than in 2009.

Housing affordability for the 25th percentile varies relatively widely over the years and reflect changes in interest rates, house prices and income. There is also a clear variation in housing affordability for the median household. For the wealthiest households, housing affordability is affected to a lesser extent by changes in interest rates, house prices and income. Their high level of debt-servicing income ensures that housing affordability is high regardless of these factors. Low debt-servicing income dominates among the households with the lowest level of housing affordability. As a result, interest rate changes do not influence their housing affordability in the same way as at the higher percentiles. House price inflation has also been highest in the lower price segments.

Calculations show that housing affordability in 2016 is generally lower, with a more skewed distribution, in Oslo than in other cities and in the country as a whole (see Chart 5b). Housing affordability in different areas is calculated based on the borrowing capacity of households resident

in an area and prices for homes sold in that area.⁶ Housing affordability for the median household in Oslo is 64 percent, while it is 82 percent in other cities and 85 percent in Norway as a whole. For the 25th percentile household, housing affordability in Oslo is only 2.5 percent, while it is close to 20 percent in other cities and 30 percent in Norway as a whole. This implies that home ownership may be reserved for a smaller share of households in Oslo than in other areas and that the households that have the capacity to debt-finance a home purchase in the capital are those with a relatively high income.⁷

Housing affordability of the median household in Oslo has shown weaker developments than in other cities and the country as a whole (see Chart 5c). If we compare 2016 with 2008, affordability increases least in Oslo, but does not differ substantially from that of the country as a whole. Compared with 2009, however, affordability decreased by as much as 8 percentage points in Oslo as against 2-3 percentage points in other cities and Norway as a whole.

The results of this analysis nuance the impression of weakened housing affordability and housing market imbalances based on the aggregated relationship between house prices and disposable income. Based on debt-servicing income and the capacity to debt-finance a home purchase, rather than income disposable for consumption, we find that for large groups of households housing affordability did not weaken between 2008 and 2016. At the same time, the results suggest that changes in bank lending rates, income and house prices can have a substantial impact on affordability for a large share of households. Affordability is sensitive to such changes.

We are interested in the impact of developments in bank lending rates, income and house prices on affordability. Based on the definition of affordability and borrowing capacity, we can explore the isolated impact of these factors. The analysis is partial and counterfactual, and the starting point is 2008. We let each of these factors be equal to their 2016 value, while the others are kept constant at their 2008 values. We do not, for example, take into account that, in addition to their direct effect on affordability, interest rate developments also have an indirect effect via their impact on house prices.

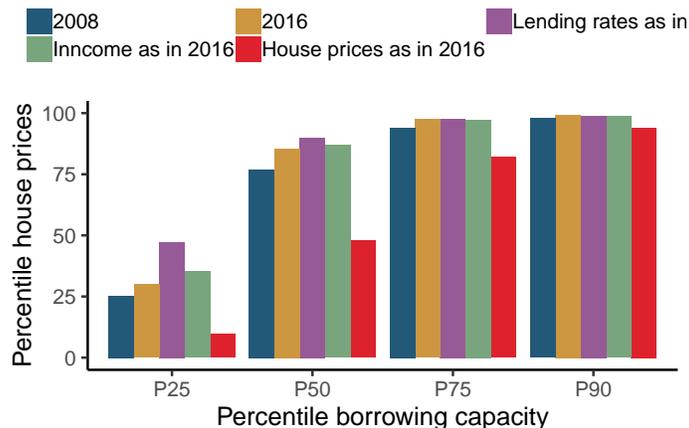
First, we calculate housing affordability and let the average lending rate be 2.5 percent as in 2016, which is 4.5 percentage points lower than in 2008. Income and house prices are as in 2008. While affordability for the median household in Norway is estimated to have increased from 77 percent in 2008 (blue bar) to 85 percent in 2016 (yellow bar) (see Chart 6), affordability in this first case is 90 percent for the median household (purple bar). This is as much as 13 percentage points higher than in 2008 and clearly higher than estimated affordability for 2016. We find that the decrease in interest rates contributes to a relatively considerable rise in affordability for the 25th percentile, while the effect declines and is virtually negligible at the upper end of the distribution. Calculations for the 10th percentile household is not included. These households do not have the capacity to debt-finance a home purchase.

If we let household debt-servicing income be equal to its 2016 value while interest rates and house prices are kept at their 2008 level, we find a pattern that is largely similar to the pattern in

⁶Housing affordability in an area could be affected by households moving in and out of the area.

⁷In general, the share of one-person, and thereby single-income, households is higher in Oslo. In our sample, almost 40 percent of households in Oslo are one-person households, while the share is around 10 percentage points higher in other areas.

Chart 6: Household housing affordability. 2008 and 2016 and the impact of different factors by borrowing capacity percentile. Percent



Sources: Ambita, SIFO, Statistics Norway and Norges Bank

the interest rate calculation (see green bars). Housing affordability for the median household is now 87 percent. In other words, the change in interest rates and in income contribute to considerably higher housing affordability for large groups of households.

When we calculate housing affordability with house prices as in 2016 and income and interest rates as in 2008, we find that the rise in house prices pushes down affordability to a considerable extent (red bar). For the median household, estimated housing affordability in this case is only 48 percent, almost 30 percentage points lower than in 2008.

This analysis shows that income growth and lower interest rates have contributed to an increase in affordability, but that the increase has largely been counteracted by higher house prices. The overall effect is higher affordability for large groups of households. As shown in the chart, the impact of the change in these factors relative to the level of affordability in 2008 is most pronounced for households at the 25th percentile and the median. The households with the highest affordability are only to a modest extent affected by the changes in these factors. Affordability for households with high debt-servicing income is persistently high independent of developments in interest rates, income and house prices.

4 Conclusion

In this analysis, we study developments in household housing affordability and the impact of house prices, income, ordinary consumption expenditure and residential mortgage rates. We compare developments for different household groups in the country as a whole and in selected cities. We limit our sample to households aged 30-60. The analysis is based on a calculated measure of household housing affordability that reflects household's capacity to debt- finance a home purchase based on income.

Housing affordability is calculated by measuring the distribution of prices for houses sold against the distribution of the capacity to debt-finance a home purchase, ie the most expensive home

households are able to debt-finance. In the calculation of this capacity, we take account of the debt-servicing requirement in the residential mortgage loan regulation. Households must be able to cover non-housing ordinary consumption expenditure and to service debt in the event of a 5 percentage point interest rate increase.

In contrast to the indicator based on the relationship between house prices and disposable per capita income, this analysis finds that affordability has generally been sustained over time. With lower interest rates, income growth and a weak rise in the price of ordinary consumption, housing affordability has remained stable over time for large groups of households despite higher house prices. Developments for households with low capacity to debt-finance a home purchase, however, have been less favourable.

There are considerable regional differences in affordability. In the cities in particular, the supply of housing in a price category that households with lower capacity to debt-finance a house purchase can afford is limited. Affordability has shown weaker developments and is clearly lower in Oslo than in the country as a whole and in other cities.

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