STAFF MEMO

High debt in Norwegian households and the risk of a substantial cutback in consumption

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KJERSTI-GRO LINDQUIST
HAAKON SOLHEIM
BJØRN HELGE VATNE

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High debt in Norwegian households and the risk of a substantial cutback in consumption*

Kjersti-Gro Lindquist, Haakon Solheim and Bjørn Helge Vatne
Financial Stability. Norges Bank†

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Abstract: On average, Norwegian households are highly indebted and their wealth is concentrated in housing. Changes in income, interest rates or house prices may cause significant adjustments in saving and consumption. This paper uses administrative register data on income and wealth to derive measures of saving and consumption expenditure. Stylised facts on the distribution across households are presented. The data are used to shed light on the risk of a drop in consumption in the event of negative shocks. We find that, on average, households have financial buffers that can significantly dampen the effect of a transitory shock. Buffers have increased in line with higher debt levels. If households' ability to access credit markets should be impaired, or if their willingness to finance consumption by new borrowing is weakened, that could have a pronounced impact on consumption expenditure.

1 Introduction

Debt in Norwegian households has grown faster than income the last 20 years, and the aggregate debt to disposable income ratio is above 200 percent. A dominant share of this debt is adjustable rate mortgage loans. The most important asset in the household portfolio – housing – is highly collateralised. This makes households vulnerable to shocks to income, interest rates and house prices. When assessing households' debt position, two risks are in general highlighted, the risk of default and the risk of a sharp decline in consumption.

> "The risk of a pronounced increase in defaults is moderate even after major shocks such as a sharp decline in house prices or a sudden rise in interest rates. On the other hand, the high level of debt could lead to substantial cutbacks in consumption following such shocks and thereby poses a risk to the Norwegian economy." (Norges Bank (2014) *Financial Stability Report*)

In this paper, we focus on the risk of a cutback in households' consumption expenditure. When addressing the consequences of high debt for consumption in the event of shocks, one should take into consideration that many households have financial assets available that can serve as a buffer. Furthermore, since shocks to households' income or housing wealth may affect their access to credit markets, the role of new loans for consumption financing should be assessed. Few papers have empirically addressed these

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†Corresponding author Bjørn H. Vatne

issues, and an important contribution of this paper is to shed light on the financial buffer and debt-financed consumption.

There is significant heterogeneity in Norwegian households' balance sheets, and the distribution of debt, income and wealth is skewed (see Lindquist et al. (2014)). Sufi (2015) argues that monetary policy, ie changes in the interest rate, affects the real economy through a redistribution channel. This channel hinges upon differences across households in debt, income and wealth as well as the marginal propensity to consume. When evaluating risks related to household debt, we therefore take a disaggregated rather than an aggregated approach. High-quality data on household-level consumption and saving over time are not available in Norway, however.[1] There is a literature that calculates consumption measures on the basis of data on income and wealth using micro data (see Browning and Leth-Petersen (2003), Koijen et al. (2014) and Kreiner et al. (2014), and Fagereng and Halvorsen (2015) for the approach applied to Norwegian household data). We follow this literature and use household-level register data, primarily tax return data on income and wealth, to derive measures of financial saving and consumption expenditure. While only an approximation of actual consumption, we expect the data to provide a realistic description of consumption patterns across Norwegian households.

Households' income varies over the life-cycle and households actively use financial markets to smooth consumption. The analysis shows that households finance a significant share of their consumption expenditure, including durable goods and home improvements, by borrowing. Restraining households in taking on new debt could potentially have a substantial negative impact on consumption. At the same time households save, and we find that financial saving have increased in line with higher debt levels. Households in fact hold financial buffers that can smooth consumption in the event of a temporary negative shock to their income and wealth. We find that the vulnerability of consumption to temporary shocks, defined as the share of consumption expenditure that is not financed by households' own available resources, ie income, financial buffers or a loan with a loan-to-value (LTV) ratio below 85 percent, has been relatively stable since 2011.

The construction of the saving and consumption expenditure data is described in Section 2. In Section 3 and 4 we present the calculated data on saving and consumption expenditure. Section 5 assesses households' financial buffers and Section 6 their ability to smooth a negative shock. Section 7 concludes. Appendices A and B describe, in more detail, the method used to calculate the data and compare the constructed volumes and transactions of financial asset with national accounts data. In the analysis, we need to select a subset of the observations. Appendix C compares the observations selected with those excluded.

2 Deriving consumption from income and wealth

Following Fagereng and Halvorsen (2015), we calculate household-level consumption measures by using the budget constraint. Disposable income, ie after-tax income less interest payments, can be used for consumption expenditure, financial transactions and fixed investment.

$$Y_t - R_t = C_t + (F_t - F_{t-1}) + (H_t - H_{t-1}) \tag{1}$$

[1] The Consumer Expenditure Survey conducted by Statistics Norway since 1974, suffers from small-sample weaknesses across important attributes. The survey, in its original form, was discontinued in 2009. As from 2012, larger periodic surveys at various intervals will be conducted. This has improved the quality of the survey.

where Y is after-tax income including financial income and transfers such as reported inheritance, R is interest payments, C is consumption expenditure, $(F_t - F_{t-1})$ is net financial transactions and $(H_t - H_{t-1})$ is net fixed investment, ie investment in housing and other fixed assets. Net financial transactions are defined as the change in borrowing (L), bank deposits (D) and securities (S) from one year-end to the next.

$$(F_t - F_{t-1}) = -(L_t - L_{t-1}) + (D_t - D_{t-1}) + (S_t - S_{t-1}) \tag{2}$$

We have access to annual tax returns for all Norwegian residents in the period 2004-2014.[2] This gives us data on Y, R, L, D and the reported value of securities holdings, S^*, which differ from the pure transaction measure, S. The change from one year-end to the next in the available data on securities, ie $(S_t^* - S_{t-1}^*)$, includes both transactions in these assets and losses and gains due to price changes. When applying the budget-constraint approach to calculate consumption expenditure measures, we therefore need to adjust for the change in securities prices. This adjustment is done by combining the tax return data with data on securities transactions in volumes and prices in the national accounts.

When using the budget-constraint approach, we face two additional major challenges: i) how to distinguish fixed investment from consumption, and ii) how to treat observations of households with financial saving in excess of reported income.

i) *Real estate transactions.* The largest net fixed investment of a household is the purchase or sale of a home. We use the register data to identify the point in time, ie the year, of such transactions. Typically, the net financial position of a household moves considerably in these years, reflecting the financing of the real estate investment or the sale rather than consumption expenditure. We are not able to separate out the consumption expenditure portion of these movements in financial assets and therefore exclude these observations from our data.

ii) *Financial transactions in excess of income.* If a household has positive net financial transactions in excess of its disposable income, ie if $Y_t - R_t < F_t - F_{t-1}$, the budget-constraint approach in Equation (1) returns a negative consumption expenditure value. These observations, most likely, reflect the use of income, transfers or asset sales not reported on the tax return and which are unobservable to us. We therefore exclude these observations from our data.

All fixed investment that takes place in years with no transaction in the housing market will be part of this consumption expenditure measure. That is, our consumption measure includes, at the household level, all housing renovation paid for by the household itself as well as its net purchases of holiday homes, cars and other major appliances.[3] This consumption expenditure measure therefore departs from the national accounts consumption measure, since the latter includes only a portion of housing renovation and does not include purchases or sales of either houses or holiday homes. Our main interest is the impact of a negative shock on household demand and not the level of utility connected to the level of consumption, however. We expect the calculated consumption expenditure measure to be a good proxy for the first.

[2]Throughout this paper, we exclude households with a self-employed primary income earner because it is not possible to split changes in debt or other financial assets between the firm and the household. This means that our category 'All' excludes these households. We also exclude 2010 from our sample due to a substantial change in registered home ownership, which would affect our data, and may also affect our analysis in a spurious way.

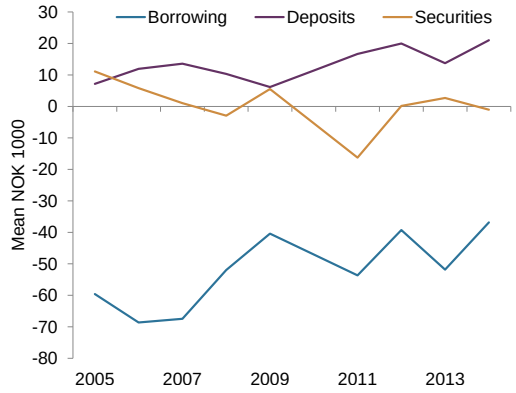
[3]On the basis of tax return data, it is more difficult to identify households that buy and sell holiday homes than those who buy and sell dwellings. According to Statistics Norway, the number of sales of holiday homes is also relatively low, about 10 percent of the sales of dwellings and holiday homes combined.

3 Households' financial transactions

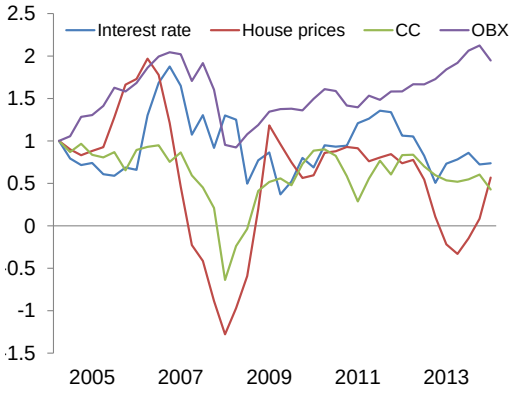
Households' overall mean financial transactions in debt, deposits and securities vary over time (Chart 1a). As consumer confidence turned negative during the financial crisis (Chart 1b), households cut back on their borrowing. As a result, the mean increase in borrowing declined despite a decline in interest rates. Borrowing has remained at a lower level after the crisis years. Note that the increase in net saving is to a large extent due to reduced borrowing. Even if interest rates came down after the crisis, in recent years, both house price inflation and consumer confidence have been somewhat lower than in the years prior to the crisis.[4]

Chart 1: Financial transactions and macro variables

(a) Transactions in debt, deposits and securities. Constant 2014-prices. 2005-2014[1]



(b) Macro variables. Quarterly data. 2005 Q1 = 1[2]



1) Owing to a break in the data, 2010 is interpolated as the average of 2009 and 2011.

2) Real lending rate, four-quarter real house price inflation, consumer confidence (CC) and Oslo Børs (OBX) index.

Sources: Statistics Norway and Norges Bank

The debt of the households in our sample, as in the aggregate, exceeds their financial assets. At the end of 2014, on average, net financial assets was NOK -305 000 (Table 1), a decrease of NOK 20 000 from the previous year. The largest component is debt, which, on average, was close to NOK 1.4 million. The mean holdings of bank deposits and securities was close to NOK 1.2 million. On average, borrowing increased by NOK 38 000 in 2014.

The mean and median values of Table 1 differ significantly, illustrating the skewness of the distribution of assets and saving. There is substantial variation across households. Nearly all households, 99 percent, have bank deposits, while 84 percent have debt. Due to the uncertainty in the valuation of securities, and because the distribution of securities is highly uneven, we concentrate primarily on debt and deposits in the following.[5]

[4]Transactions in deposits and securities, which are alternative financial instruments, seem to move in opposite directions. Transactions in securities will in general be dominated by the behaviour of wealthier households. When constructing the data, transactions in securities were initially adjusted proportionally at the household level so that, prior to trimming the sample, the aggregate matched developments in volumes and prices in the national accounts. The distribution of securities is skewed. One should therefore be careful when interpreting the pattern of the remaining securities holdings.

[5]Close to 60 percent of the households in the sample own securities. This corresponds to the share prevailing among all Norwegian households.

Table 1: Financial assets and financial transactions. 2014

		NOK	Mean	Median	P5	P95	Percent reporting
		billion	NOK 1000				non-zero value
	Net transactions	-38	-20	12	-382	317	100
-	Borrowing	73	38	0	-153	303	85
+	Deposits	39	20	8	-161	240	100
+	Securities	-3	-2	0	-22	27	56
	Net assets	-584	-305	-181	-3 027	1 991	100
-	Debt	1 950	1 392	461	0	3 478	84
+	Deposits	719	495	132	1	1 537	99
+	Securities	647	674	4	0	1 040	54

Sources: Statistics Norway and Norges Bank

In 2014, 57 percent of the households had positive net financial transactions and improved their net financial asset position (Table 2). On average, these households repaid NOK 49 000 on loans and increased deposits by NOK 75 000. The remaining households had negative net financial transactions. They significantly increased their debt. Ranking households according to the size of their net financial transactions shows that close to half of the households had modest net transactions, ie net transactions within the range of ± NOK 100 000 (Chart 2a). However, the three percent of households with the largest negative net transactions accounted for more than 25 percent of the total (Chart 2b). The positive net financial transactions are more evenly distributed (Chart 16b in the appendix).

Table 2: Financial transactions by positive and negative net financial transactions. 2014

		Mean NOK 1000			
	Percent of households	Total	- Borrowing	+ Deposits	+ Securities
Negative	43	-222	156	-54	-12
Positive	57	130	-49	75	6
All	100	-20	38	20	-2

Sources: Statistics Norway and Norges Bank

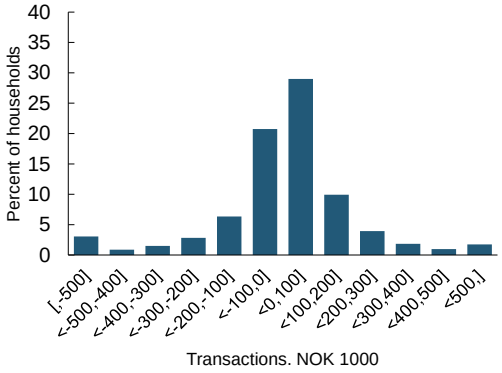
Households typically increase their debt early in life to invest in housing and other fixed assets (Chart 3a). On average, a household with a primary income earner under the age of 31 increased its debt by more than NOK 60 000 between end-2013 and end-2014. Transactions in deposits show a small variation across age groups, and transactions in securities holdings are small in all age groups. Net financial transactions were positive only among households in the age group 54-66.

Mean debt is relatively high among younger households, which are typically settling down or climbing the housing ladder (Chart 3b). Financial wealth increases with age and the oldest households prioritise bank deposits over securities. The latter may reflect a shortening of the investment horizon with age.

Broadly, the age-group pattern in net financial transactions is consistent across time (Chart 4a). The younger the household, the larger the negative net financial transactions. The relative position of the youngest household group fluctuates somewhat, however. Net

Chart 2: Net financial transactions. 2014

(a) Share of households by size of net financial transactions.



(b) Negative net financial transactions by size of transaction

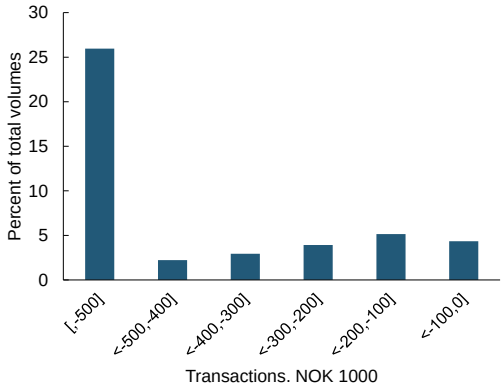
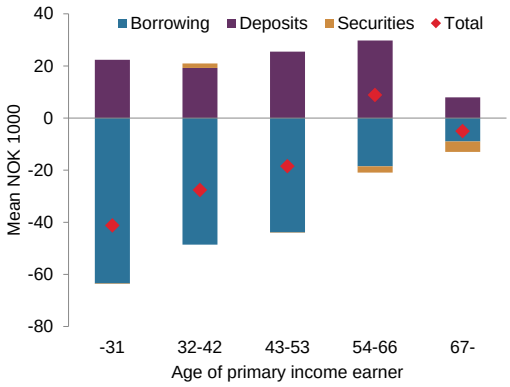
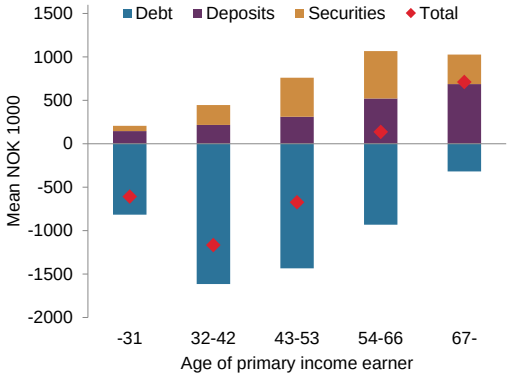


Chart 3: Financial assets and transactions by age and income quintiles. 2014[1]

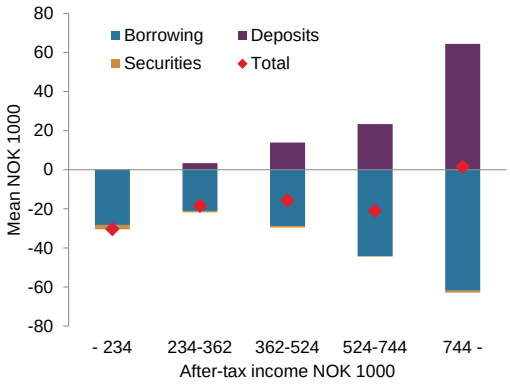
(a) Transactions by age quintile



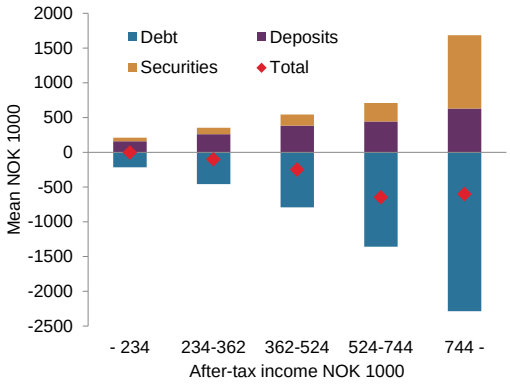
(b) Assets by age quintile



(c) Transactions by income quintile



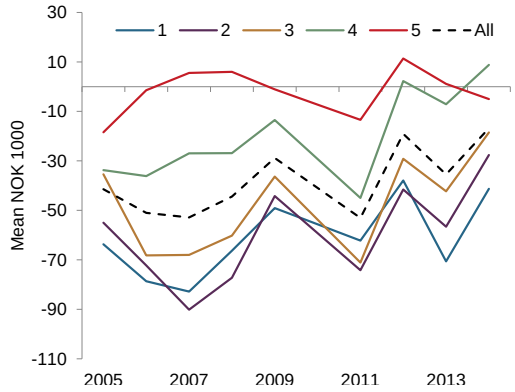
(d) Assets by income quintile



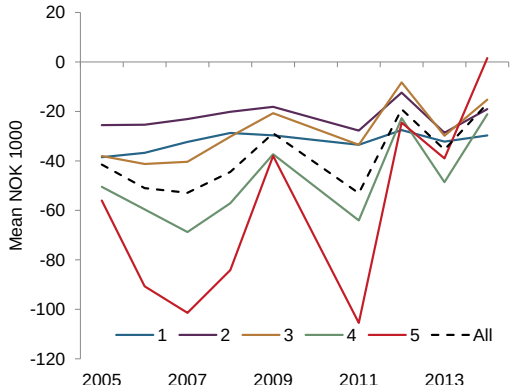
1) Households are divided into five equally sized groups sorted by age and after-tax income.
Sources: Statistics Norway and Norges Bank

Chart 4: Net financial transactions. Constant 2014 prices. 2005-2014[1,2]

(a) By age quintile



(b) By income quintile



1) Households are divided into five equally sized groups sorted by age and after-tax income.
2) Owing to a break in the data, 2010 is interpolated as the average of 2009 and 2011.
Sources: Statistics Norway and Norges Bank

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financial transactions of the oldest households fluctuate around zero. The same is true for age group 54-66 in later years.

Financial flexibility increases with income. High-income households increase borrowing and saving in deposits and securities more than lower income groups (Chart 3c). The behaviour of the lowest income group should be interpreted with care, as it contains both truly poor households and wealthy households with low taxable income and wealth as a result of tax planning. The distribution of financial assets across income groups is as expected, ie the richer, the more there is of everything (Chart 3d). High-income households show larger movements in their annual net financial transactions. Their flexibility is particularly prominent during the financial crisis (Chart 4b). The behaviour of the highest income quintile explains much of the variation in the aggregate in the crisis years.

4 Consumption and sources of financing

4.1 Household real consumption expenditure

Household real consumption expenditure, calculated as described in Section 2, has increased significantly between 2005 and 2014 (Chart 5a). In the years prior to the financial crisis, total consumption expenditure was above total after-tax income, but this changed after the crisis. Despite an increase in total debt, interest payments have remained stable owing to low interest rates.

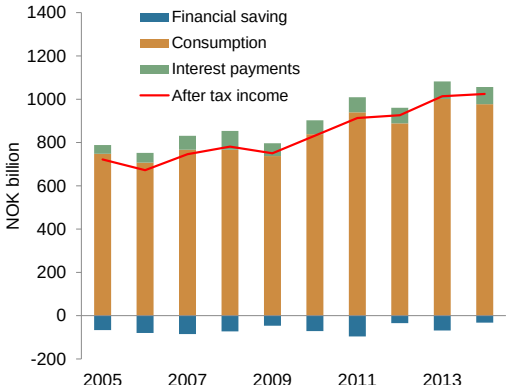
Households' 'ordinary consumption expenditure', as estimated by the National Institute for Consumer Research (SIFO)[6], has fallen as a share of total consumption (Chart 5b). Measured as a percentage of the after-tax income, ordinary consumption declined by nearly 10 percentage points between the mid-2000s and 2014.

Mean real consumption expenditure has increased over time for all age groups, but measured as percentage growth, the increase has been most pronounced among the oldest

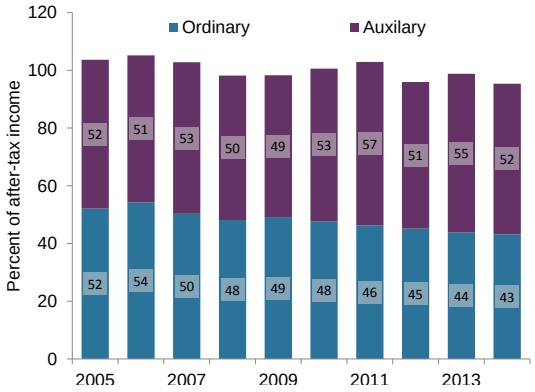
[6]Ordinary consumption expenditure includes ordinary current expenditure on food, clothing, toiletries, etc. and expenses on less frequent purchases of consumer durables such as furniture and electrical appliances. We define consumption expenditure above ordinary consumption expenditure as auxiliary consumption expenditure.

Chart 5: Consumption expenditure. Constant 2014 prices. 2005-2014[1]

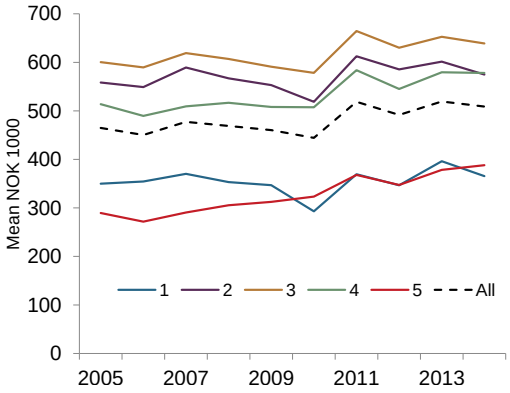
(a) Consumption, negative net financial saving and after-tax income



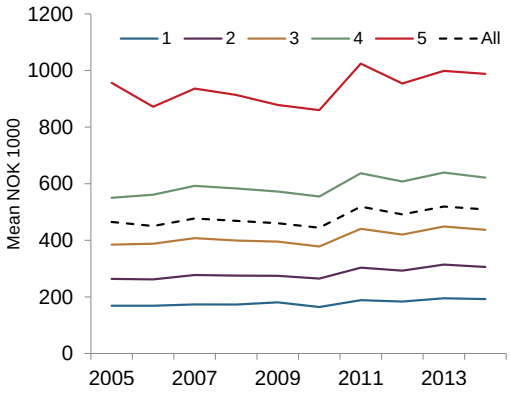
(b) Ordinary and auxiliary consumption in percent of income



(c) Consumption by age quintile[2]



(d) Consumption by income quintile[2]



1) Owing to a break in the data, 2010 is interpolated as the average of 2009 and 2011.
2) Households are divided into five equally sized groups sorted by age and after-tax income.
Sources: Statistics Norway and Norges Bank

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households. Mean consumption expenditure of the youngest and the oldest age quintiles are relatively low compared with the other age groups as the share of single person households is highest in these groups (Chart 5c). During the financial crisis in 2008 and 2009, only the oldest households continued to increase their consumption expenditure. Looking across income quintiles one finds that the higher the income, the higher the consumption and annual variability in mean real consumption expenditure (Chart 5d). The drop in consumption between 2005 and 2006 in the highest income group probably reflects a tax reform that affected dividends on securities.

4.2 Decomposing the financing of consumption

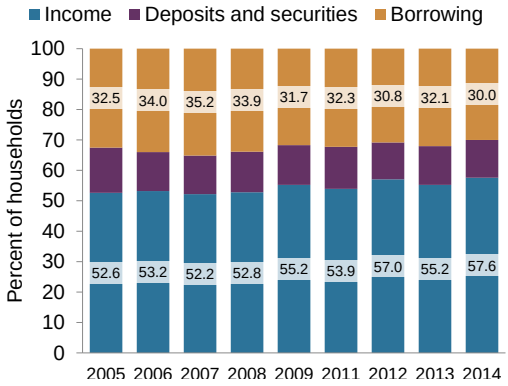
By definition consumption expenditure is financed by:

1. Disposable income, ie income after tax and interest payments.
2. Decreasing deposits or securities holdings.
3. New debt.

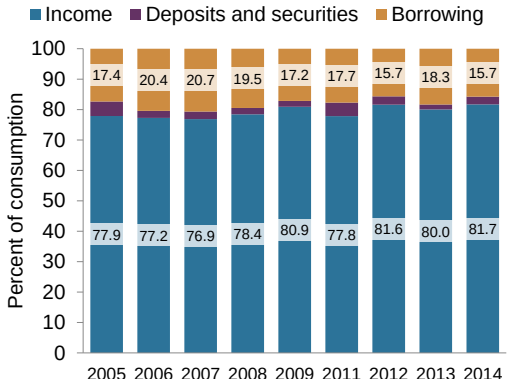
The share of households that in a given year finance all of their consumption expenditure with disposable income has increased from around 53 percent prior to the financial crisis to above 55 percent in most years after the crisis (Chart 6a). Approximately 12-13 percent of households draw down their financial assets in addition to spending their income to finance consumption. This share has been relatively stable over time. The final group of households increases their debt in addition to spending their income and portions of their financial assets to finance consumption. In 2007, more than 35 percent of the households were in this category, but the fraction declined to 30 percent in 2014.

Chart 6: Financing of consumption expenditure. 2005-2014[1]

(a) Households[2]



(b) Consumption expenditure[3]



1) Owing to a break in the data, 2010 is excluded.
2) Share of households with consumption expenditure less than or equal to income (blue), or less than income plus the decrease in financial assets (purple), or in excess of income and the decrease in financial assets (yellow).
3) Share of consumption expenditure that is financed by income (blue), by a reduction in financial assets (purple), or by new borrowing (yellow).
Sources: Statistics Norway and Norges Bank

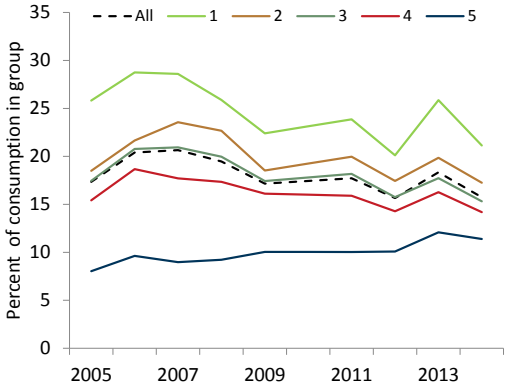
Empirical analyses using macro data find that both the marginal and average propensity to consume out of income is high, emphasising the importance of income for household consumption (Andersen et al. (2016)). Consistently, our data show that around 80 percent of total household consumption expenditure is financed by income (Chart 6b). The share is higher in the post-crisis years compared with the pre-crisis years. In most of the years in our sample, only 2-3 percent of consumption expenditure is financed by drawing down financial assets. The share of consumption that is financed by new debt is significant, but has decreased over time. Nevertheless, it was close to 16 percent in 2014.

On average, the households that use new debt to finance consumption, finance close to 40 percent of their consumption this way. Their consumption is approximately 40 percent of total consumption. As shown in Section 3, in a given year, a small share of households accounts for a a large share of the net increase in debt. This probably reflects the fact that much of this borrowing finances infrequent purchases of durable goods and net fixed investment other than in housing, eg holiday homes. In between such purchases and fixed investment, a household will typically service its debt in accordance with the loan agreement.

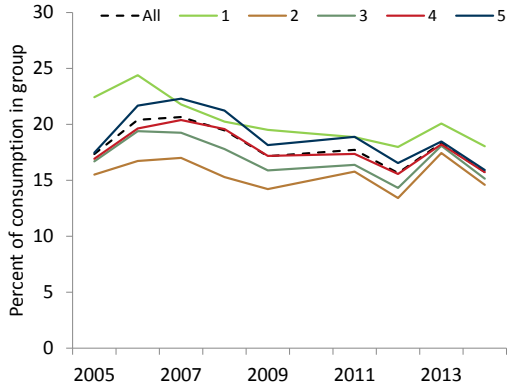
The dependence on new debt to finance consumption is most pronounced among younger households (Chart 7a). However, while younger households' reliance on debt has declined over time, it has increased for older households, reducing the difference across

Chart 7: Financing of consumption expenditure. 2005-2014[1]

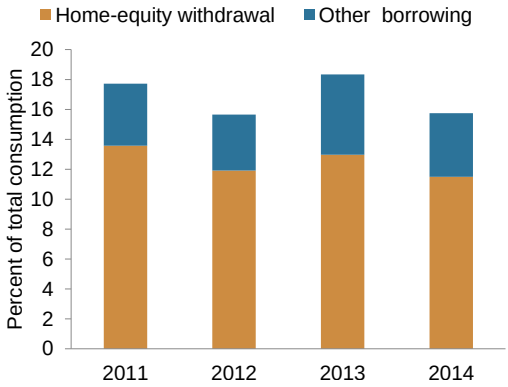
(a) Debt-financed consumption by age quintile



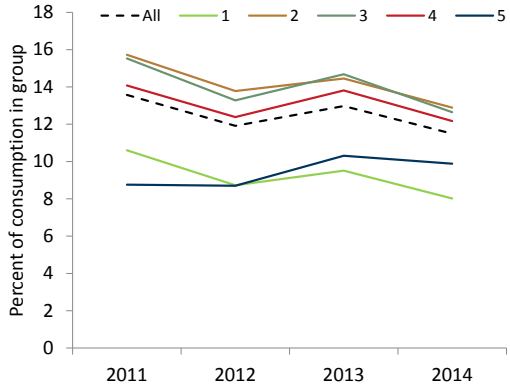
(b) Debt-financed consumption by income quintile



(c) Home-equity withdrawal[2] and other borrowing



(d) Home-equity withdrawal[2] by age quintile



1) Owing to a break in the data, 2010 is interpolated as the average of 2009 and 2011.
2) Increased debt by homeowners who do not move.
Sources: Statistics Norway and Norges Bank

age groups. The variation across income quintiles is more suppressed and has decreased over time (Chart 7b). In general, the lowest and highest income quintiles debt finance more of their consumption than the other quintiles.

Household consumption depends on income, financial wealth and housing wealth, see Andersen et al. (2016). The latter is assumed to reflect, at least partly, home equity withdrawal. In the 2000s, house prices, and hence collateral values, increased significantly. At the same time, new financial instruments helped improve households' access to home equity withdrawal to finance consumption. Our data allow us to identify homeowners that do not move but increase their indebtedness. We use this increase in indebtedness as an estimate of home equity withdrawal. Over the period 2011 - 2014[7], for each NOK 100 increase in housing wealth, homeowners increased their debt by around NOK 20. According to our analysis, these households account for more than 40 percent of the increase in household debt. Approximately 12-14 percent of total consumption expenditure has been financed by home equity withdrawal (Chart 7c). In this chart we decompose the share of consumption expenditure that is financed by new debt (as shown in Chart 6b), as a 'home-equity withdrawal' portion and a 'other loans' portion. Over time, consumption financed by home equity withdrawal has decreased slightly in younger age groups and increased in older age groups (Chart 7d).

5 Financial buffer

In the event of a negative shock to their income or wealth, households may use their own available resources to avoid reducing consumption. That is, they may draw on liquid financial saving or increase the propensity to consume out of current disposable income if the initial propensity to consume is less than 1. We therefore calculate the household financial buffer as the sum of the following two elements:

1. Liquid financial assets $A_{t-1} = D_{t-1} - \frac{1}{24}Y_t + SM_{t-1}$. Deposits ($D$) and mutual funds ($SM$) are assumed to be readily available assets.[8] We use asset volumes at the beginning of the year. Households keep deposits for both saving and transaction purposes. Only the saving portion is assumed to serve as a financial buffer. The transaction purpose portion is approximated as half of one month's after-tax income ($\frac{1}{24}Y$), since many households receive wages and transfers around the middle of the month, and the data we use are measured as at 31 December.

2. Disposable income in excess of consumption expenditure. That is, if $B_t^Y = Y_t - C_t > 0$, this forms the second part of the financial buffer.[9]

The financial buffer is defined as:

$$B_t = \alpha A_{t-1} + B_t^Y \tag{3}$$

where $0 <= \alpha <= 1$ is included to allow for a restriction on the annual share of liquid assets to be used for consumption smoothing purposes in the later analysis. Households may want to save liquid assets for later in case the shock is more persistent or because they want to be prepared for an even larger shock ahead.

Calculated in this way, and with $\alpha = 1$, the financial buffer of Norwegian households was NOK 860 billion in 2014. The buffer is unevenly distributed, however. Half of the

[7] The data do not include information on the market value of housing prior to 2010.

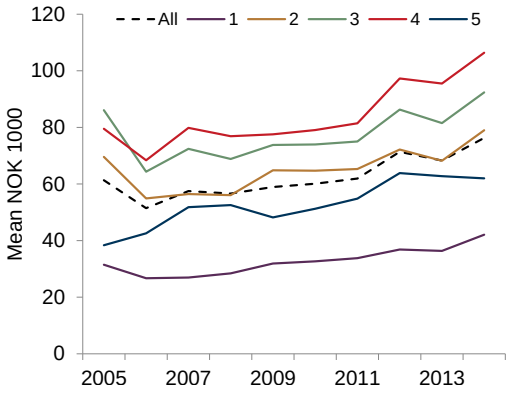
[8] SM is part of S in Equation 2.

[9] On average, these households save 15 percent of their income.

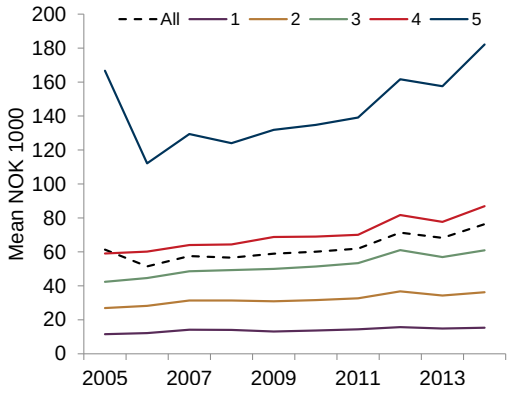
households held 6 percent of the total buffer, but held close to half of total debt and accounted for more than 40 percent of consumption expenditure. At the same time, 7 percent of the households had no buffer. Their share of consumption expenditure was a little more than 6 percent.

Chart 8: Financial buffer. Constant 2014 prices[1]

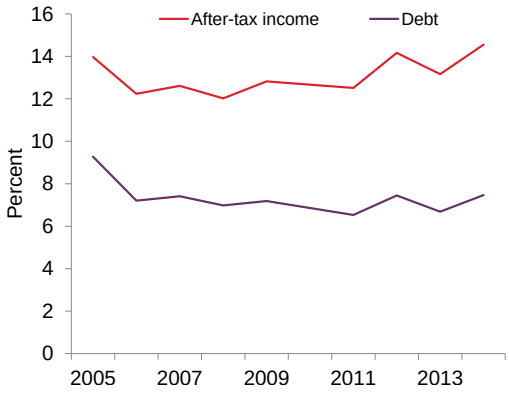
(a) By age of primary income earner quintile, $\alpha = 1$



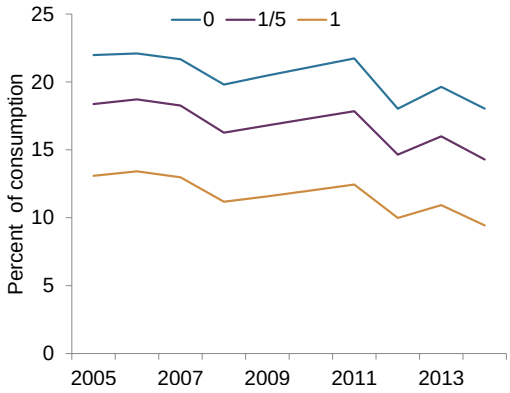
(b) By after-tax income quintile, $\alpha = 1$



(c) Buffer as a percentage of income and total debt, $\alpha = 1$



(d) Buffer as a percentage of consumption expenditure as a function of α



1) Owing to a break in the data, 2010 is interpolated as the average of 2009 and 2011.
Sources: Statistics Norway and Norges Bank

In general, the mean financial buffer has increased over time in all age groups (Chart 8a). The youngest and the oldest households have the smallest buffer. Also across income groups, we find that the buffer in general has increased over time (Chart 8b). The variation across income quintiles is much wider than across age quintiles. On average, the households in the highest income quintile have a buffer that is two times the size of the mean.

Measured as a percentage of after-tax income, the total financial buffer increased between 2006 and 2014, and as a percentage of total debt, it has remained relatively stable (Chart 8c). Hence, on average, the buffer has increased its potential to compensate for a decline in household income and retained its potential to reduce debt or compensate for a credit crunch.

The share of consumption expenditure in excess of income and the buffer has decreased (Chart 8d). The choice of α affects the share of consumption expenditure in excess of income and the buffer, doubling from 9 to 18 percent as α goes from one to zero.

6 Sensitivity of consumption to shocks

We assess the degree to which households have sufficient resources, that is disposable income and financial buffer, to maintain their consumption expenditure in the event of two different shocks:

1. a fall in house prices,
2. an increase in lending rates.

In the analysis, households finance their consumption expenditure in a hierarchical way.[10] Each household first spends its entire disposable income. If that is not sufficient, it will use its financial buffer as defined in Equation 2 with $\alpha = \frac{1}{5}$.[11] If the sum of disposable income and this available buffer is not sufficient, the household will need to finance the exceeding part of consumption expenditure by new borrowing, which requires access to the credit market, or to cut consumption.

Mortgage loans, which have favourable terms compared to most unsecured credit, are available to homeowners only. Although there is some degree of flexibility, the present regulation limits the loan-to-value (LTV) ratio on new mortgage loans to 85 percent (Financial Supervisory Authority of Norway (2015) [12]). We divide households into three groups reflecting the availability of mortgage loans:

1. **No collateral** Households with no registered housing wealth in their tax return.
2. $LTV <= 85$ Homeowners that can finance the share of current consumption expenditure that exceeds income and available buffer with a loan below 85 percent of the house value.
3. $LTV > 85$ Homeowners that cannot finance the share of current consumption expenditure that exceeds income and available buffer with a loan below 85 percent of the house value.

We measure the effect of the shock as the share of current consumption expenditure that after the shock is in excess of income and the available financial buffer. In the baseline, that is prior to any shock, 37 percent of the households have consumption expenditure in excess of income and available buffer (first column of Chart 9a and 9c). The debt-financed consumption expenditure of these households amounts to 26 percent of total consumption expenditure (first column of Chart 9b and 9d).

As much as 16.5 percent of household consumption expenditure is associated with debt-financing with high-LTV loans and 5.6 percent with low-LTV loans, while 3.6 percent is financed from other sources. This suggests that a tightening of credit standards by banks or a change in households' attitude towards debt financing consumption expenditure may significantly affect consumption.

[10] We use a counterfactual approach and assess the impact of a transitory shock within a static non-equilibrium framework. There are no endogenous responses to shocks by households or other agents.

[11] Under this assumption, households with a buffer are able to smooth through an average downturn period and part of the recovery period (see Aastveit et al. (2016)).

[12] In the calculations of LTV, we use total debt, which includes consumer credit and student loans. Mortgages dominate, however. The regulation permits additional collateral, which is not included in our data.

Fall in house values

A fall in house values does not affect the liquid resources available for consumption, that is households' disposable income and financial assets. Consequently the share of households and the share of consumption expenditure exceeding income and buffer are unaffected.

However, a fall in house values reduces the amount a household can borrow within the 85 percent LTV limit. If house values fall by 30 percent, the percentage of households with consumption expenditure in excess of income and available buffer that can finance their current consumption expenditure with a mortgage loan within the 85 percent limit declines to 7.2 percent (Chart 9a). The corresponding consumption share declines to 2.9 percent (Chart 9b). If the increase in the high-LTV financed consumption is cut, or if an even larger share of debt financed consumption is discouraged, that could have important macroeconomic consequences.

Higher interest rates

An increase in interest rates affects income available for consumption both through an effect on after-tax income, that is through the effect on interest income, and through interest payments. We assume that the margin between lending and deposit rates remains unchanged and all interest rates increase by ρ percentage points. The increase in interest payments when households do not take on new debt equals $\hat{R}_t = R_{t-1} + L_{t-1}\rho(1-\tau)$, where τ is the tax rate. When calculating the income effect of the interest rate shock, we assume unchanged deposits. The increased interest income from deposits, $D_{t-1}\rho(1-\tau)$, is added to after-tax income.[13]

If interest rates on loans and deposits rise by 3 percentage points, the share of households with consumption expenditure in excess of income and available buffer increases by close to 3 percentage points and approaches 40 percent (Chart 9c). Most of the increase in debt-financed consumption expenditure is covered by high LTV loans, and the high LTV loan share increases by one percentage point (Chart 9d). Only a small share is covered by low LTV-loans.

Consumption sensitivity over time

As seen above, compared to the volume of debt-financed consumption expenditure prior to shocks, the increase in the need for debt-financing after a shock to house values or interest rates is relatively modest. An important question is, however, whether households have become more vulnerable to negative shocks over time owing to an increase in the debt burden. To shed light on this, we calculate the developments over time in consumption expenditure in excess of disposable income and the available buffer given a fall in house values of 20 percent and a 3 percentage point increase in interest rates.[14] We are particularly interested in developments in the share of consumption expenditure that would need to be financed by borrowing with an LTV ratio above 86 percent and therefore focus on this.

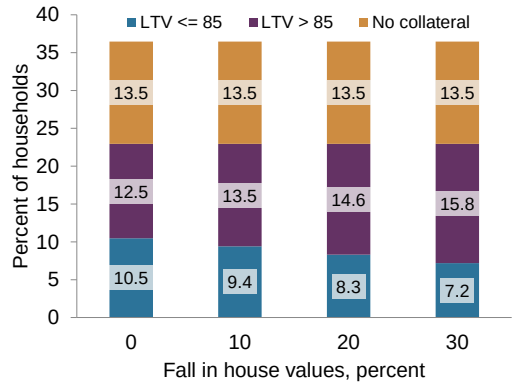
Since 2011, the share of households dependent on debt-financing of consumption above the 85 percent LTV ratio has been relatively stable (Chart 10a). This is true for both the pre-shock situation and the two different shocks. The corresponding shares of consumption have also been relatively stable over this period, but have turned downward (Chart 10b).

[13] The no-change assumption on debt and deposits has consequences for the tax payments and hence for after-tax income. We make adjustments to capture this.

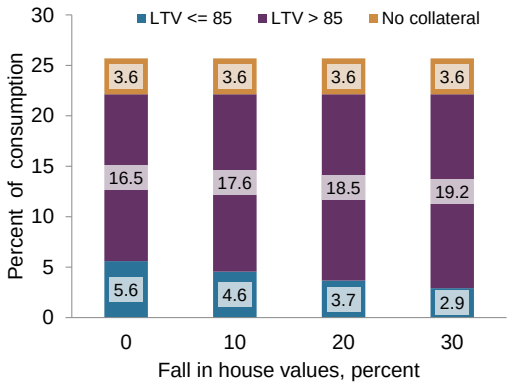
[14] Estimated market values of dwellings are available as from 2010. We use data from 2011. This puts a limit to our assessment of consumption sensitivity related to LTV.

Chart 9: Sensitivity of consumption to shocks. Debt-financed consumption expenditure, $\alpha = \frac{1}{5}$. Share of households and consumption. 2014

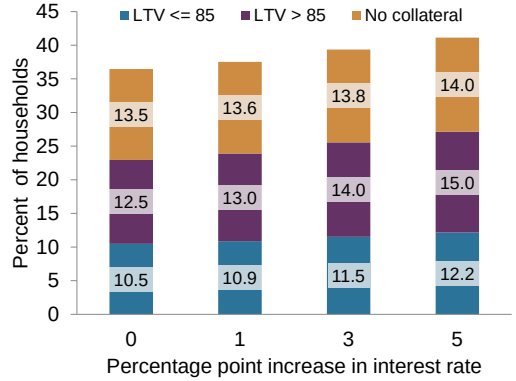
(a) Fall in house values. Households[1]



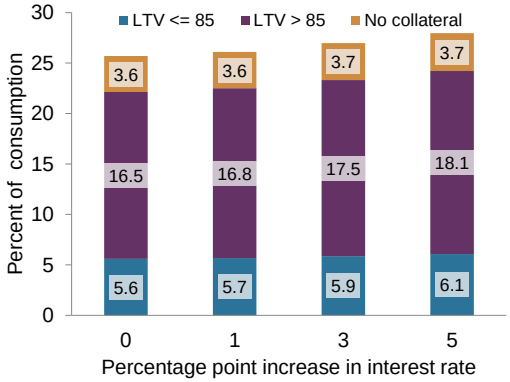
(b) Fall in house values. Consumption[2]



(c) Increase in interest rates. Households[1]



(d) Increase in interest rates. Consumption[2]



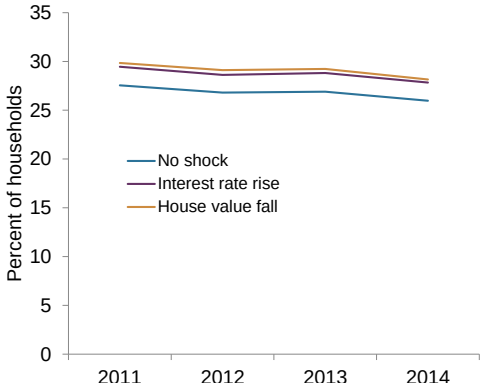
1) Share of households with consumption expenditure in excess of disposable income and available financial buffer by the level of LTV that would result from financing this consumption by new borrowing.

2) Share of consumption expenditure exceeding disposable income and available financial buffer by the level of LTV that would result from financing this consumption by new borrowing.

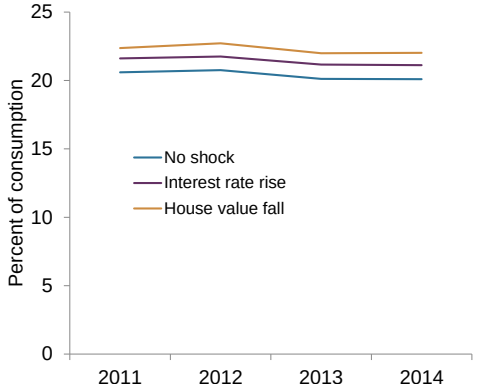
Sources: Statistics Norway and Norges Bank

Chart 10: Sensitivity of consumption to a 3 percentage points rise in interest rates and a 20 percent fall in house values. The need for high-LTV financing, $\alpha = \frac{1}{5}$. 2011-2014

(a) Share of households[1]



(b) Share of consumption[2]



1) Share of households with consumption expenditure exceeding their disposable income and available financial buffer and $LTV > 85$ when financing this consumption by new borrowing.
2) Share of consumption expenditure exceeding disposable income and available financial buffer and $LTV > 85$ when financing this consumption by new borrowing.
Sources: Statistics Norway and Norges Bank

Despite a continuous increase in households' loan-to-income ratios, their financial buffer has increased and interest rates have declined, which has contributed to stabilising their shock-sensitivity.

Of course, within a behavioural context, the conclusion may be different. Shocks may increase households' uncertainty, and this may spur changes in consumption (see for example Gudmundsson and Natvik (2012) for an analysis using aggregate Norwegian data). Also, a fall in demand, even within the range of 1-3 percentage points, may have important macroeconomic consequences owing to a reduction in domestic activity.

7 Summary and conclusion

The main objective of this paper is to increase our understanding of household saving and to assess the hypothesis that high debt levels pose a risk of a significant cutback in household consumption expenditure. Based on register data covering income and wealth for all Norwegian residents in the period 2005-2014, we derive household-level measures of financial transactions and consumption expenditure. The latter is calculated using a budget-constraint approach. In the consumption risk analysis, we take into account that most households have a liquid financial buffer available that, at least partially, can be used to smooth consumption in the event of a negative shock to disposable income or house values. We also assess the importance of new debt for household consumption.

We show that household consumption expenditure is highly dependent on access to the financial market. If households were constrained from taking on new debt, this could significantly affect households' ability to maintain their level of consumption. Around 15-20 percent of consumption expenditure is financed by new debt each year.

When assessing the sensitivity of consumption to shocks, we calculate the fraction of pre-shock consumption expenditure that after a shock would need to be financed by new debt. In this analysis, affected households are assumed first to reduce their savings and

draw down a share of their stock of liquid financial assets before taking on new debt. By relating the borrowing to housing wealth, we identify the need for debt-financing above (and below) the 85 percent LTV ratio. Both a fall in house values and an increase in interest rates may significantly affect household consumption expenditure through a reduction in the available collateral that can be mortgaged in the first case and a reduction in disposable income in the second. Despite a continuous increase in households' LTI ratios, consumption sensitivity has been stable, and even decreased slightly, in subsequent years. Both an increase in households' financial buffer and the reduction in interest rates have contributed to this.

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Appendices

A Data sources

The data used in this analysis are the *Income and wealth statistics for households* compiled by Statistics Norway (Statistics Norway (2015a)). This statistics include data on all persons residing in private households in Norway as at 31 December each year. The data are compiled by linking different administrative registers and statistical data sources for the whole population. The primary data source is tax returns, which cover wages and salaries, self-employed income, pensions and other transactions, financial income and wealth, and real wealth etc. Wealth data do not include accrued pension entitlements and actuarial reserves. As from 2004, these register-based income statistics are a full-coverage census. Estimated market values of dwellings are available as from 2010. In 2010, there was a change in registered home ownership, increasing the coverage. Non-registered houses were connected to the true owner. This causes in a break in the data, and 2010 is therefore excluded from the analysis. Reported figures for 2010 are estimated as an average of 2009 and 2011.

Table 3: Income and wealth statistics for households. Positive observations as a percentage of total and in billions of NOK. 2014

Tax return item	Obs %	Sum billion	Mean 1000	P5 1000	P50 1000	P95 1000
4.1.1 *Total debt*	84	945	1102	0	528	3686
4.1.3 Deposits in domestic banks	99	868	381	1	127	1560
4.1.3 Cash	0	0	0	0	0	0
4.1.9 Deposits in foreign banks	0	5	2	0	0	0
Bank deposits	99	873	383	1	127	1566
4.1.4 Units in unit trusts	28	93	41	0	0	170
4.1.5 Bond funds and money market funds	6	19	8	0	0	1
4.1.6 Debt receivable	5	77	34	0	0	1
4.1.7 Securities listed in VPS	14	77	34	0	0	83
4.1.8 Unlisted securities	9	590	259	0	0	134
4.5 Other capital	30	61	27	0	0	72
4.6.2 Other taxable capital abroad	3	28	12	0	0	0
Securities	56	945	415	0	5	1002
Gross financial assets	99	1818	798	2	176	2526

Sources: Statistics Norway and Norges Bank

Households are derived from formal addresses in the central population register. Some adjustments need to be made, however, such as omitting people living in institutions and students that no longer reside with their parents. The latter group of persons is defined as single-person households. Surveys suggest that fewer than 10 percent of the students in Norway actually live with their parents. In addition, other administrative sources are used to help identify cohabiting couples that should be treated as households.

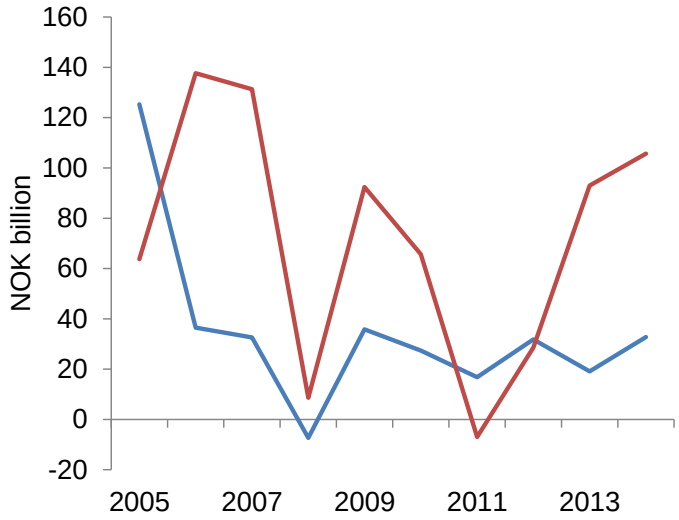
We aggregate the financial portion of the balance sheet into three groups of items: *Total debt*, *bank deposits* and *securities*. The latter group consists of financial assets other than deposits and debt. The classification of these financial asset groups is provided in Table 3. See Norwegian Tax Administration (2015) for more detailed information on the individual tax return items.

Unlisted securities account for nearly two-thirds of all securities. Typically fewer than 10 percent of the households own unlisted paper. The distribution of this paper is highly skewed to the right. In 2014, the one percent of households with the most unlisted securities held more than 80 percent of the total.

B Transactions, assets and the national accounts

The values reported for items on *securities* in tax returns are tax values, which do not necessarily reflect market values. Unlisted securities in particular are difficult to value. In the calculations of financial transactions, as a measure of saving, and consumption expenditure, we need to arrive at the change in stocks adjusted for changes in market values. The available household-level data provide no information that can help us split the change in reported tax values for securities into transactions and gains/losses. In the corresponding calculation of transactions and gains and losses, Statistics Norway utilises information that is not easily available to us. To separate transactions in securities from gains and losses, we therefore calibrate our household data to the figures in the financial accounts compiled by Statistics Norway (Statistics Norway (2015b)).

Chart 11: Securities[1)]. Annual change in the household data (Income statistics) and transactions in financial accounts



1) Financial assets other than bank deposits.
Sources: Statistics Norway and Norges Bank

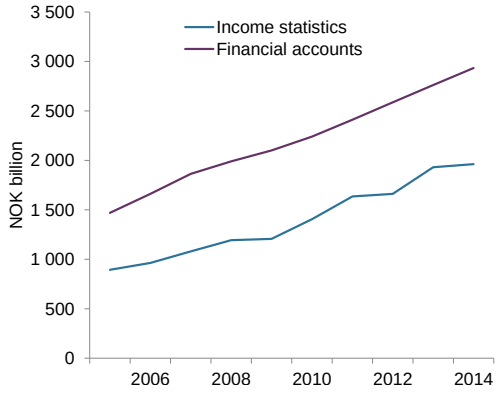
In Chart 11, the annual change in aggregate securities in the household data is compared with the data on transactions in the financial accounts published by Statistics Norway. We calibrate the household data to the Financial account data in two steps:

1. The item 'securities' in the household data is proportionally adjusted, ie multiplied by a constant, so that the total volume is consistent with the financial accounts. This is done prior to excluding any households or single observations.

2. The annual change of the adjusted volumes are split into transactions and gains/losses in the same proportion as in the financial accounts.

Chart 12: Debt. Volume and transactions. Household data and financial accounts. Constant prices, 2014=1

(a) Volume



(b) Transactions

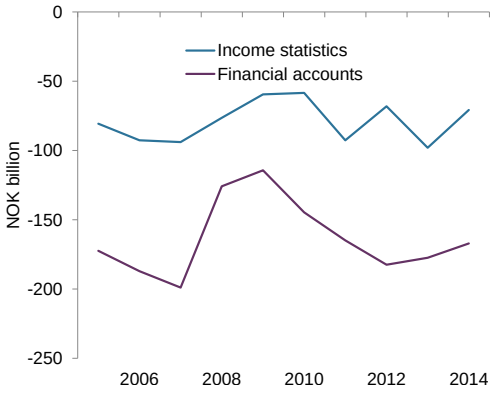
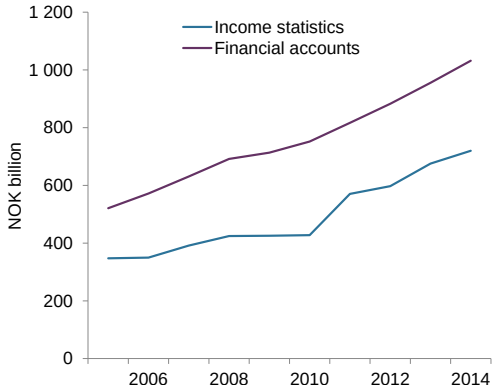


Chart 13: Bank deposits. Volume and transactions. Household data and financial accounts. Constant prices, 2014=1

(a) Volume



(b) Transactions

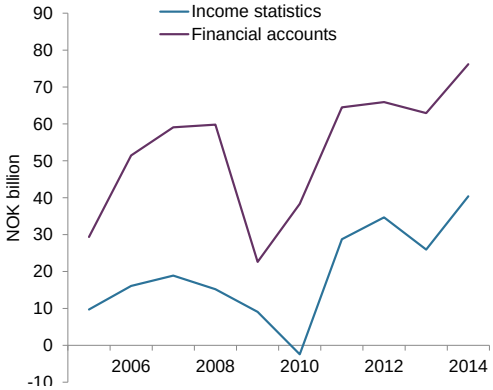
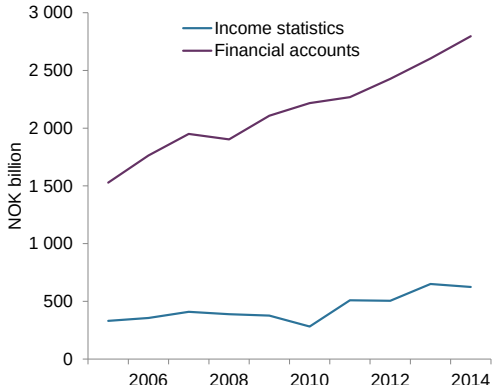
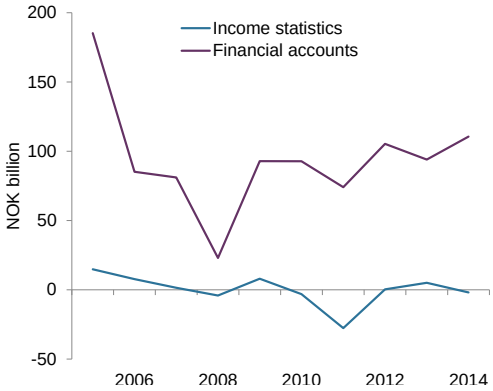


Chart 14: Securities. Volume and transactions. Household data and financial accounts. Constant prices, 2014=1

(a) Volume



(b) Transactions



Sources: Statistics Norway and Norges Bank

In the analyses, we focus on income earners and benefit recipients; self-employed persons are excluded. The data do not allow us to split changes in debt and other financial assets between the firm and the household, and our primary interest is in households' borrowing and financial saving. Due to the exclusion of self-employed, the volumes of debt and deposits in our sample are somewhat below the corresponding data for private households in the financial accounts. This is particularly true for securities. This can be seen in Chart 12a - Chart 13b. On the other hand, the time paths of both asset values and transactions are comparable.

In 2011, the discrepancy between household data (income statistics) and financial accounts is small. This poses a challenge when applying the adjustment procedure described above. For this year, the adjustment factors are calculated as the average of the factors in 2010 and 2012. The output of the calibration and corresponding financial account data are shown in Chart 14b.

C Selecting the sample of the analysis

In addition to excluding self-employed households for the reason explained above, we adjust our sample in response to two additional challenges. This is discussed in detail in Section 2. As explained in Appendix A, we also exclude all observations from 2010.

The most recent tax return data available to us are the 2014 statements. We divide the data set into two parts

- *Sample:* The households in the sample selected for this analysis, and
- *Excluded:* Households engaging in real estate transactions and households with financial transactions in excess of income.[15]

Table 4: Financial transactions and assets by group of households. 2014. In billions of NOK

		Transactions			Assets		
		Sample	Excluded[1]	All[2]	Sample	Excluded[1]	All[2]
	Total net	-38	-15	-53	-584	156	-428
-	Debt	73	93	166	1 950	718	2 667
+	Deposits	39	53	91	719	230	948
+	Securities	-3	25	22	647	644	1 291

[1] Households active in the real estate market or with financial transactions in excess of income.
[2] Households with a self-employed primary income earner are excluded from this aggregate. See footnote 2 in the main text.

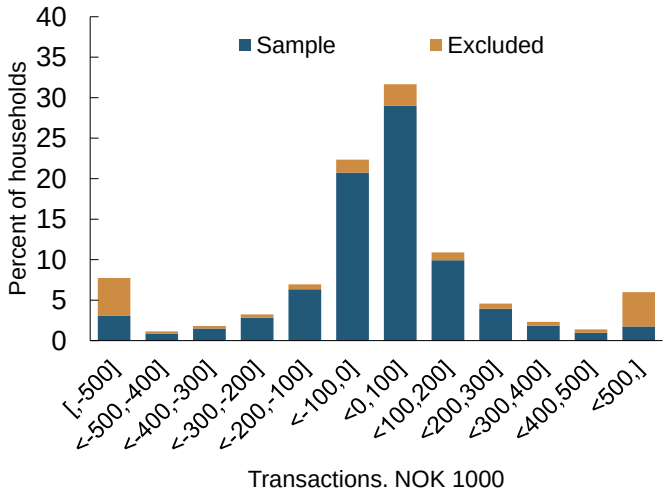
Sources: Statistics Norway and Norges Bank

As a result of a strong increase in debt, total financial transactions are negative. This is true both for the sample used in the analysis, and for households in total (Table 4). The same is true for net financial assets. Hence, the increase in debt dominates net financial transactions and the volume of debt dominates net financial assets. The households in the sample account for close to three-quarters of the total change in net financial assets,

[15] Self-employed households are excluded prior to this assessment.

approximately 40 percent of the change in debt and deposits, but only about 15 percent of transactions in securities. Net financial transactions in excluded households amounts to NOK -15 billions, which is about 30 percent of total net financial transactions.

Chart 15: Share of households by size of net financial transactions. In sample and in excluded observations. 2014



Sources: Statistics Norway and Norges Bank

More than half of the households have relatively modest net financial savings, ie net financial savings between NOK -100 000 and NOK 100 000 (Chart 15). The high share of households with modest positive net financial transactions is consistent with the typical mortgage contract. The majority of household borrowing is mortgage loans with contracted maturities of 20-30 years.

Changes in net saving are dominated by households that engage in large transactions, ie households that decrease or increase their net financial assets by more than NOK 500 000 (Charts 16a and 16b). As a result, total net financial transactions in households are determined by the behaviour of fewer than 15 percent of households.

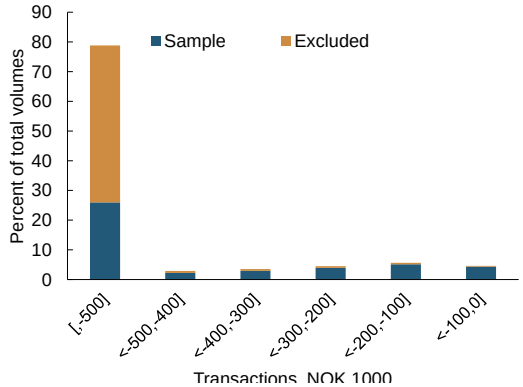
Large negative transactions in financial assets are dominated by home purchases which do not reflect consumption expenditure behaviour. We exclude observations with home purchases from our sample. These observations are defined as observations where house values increase by more than 25 percent from one year to the next. (In general, the market value of dwellings is increased by a specified rate by the tax authorities based on the observed growth in national house prices. The 25 percent limit used in the calculation ensures that observations are not excluded due to this annual adjustment of house values.) In total, about half of the increase in negative net financial assets is retained in our sample.[16]

Large positive net financial transactions may reflect the sale of real property, in which case the observation is excluded from our sample. Large positive net financial transactions may alternatively be due to high income or large transfers such as inheritance, or the sale of other assets. If positive net financial transactions a year exceeds disposable income, the observation is excluded, since the method used to calculate consumption will return

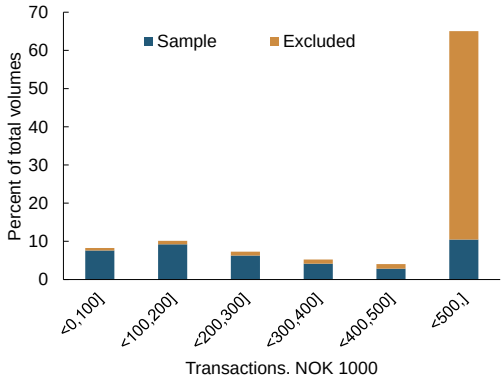
[16]This is consistent with the findings in Lindquist et al. (2014) that approximately 40 percent of the increase in debt is in home-owning households that do not move.

Chart 16: Net financial transactions in sample and in excluded observations. 2014

(a) Negative net financial transactions by size of transaction



(b) Positive net financial transactions by size of transaction



Sources: Statistics Norway and Norges Bank

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negative numbers in these cases. As a result, the dominant part of large positive net financial transactions is removed from our sample.