



Does household mortgage debt influence the transmission of monetary policy in the United Kingdom?

Does monetary policy transmission in the United Kingdom depend on household mortgage debt? This article shows that changes in Bank of England base rates have a greater impact on consumption when a larger proportion of households are financially constrained and close to their borrowing limits. Moreover, the impact of monetary policy depends partly on the past house price developments and thus on households' refinancing capacity. However, the effect of debt levels on monetary policy in the UK is not symmetrical: an increase in interest rates is more effective than a decrease because it pushes households towards their financial constraints. It therefore reduces their consumption relatively more than a decrease would increase it.

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2.9

the value of the mortgage loan to annual household income ratio in the UK between 2005 and 2017

15%

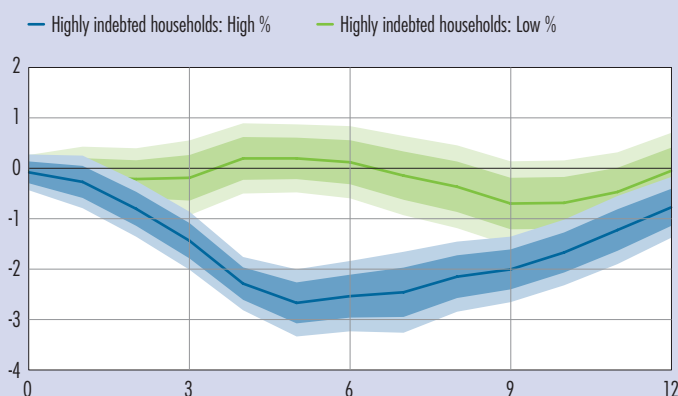
the share of households with a loan-to-income ratio above four in the UK between 2005 and 2017

2.6 percentage points

the difference in the impact of monetary policy on total consumption over a 6-month horizon, depending on whether the share of highly indebted households is low or high, in the UK between 2005 and 2017

Impact of monetary policy on total consumption in the UK according to household debt between 2005 and 2017

(x-axis: length in months; y-axis: in %)



Sources: Product Sales Database (PSD), Bank of England, Cumming and Hubert (2021 a).

Note: Response of total consumption to a one percentage point increase in the central bank's base rate. The impact on consumption differs according to the share of financially vulnerable households (high share, or 8% represented by the blue bands and low share, or 2%, by the green bands). Households are classified as financially vulnerable based on their loan-to-income ratio.



1 The heterogeneity of financial situations affects the impact of monetary policy

There is growing empirical evidence in the economic literature that households adjust their consumption differently to income shocks – that is, households differ in their marginal propensity to consume.¹ Such heterogeneous contributions rank households according to the amount of liquid assets they hold. Liquidity-constrained households tend to have high marginal propensities to consume and therefore consume a large share of their income. These households are termed “hand-to-mouth” (HtM) in the literature.² They can be either “poor” (if they have no assets) or “wealthy” (if they have positive but illiquid assets, e.g. if they own their main residence, but have very limited cash and high constrained expenses, such as their monthly mortgage payment).³ Using this

classification, Slacalek et al. (2020) show that 10% of euro area households are “HtM”, 12% are “wealthy HtM” and 78% are “not HtM”.

In response to a change in base rates (e.g. an easing of monetary policy), non-HtM households behave according to the permanent income hypothesis: their consumption habits remain largely unchanged following a transitory increase in their incomes due to the indirect effects of monetary policy (increase in economic activity and thus in incomes).⁴ However, their consumption can be stimulated by the intertemporal substitution channel and the role of interest rates on the trade-off between consumption and savings. Conversely, faced with the same expansionary monetary policy, the consumption of HtM households is mostly stimulated through indirect effects (see Box).

Box

Direct and indirect channels of monetary policy transmission

The impact of monetary policy on households can be classified into two broad categories: direct and indirect.

- **Direct effects** refer to the immediate impact of changes in policy interest rates. This influences the interest rates on savings (savings passbooks, life insurance, etc.) and on household loans (housing or consumer loans). Depending on the structure of savings and debt, we refer to households’ net financial income, or their net exposure to interest rates. This is historically and theoretically the main transmission channel for monetary policy. It is heterogeneous across households because it depends on the composition of their asset and liability portfolios. For example, a decrease in policy interest rates will reduce the interest payments of households with variable rate mortgages. It will also reduce the financial income of households that hold short-term assets (whose returns will fall). The second direct effect of monetary policy is to modify household saving incentives (intertemporal substitution). This effect is also heterogeneous across households, as it mainly concerns households with liquid savings that they will be able to adjust.
- **Indirect effects** act through the aggregate (i.e. general equilibrium) responses of prices and wages (and thus labour income and employment). When policy interest rates are reduced, the resulting increase in household consumption and corporate investment results in higher economic growth, which puts upward pressure on employment and wages. This indirect effect, which acts through lower unemployment and higher labour incomes, leads to further increases in aggregate demand. This channel also has heterogeneous effects as different sources of income (e.g. wages or capital income) or different types of jobs (e.g. low versus high skilled) have different elasticities to changes in economic growth. Indirect effects also include the impact of monetary policy on house prices and financial asset prices, which can generate a wealth effect.

1 See Jappelli and Pistaferri (2010) or Christelis et al. (2019).

2 A common empirical measure of this liquidity constraint in the literature is that households are ‘hand-to-mouth’ if they hold positive net liquid assets that are equivalent to less than two weeks of income.

3 See Weidner et al. (2014).

4 See Kaplan et al. (2018) and Bilbiie (2020).



The impact of the indirect effects is heavily skewed towards these households, as they have lower incomes on average and benefit more than proportionally from the new jobs created and wage increases. The effect of this channel on consumption is amplified by their higher marginal propensities to consume than other households. In short, the intertemporal substitution channel plays a major role for non-HtM households that hold large amounts of savings. Other transmission channels (e.g. operating through the changes in house prices or aggregate economic growth) play a more important role for HtM households that do not have savings (i.e. liquid assets) to smooth their consumption in response to economic shocks.

Household heterogeneity can therefore play a key role in the transmission of monetary policy. It is important to take account of differences between households – in terms of marginal propensity to consume, wealth, income and the sensitivity of this income to the economic cycle – when assessing the impact of monetary policy on consumption.

2 The loan-to-income ratio as an indicator of UK households' financial constraints

While the literature has mainly focused on differences in the responses of households based on their assets, debt (i.e. level and/or term) is also likely to play a role. Thus, Cloyne et al. (2020) show, using US and UK data, that it is the status of the main residence that most influences the response to monetary policy: while the consumption of renters and homeowners who have finished repaying their mortgage (i.e. net homeowners) does not respond to monetary policy, that of homeowners with an outstanding mortgage does. Furthermore, Wong (2021) examines the importance of mortgage renegotiation in explaining household consumption behaviour in the United States. In both the United States and the United Kingdom, the vast majority of mortgages are granted with a fixed interest rate for a given period (between two and five years on

average).⁵ After this period, the interest rate becomes variable, and households can renegotiate their mortgage and start a new fixed rate period of two to five years. In the United Kingdom, over 80% of households renegotiate their mortgage at this point and recommit to a new period of two to five years with a new fixed rate. Households' decision on whether to take out a fixed or variable rate loan depends largely on the level of interest rates and expectations of future rates.

A recent study (Cumming and Hubert, 2021a) investigates the extent to which household debt influences the transmission of monetary policy to consumption in the United Kingdom. Using microeconomic data on mortgage characteristics covering all 14 million mortgages taken out in the UK between 2005 and 2017, the role of household debt heterogeneity is analysed.⁶ A measure of their financial vulnerability is constructed using a rich array of information on their indebtedness (see Appendix). This approach aims to isolate those most likely to change consumption behaviour abruptly within the group of indebted households and highlights the fact that indebted households are more or less financially vulnerable. The mechanism that this article tries to identify is not only related to the fact that mortgages can be taken out with a variable interest rate – and hence that changes in monetary policy have a direct impact on the monthly mortgage repayments. This mechanism may also result from the fact that monetary policy has indirect effects on household incomes and that the most indebted have limited leeway in response to changes in monetary policy.

Recent borrowers who have taken on large amounts of debt relative to their incomes are likely to hold their wealth primarily in illiquid assets (their homes), have few liquid assets (after paying their down payment) and have monthly repayments that constitute a substantial fraction of their disposable income. This article therefore focuses on new mortgages taken out recently, as the monthly repayment burden is highest when taking out a mortgage.⁷ Households are considered financially

⁵ For example, this share was 92% in June 2017 in the UK. At the same date, the stock of fixed interest rate mortgages was 60%.

⁶ The sample considered includes the 2008 financial crisis and the implementation of non-standard policies. Different alternative indicators of the monetary policy stance are used to measure its impact over this period.

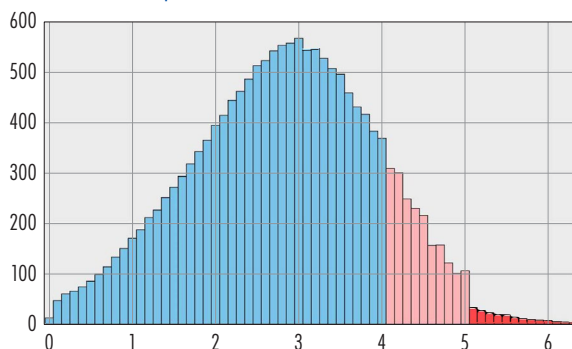
⁷ This is because incomes tend to increase over time; in addition, mortgages are renegotiated approximately every two years in the sample.



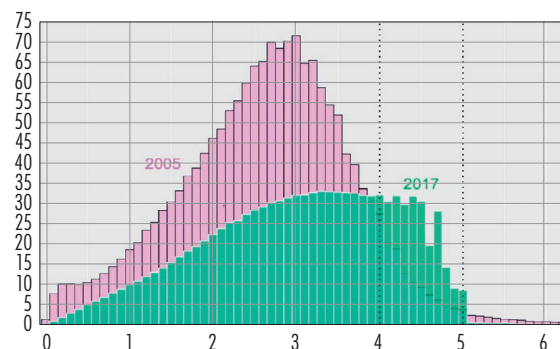
C1 Distribution of the loan-to-income ratio

(x-axis: loan-to-income ratio; y-axis: number of mortgages in thousands)

a) Over the whole sample from 2005 to 2017



b) In 2005 and in 2017



Sources: Product Sales Database (PSD), Bank of England.

Note: Chart a) shows the distribution of the (gross) loan-to-income ratio for the 14 million mortgages granted in the UK over the period 2005-17, with a focus on loans granted with a ratio greater than 4 (pink) and 5 (red). Chart b) shows the distribution in 2005 and 2017 specifically.

vulnerable when their loan-to-income (LTI) ratio is high (see Annex). This limit is set at 4 (see Chart 1a) for two reasons. It is consistent with the threshold for the Bank of England's Financial Policy Committee's macroprudential recommendations for banks⁸ and corresponds on average to an LTI ratio of 35% of gross income, which is also in line with the Financial Policy Committee's recommended limit for banks vis-à-vis their customers. In this article, it is assumed that it is difficult for households with a ratio greater than 4 to smooth their consumption in response to economic shocks.

C2 Change in the average loan-to-income ratio per month between 2005 and 2017



Sources: Product Sales Database (PSD), Bank of England.

The main challenge is to compare these debt levels over time or space and to define what is meant by a highly indebted or overindebted household. According to some measures, UK households are more indebted today than at any time in the past, partly because of the sharp rise in house prices (see Charts 1a and 2). Due to the significant change in interest rates between 2005 and 2017, the cost of credit has fallen significantly. It is therefore misleading to compare LTI ratios in 2005 and 2017. This article therefore provides a measure of the share of highly indebted households that is comparable over time. This measure takes into account the effects of regulatory changes, banks' lending behaviour, individual preferences, geographical effects and other macroeconomic developments.

The time variation in this debt variable is then used to study whether and, if so, how the effects of monetary policy depend on the share of financially vulnerable households. Intuitively, a restrictive monetary policy leads to lower consumption in the short and medium term, which is why central banks raise interest rates when the economy is overheating. This article examines whether this result changes according to the share of financially vulnerable households.

⁸ The Financial Policy Committee has also imposed a limit since 2014 that banks should not grant over 15% of their mortgages at an LTI level above 4.5.



3 The effects of monetary policy contingent on financial constraints

Estimates suggest that UK monetary policy is more effective when a larger share of households are highly indebted. Chart 3 shows the response of consumption over a 12-month period to a one-percentage point increase in the base rate. Chart 3a shows the average impact of a restrictive monetary policy: consumption is reduced by just under 2%. Chart 3b shows that the impact on consumption differs according to the share of financially vulnerable households (high share represented by the blue bands and low share by the

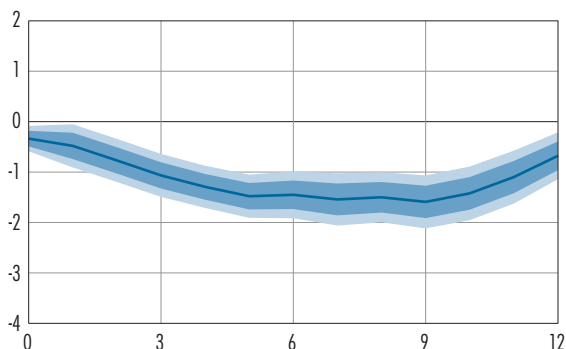
green bands). The difference between these two responses suggests that the impact of monetary policy on consumption is stronger when the share of highly indebted households relative to their income is greater.

This differing impact can probably be explained by at least two mechanisms: first, in an economy – the United Kingdom – where, unlike France, interest rates on mortgages are variable, when the amount borrowed by households increases relative to their income, the mechanical impact of monetary policy on disposable income is amplified. Households with large mortgages are penalised by the increase in monthly loan repayments when interest rates rise, which reduces their purchasing power and therefore their consumption. Thus, as the share of highly indebted households increases, so does the aggregate impact on consumption. The predominance of fixed rates in France may therefore be beneficial to borrowers if policy rates rise, but it also means that monetary policy has potentially less impact on the economy. Second, households close to their financial constraint are likely to spend a higher proportion of their income (they have a higher average propensity to consume). In other words, the higher the proportion of borrowers' income spent on debt repayment, the more income-dependent their consumption. The monetary policy-related change in income will then have a greater impact on their consumption. Lastly, and interestingly from a financial stability perspective, estimates show that this non-linearity is directly attributable to the share of highly indebted households rather than to the general level of household debt. These results also highlight one of the many interactions between monetary and macroprudential policies: the effectiveness of monetary policy is influenced by the share of highly indebted households.

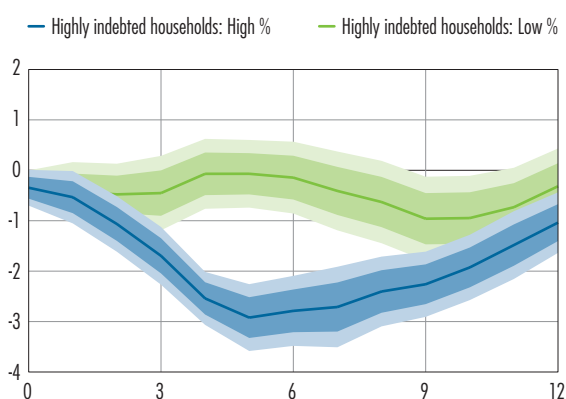
C3 Impact of UK monetary policy on total consumption

(x-axis: length in months; y-axis: as a %)

a) Average impact



b) Impact contingent on indebtedness



Sources: Product Sales Database (PSD), Bank of England, Cumming and Hubert (2021a).

Note: In Chart a), the blue line represents the average response of total consumption to a one percentage point increase in the central bank's base rate. Chart b) shows the impact on consumption differs according to the share of financially vulnerable households (high share represented by the blue bands and low share by the green bands). Households are classified as financially vulnerable based on their loan-to-income ratio.

The results also suggest (see Chart 4 below) a degree of asymmetry in the transmission of monetary policy. When the share of constrained households is large, interest rate increases have a greater impact (in absolute terms) than decreases. To some extent, this is not surprising. When the level of income is very close to the level of spending, a drop in income has very different effects (in absolute terms) than an increase in income.



Other results (Cumming and Hubert, 2021b) also suggest that house price developments play an important role (see Chart 5). In the United Kingdom and in Anglo-Saxon countries in general, there is an equity release mechanism that allows households to take advantage of the increase in value of their property to obtain liquidity. When house

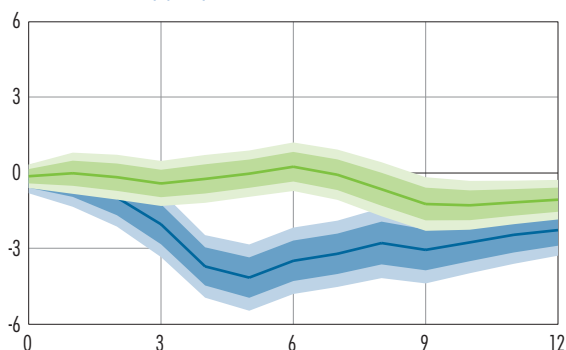
prices rise, homeowners are able to renegotiate their mortgages more easily in order to reduce their monthly repayments or to release equity for other expenses, particularly the purchase of durable goods. This may offset some of the negative effects of increasing interest rates. However, when house prices fall, it is no longer possible to renegotiate the mortgage. In this case, an increase in interest rates amplifies the contractionary effect on the economy, making monetary policy very powerful.

C4 Asymmetric impact of UK monetary policy on total consumption

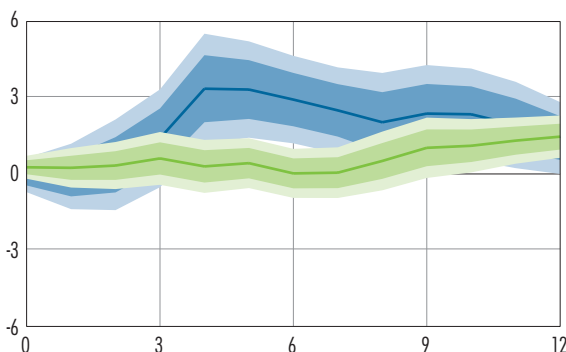
(x-axis: length in months; y-axis: as a %)

— Highly indebted households: High % — Highly indebted households: Low %

a) Restrictive monetary policy (rate increase)



b) Expansionary monetary policy (rate cut)



Sources: Product Sales Database (PSD), Bank of England, Cumming and Hubert (2021a).

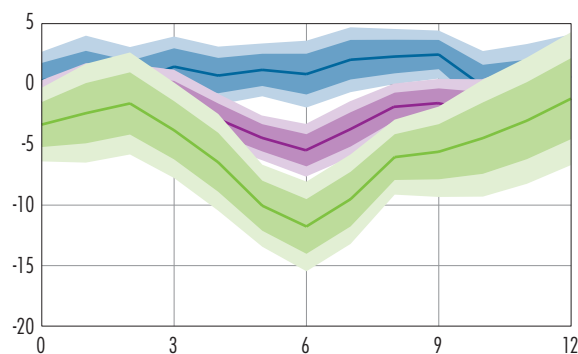
Note: Response of total consumption to a one percentage point change in the central bank's base rate. Impact on consumption differs according to the share of financially vulnerable households (high share represented by the blue bands and low share by the green bands). Households are classified as financially vulnerable based on their loan-to-income ratio.

This result corroborates different studies that show the importance of changes in house prices and mortgage renegotiation conditions for monetary policy transmission (see Berger et al., 2017, Beraja et al., 2019, and Eichenbaum et al., 2020).

C5 Impact of UK monetary policy on the consumption of durable goods conditional on the level of debt and changes in house prices

(x-axis: length in months; y-axis: as a %)

Highly indebted households: High %
— Rise in house prices — Fall in house prices — Stable house prices



Sources: Product Sales Database (PSD), Bank of England, Cumming and Hubert (2021b).

Note: Response of durable goods consumption to a one percentage point change in the central bank's base rate when the share of highly indebted households is high and according to changes in house prices over the last twelve months. The green band thus represents the impact of monetary policy when the share of highly indebted households is high and house prices have fallen.



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Appendix

Data and methodology

The mortgage data used in this study is collected by the Financial Conduct Authority (FCA) in the United Kingdom. This set of regulatory data on mortgages, known as the Product Sales Database (PSD), provides a wealth of information on the features of all mortgages issued since April 2005. This database contains information on the characteristics of borrowers, mortgages and properties purchased, for 14 million mortgages granted between 2005 and 2017. Around half of the latter are mortgages and the other half are renegotiations.

The main challenge is to be able to compare these debt levels over time or space and to define what is meant by a highly indebted or overindebted household. By some measures, UK households are more indebted today than they have ever been in the past. The average loan to annual income ratio has risen from around 2.5 in 2005 to just over 3.0 in 2017. Over the same period, the 95th percentile level of this ratio increased from about 4.0 to about 4.7. However, these aggregate debt measures overlook some of the crucial elements of households' debt decisions, in particular house price developments and financing costs. In order to identify mortgages with a **high** LTI ratio, these micro data control for household and bank characteristics and other structural factors.

There are at least four reasons why the loan-to-income ratio may vary between households.

- The differences may be due to the **underlying characteristics** of the borrower. The age, income and location of a borrower are used by banks to assess borrowing capacity.
- **This ratio can vary over time**, as interest rates and repayment rates fluctuate and thus affect the level of debt that households are willing and able to take on.
- The differences may be due to the **idiosyncratic preferences** of borrowers. For example, risk aversion

and preferences for smoothing consumption influence the type of property people want to buy and the loan structure they need to finance it.

- Many banks look at **other information** about borrowers, for example whether they hold savings accounts with them. Information such as the cyclical nature of income, employment prospects and spending behaviour can also be derived by banks from the intermediation relationship and discussions prior to the mortgage offer.

The empirical approach to constructing the share of highly indebted households involves two steps. First, the procedure aims to predict the LTI ratio of each borrower based on the observable characteristics recorded in the Product Sales Database (PSD). By stripping out other unobservable factors (such as those in the last two groups above), this procedure constructs an adjusted measure, which appears to be closer to the 'true' financial vulnerability of each household. Under the assumption that this relationship is monotonic, households with a high ratio are more likely to reduce their consumption when faced with adverse shocks. Second, in order to make the LTI ratio comparable over time, we adjust its upward trend for the trend growth in house prices.

Let us take three households with different ratios. Household A has a stable job and takes out a loan of four times its income; the ratio predicted by this model is also 4 based on information from the PSD. Household B borrows five times its income because it feels confident after having just started a new job with an upward wage path. Household C only borrows three times its income to buy a house because it likes to spend its money on expensive leisure activities. The econometric model transforms these raw ratios into a vulnerability score. Household B is safer than the raw ratio suggests, as the bank has estimated that the household can borrow more than others. Conversely, household C is somewhat riskier than its raw ratio suggests.



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