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Household debt and resilience

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Summary

In this FI analysis, we examine how debt affects household resilience to economic shocks and in times of crisis. The ability to borrow is beneficial to households in many ways, but households that take on debt also need to deal with unexpected changes in interest rates, income, and house prices. Debt can make their consumption more sensitive to such changes.

In a crisis, several shocks can interact with each other. Depending on the nature of the crisis, this can either reinforce or weaken the overall impact on households. We illustrate this with two hypothetical crisis scenarios where borrower-based measures – regulation affecting borrowers' debts or assets – can have an impact on how the crisis evolves. The preventive borrower-based measure that is suitable differs in the scenarios. It is hard to assess the likelihood of different scenarios that may be realised in the future, and thus also hard to determine ex ante what constitutes suitable borrower-based measures.

Debt makes household consumption more sensitive to certain kinds of economic shocks, but this does not necessarily imply that a measure that leads to lower debt increases resilience. To assess the effects of measures that lower debt, it is necessary to look at households' liquid assets, as these constitute a key buffer that increases households' resilience. It is also necessary to consider effects on households' cash flow. If households can use their disposable income in a flexible manner, this increases their resilience.

An amortisation requirement affects households in different ways depending on each household's characteristics. In terms of resilience, the net effect depends on the extent to which the amortisation payments crowd out saving in liquid assets and the flexibility households have to reallocate cash flow from amortisation to buffer saving or consumption when facing, for example, a negative income shock. In normal times, the welfare effect is determined by the effect on household

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consumption. For many households, it is likely to be negative. But the overall welfare effect depends on both how welfare effects in normal times are weighed against potential welfare gains from increased resilience in times of crisis and the probability assigned to different crisis scenarios with and without regulation. Such calculations contain considerable uncertainty. The welfare calculation becomes even more complicated if there is a perceived risk that myopic households may engage in unsustainable debt-financed consumption, for example when house prices rise.

Our analysis indicates that household resilience depends on factors that differ considerably between households due to heterogeneity in economic characteristics and expectations. Micro data on household debt, assets and consumption is hence an important input for assessing macroeconomic risks linked to household debt and resilience. There is also valuable information to be gained from measuring household expectations of future interest rates and house prices. The interaction between asset prices, expectations and debt can also have a material impact on how a crisis evolves.

Introduction

In Sweden, household debt has been growing faster than household income for many years. The aggregate debt ratio, household debt as a share of disposable income, is now at the highest level observed so far, 180 percent. The increase in debt has occurred against a backdrop of a secular decline in interest rates that has pushed up the prices of houses and other assets while also enabling households to take on more debt. Despite increased debt, the interest ratio – household interest payments as a share of disposable income – has declined to a historically low level of slightly less than 4 percent. In aggregate, the net wealth of the household sector has increased, i.e., the value of assets has increased more than the debt, but the assets – to a greater extent than the debt – are unevenly distributed across households. This applies in particular to financial assets.[1]

House prices[2] have risen steeply since the 1990s. The ability of households to borrow is an important determinant of house prices, but the rise in prices also reflects structural problems in the Swedish housing market and the construction sector. The process of planning and building new homes is expensive and slow in Sweden compared to other countries, and the existing housing stock is not utilised efficiently. The supply of housing reacts slowly to increased demand, resulting in upward pressure on house prices.

[1] See Andersson and Vestman (2021).
[2] Throughout the text, we use the term *house prices* in reference to owner-occupied homes in the form of houses but also co-op apartments and condominiums.

Drawing on lessons learned in the great financial crisis, many countries have chosen to tighten the regulation of credit markets. That crisis was in many places preceded by rapid debt growth followed by a sharp contraction in consumption. After the financial crisis, Sweden and many other countries introduced tougher requirements on banks' capital and liquid assets to act as a buffer against unexpected shocks. Many countries have also introduced so-called borrower-based measures, i.e., regulatory measures that restrict how much households can borrow in relation to, for example, their income or the value of their home. Borrower-based measures differ from country to country, reflecting, among other things, institutional differences in terms of the design of mortgage contracts, the functioning of the housing market, etc.[3] In Sweden, FI has introduced a loan-to-value cap for mortgages (LTV cap) and amortisation requirements. To some extent these measures have held back the increase in debt and house prices.[4]

Important to clarify underlying mechanisms

New regulation has been introduced with reference to risks for individual households and credit risk for banks but also macroeconomic risks.[5] As an example of macro risk, FI has pointed to the possibility that unanticipated events, such as a sharp economic downturn coinciding with higher interest rates, changes to taxes or other rules, and falling house prices could cause households, especially those with high leverage, to reassess their economic situation and reduce their consumption.[6] If many households do so simultaneously, it could amplify the downturn.

Household consumption is the single largest component in GDP, amounting to nearly half of aggregate demand. Housing is the main purpose when households take on debt. It is also their most valuable asset, with a market value of roughly 200 percent of GDP. Housing investment makes an important, but volatile, contribution to GDP – so far during the 2000s ranging from 2 to 6 percent of GDP. In other words, there are strong links between household finances and the macroeconomy.

But *how* are households affected by high debt? The purpose of this report is to draw on standard economic theory as well as recent empirical research to shed light on the ways through which household consumption and welfare are affected by having debt and by making amortisation payments. Clarifying the mechanisms can be useful for assessing risks and when designing borrower-based measures.

[3] For a detailed breakdown, see *Overview of national macroprudential measures*, ESRB.
[4] See Finansinspektionen (2017), Andersson et al (2018) and Andersson and Aranki (2019).
[5] This also applies to the raising of the risk weight floor for mortgages from 15 to 25 percent and, in part, to the countercyclical capital buffer that has been introduced with reference to credit risk linked to macroeconomic risk.
[6] See Finansinspektionen (2014a).

A key takeaway from our enquiry is that it is necessary to look at the interplay between household consumption, saving and borrowing – both for individual households and for the economy at large. We examine this interplay in response to isolated shocks but also deeper crises. Further, we illustrate the interplay with two crisis scenarios that serve as examples in which household debt and the design of borrower-based measures matter for how the crisis evolves. FI has previously addressed several of these mechanisms on a more general level.[7] Our more extensive discussion can make it easier to see the effects of borrower-based measures, such as amortisation requirements, and to determine what information is relevant for assessing risks linked to household debt. The report is not intended as a complete policy framework for designing and evaluating borrower-based measures but can hopefully contribute to the foundations of such a framework. The report can also provide analytical support when selecting indictors of economic fragility to be used when assessing risks linked to household debt.

Definitions, scope and outline

We analyse how debt affects the sensitivity of household consumption to economic shocks. By shocks we mean that households face unexpected increases in interest rates, loss of income or falling house prices. By sensitivity we mean that households' consumption is affected in a way that reduces their welfare.[8] We discuss this sensitivity in relation to smaller, isolated shocks but also in relation to crises where many shocks occur at the same time. This is important because it is particularly in times of crisis that households experience large and persistent reductions in consumption and significant welfare losses. The interplay between debt, asset prices and household expectations can play an important role in how a crisis evolves. Economic policy contains many tools that can affect these linkages. Our discussion focuses on tools within FI's area of responsibility, in particular amortisation requirements. We focus on short-run and medium-run effects. The long-run effects of, for example, borrower-based measures can be both larger and smaller than the short-run effects.

In the report, we refer to empirical and theoretical research. There are insights to be gained from the existing literature, but to a large extent it relates to the great financial crisis and a US context. Different crises have different characteristics, and institutional features differ between countries. Results based on US conditions may have limited relevance for Sweden, a country that, for example, has more extensive income insurance, stronger lender protection in mortgage contracts, and a more regulated rental market.

[7] See for example Finansinspektionen (2014a and 2014b).
[8] Welfare losses can be a result of (a) a lower level of consumption, or (b) increased volatility of consumption in response to shocks.

The report is organised as follows. First, we describe standard economic theory regarding household consumption, in which debt and assets constitute an important part. In the next section, we discuss mechanisms whereby debt and assets affect households' sensitivity to different shocks. This is followed by a short section addressing how debt can impact the evolution of a crisis, in relation to borrower-based measures. The next section looks at how the sensitivity of household consumption to shocks is affected by requiring borrowers to make amortisation payments. A final section summarises our conclusions.

Consumption theory

In this section, we provide a short description of standard economic theory of household consumption and balance sheets. The main purpose is to explain a few concepts that are central to the discussion in the following sections. We start with the simplest possible model and then proceed by adding several complicating factors – frictions – to the model. The frictions are an important means for closing, or at least reducing, the gap between theory and what we observe in real life. This approach is conventional in the sense that the frictions we discuss are well-established in mainstream economic thought and reflect how economic research has evolved over time. But the list of possible frictions is long, and our discussion is not exhaustive. For example, we do not incorporate problems of limited self-control. Rather, we assume that households act rationally in a fundamental sense (see the short discussion in the section on financial frictions, below).

The basic household consumption problem

A starting point for consumption theory is that households wish to smooth consumption over time. A marginal increase in consumption is more beneficial for the household at a low level of consumption than at a high level. In other words, households have diminishing (marginal) utility of consumption.

The income that is traded for consumption varies over time. This is a result of predictable factors such as being in different stages of the life cycle and working to a greater or lesser extent, but also unanticipated events. Variations in income reflect both cyclical factors such as labour market conditions and individual (idiosyncratic) factors such as sickness. Households are not able to fully insure against all these risks – markets are incomplete – and wish to avoid very low levels of consumption if a bad outcome is realised. Further, households have different characteristics in terms of earnings potential, unemployment risk and preferences, and thus make different decisions regarding consumption, saving, borrowing, and working.[9]

[9] By differences in preferences, we mean that households differ with regard to willingness to take risks, patience (how future consumption is valued relative to current consumption), and utility of leisure.

It follows that the basic consumption problem has to do with reallocating income and wealth over the life cycle but also determining an appropriate amount of precautionary savings in light of risks to future consumption.

A life cycle model with uncertainty is a straight-forward optimisation problem – free from psychological features – but the model is not always good at explaining the patterns observed in data. For example, actual household consumption reacts too strongly to temporary changes in income and not enough to persistent ones. To address this, macroeconomists have extended the model described above in different ways. In the following, we discuss some extensions that are particularly relevant in relation to household debt and consumption.

Financial frictions

Borrowing, like saving, can make it easier for households to smooth consumption, for example to handle expenditures for durable consumer goods.[10] Housing is a special – and for households important – category of durable goods and the main purpose when Swedish households take on debt. Borrowing can also be a way to manage a temporary loss of income and thus fills a similar function to (and to some extent acts as a substitute for) savings that can be drawn on when income is temporarily reduced.

Therefore, available credit – the difference between existing debt and the upper limit on how much the household can borrow – is an important buffer for households. The size of this buffer is affected by the functioning of credit markets. Patterns of consumption and saving that are hard to reconcile with a simple life cycle model can in part be explained by credit markets working less smoothly in real life compared to the simple model.

In theory, a household's borrowing limit depends on its assets and the present value of its future income stream. But in practice, the ability to borrow is also constrained by frictions in the credit market. Loan contracts are designed on the basis of incomplete information, a limited ability to enforce borrowers to abide by the loan terms, and additional costs for distressed debt, such as costs incurred when drawing on collateral. For these reasons, lenders set tighter limits on borrowing than they would have if they had access to complete information and were certain that borrowers would honour the obligations of the contract. Higher collateral requirements, tougher income requirements, and higher interest rates are examples of such credit constraints.

Households can be credit constrained in the sense that they are unable to maintain a desired, and from the point of view of the household rational, consumption level

[10] Durable consumption goods are goods, for example cars, where the purchase is lump sum but consumption, in an economic sense, occurs over a considerably longer time period.

because of a limited ability to borrow. For example, a student, despite good income prospects, might find it hard to borrow against future income. Or households may have high incomes but already hit the borrowing limit set by the lender. Frictions in the credit market can make households hit this limit without having exhausted their debt-servicing capacity. Forward-looking households take such frictions into account by maintaining precautionary savings. Credit market frictions can become more severe in a crisis, making it harder to borrow. If households are dependent on credit to sustain their consumption level, this constitutes a channel through which problems in the financial sector can spill over onto aggregate demand.[11]

Over-consumption and welfare

As a starting point, it is reasonable to imagine that credit constraints that restrict the set of possible actions available to households also reduce their welfare. But the welfare effect depends on what assumptions are made regarding the ability of households to allocate consumption across time in a manner that maximises their long-run welfare. For households that in the absence of other constraints consume optimally, credit constraints lead to lower welfare. But it is also possible to imagine that there are households that tend to consume too much in the short run, for example due to self-control problems that result in myopic behaviour that is not in line with their own long-run interests.[12] For these households, credit constraints need not lead to a reduction in long-run welfare. Depending on the assumptions made, a credit constraint in this case could even increase welfare if the household would otherwise have taken on excessive debt or used particularly expensive forms of credit.[13]

To generate macroeconomic risks, households with self-control problems must have a relatively large importance for aggregate household consumption or the housing market – for example, by being a big group, having large amounts of debt, or extensive self-control problems. It is beyond the scope of this report to determine whether this is the case in Sweden, and we do not focus on this type of household when we analyse macroeconomic risks. But even if this group were to be modest in size, it is relevant when considering the overall welfare effects of regulation, and it is relevant for FI from a consumer protection perspective.

Liquid assets an important buffer

Savings, like debt, are a tool that households can use to smooth consumption. In a simple life cycle model, the household accumulates assets during its working years

[11] For example, a study on Danish data shows that customers in banks that restricted credit supply more in the great financial crisis also reduced their consumption more than other households. See Jensen and Johannesen (2017).
[12] See Thaler and Shefrin (1981).
[13] Gathergood (2012) finds that, in a sample of UK households, self-control problems are positively correlated with having problems making debt payments and the use of expensive, short term consumer credit.

that can be used for consumption later in life when income declines. The pattern is predictable, and savings can be invested with a long investment horizon to get the best possible trade-off between risk and return.

But when you take uncertainty into account, it also matters how easy it is to convert savings into cash to pay for consumption – in other words, whether the household has access to liquid assets. By liquid assets we primarily mean financial assets outside of (public and private) pension plans, for example bank deposits or direct holdings of stocks and mutual fund shares. The latter are not immediately available for consumption purposes but can usually be converted into cash in a short amount of time and with small transaction costs.

The composition of the liquidity buffer involves a trade-off between consumption in the short and long run. From a buffer perspective, physical cash or bank deposits carry the advantage that they are not only liquid but also have a highly predictable value. The disadvantage is that they (as safe assets) generate little or no financial return, thus foregoing consumption opportunities in the long run. Riskier assets can offer a better return but run the risk of falling in value when the economy is hit by shocks and the buffer is needed. Some assets can also become less liquid if market conditions become strained.

Housing closely linked to household debt

In terms of linkages between debt and consumption, housing stands apart. Housing is one of the largest consumption expenditures of households, and a poorly functioning rental market means that many households have limited alternatives to owning a home. For many Swedish households, their home is their single most important asset and the dominant motive for taking on debt. Households' demand for housing services varies considerably across the life cycle.

Mortgage debt has some special characteristics. When a household takes out a mortgage, it uses housing as collateral. Hence, mortgage interest rates are lower than for unsecured debt. Also, there are specific borrowing constraints linked to mortgages. In Sweden, a mortgage LTV cap limits the loan-to-value ratio to 85 percent.[14] Depending on the loan-to-value ratio and the debt-to-income ratio, amortisation payments vary (according to FI rules), and this is incorporated in the discretionary income calculations that form part of Swedish banks' credit evaluations. Another aspect is related to liability in case of default. In Sweden, the

[14] This is a simplification. Technically, the regulation stipulates that no more than 85 percent of the value of the house be used as collateral for the mortgage.

borrower has a far-reaching liability for the mortgage, irrespective of the underlying collateral.[15]

In terms of being an asset, housing also has special characteristics. Transaction costs, such as broker fees and stamp duty, and search costs for finding the right house make housing an illiquid asset. Transactions costs make households less willing to move in order to adjust to changes in economic circumstances. This is also an obstacle when it comes to drawing on the wealth that a house represents in order to smooth consumption. Borrowing against the house can be a way to draw on this wealth at a low transaction cost and thus forms part of the household's available buffers. But a new loan requires a counterparty that is willing to lend. In a serious economic crisis, there is a risk that banks, worrying about increased credit losses that will reduce their capital or having already incurred such losses, will choose to cut back on the provision of new credit, and this may coincide with a sharp fall in house prices and a significant increase in unemployment risk. Under such conditions, it is not reasonable to expect households to have the same access to credit that can be used as a buffer, even if that credit would be available under more normal conditions. Shocks that only affect the individual household can also reduce its access to credit, for example if the household experiences a loss of income. Therefore, as insurance against shocks, the accumulation of savings in the form of housing equity is not equivalent to savings in more liquid assets.

Buffers affect the consumption response to shocks

Household sensitivity to shocks, in the sense used here, is often expressed in terms of the marginal propensity to consume.[16] This measure refers to the change in consumption in proportion to the change in income or wealth. We use this term many times in the report and hereafter refer to it by the acronym MPC.

There are several economic explanations for why households differ in their MPCs, as observed in data.[17] As a starting point, it is possible to consider a theoretical extreme case: a household that in the absence of uncertainty, and absent other restrictions, allocates its lifetime resources so that the marginal utility of consumption remains constant over time. If the household becomes better off due to a temporary increase in income, this increase in resources is spread out across

[15] In the US, a number of states have non-recourse mortgages whereby the bank, in a debt recovery process, gains access to the underlying collateral – the house – but not to other assets or income.
[16] To keep things simple, we refer to consumption as though it represents a single quantity. But, in practice, households consume a basket of goods and services for which its MPC can differ. This applies not least to the distinction between durable goods (e.g., cars and home appliances) and non-durable goods (e.g., food and gas). See, for example, Browning and Crossley (2009).
[17] See, for example, Jappelli and Pistaferri (2014).

the entire remaining life cycle. The impact on current consumption is modest, compared to the change in income. The household has a low MPC, close to zero.

This can be contrasted with another extreme case: a household that is unable to borrow and lacks liquid savings. Such a household has no alternative to reducing current consumption to fully offset a loss of income or an increase in interest payments. Such changes lead the household to consume significantly less than it would have done if it had been able to use savings or debt as shock absorbers. The lower consumption level may be more or less temporary. It could be temporarily lower because the household has experienced a loss of income and has small buffers in the form of available credit or liquid assets. But it could also be persistently lower, for example if the household is unable to borrow against future income. Because these households would prefer a higher level of current consumption, changes in income or wealth will have a comparatively large effect on their consumption. They may have an MPC of about 1, which is to say that an increase in income or wealth generates an increase in consumption by the same amount. This is sometimes described as households living hand to mouth.

Even households that have not exhausted their buffers can exhibit hand-to-mouth behaviour, or something close to it. Uncertainty about the future can make it rational for a household to safeguard some precautionary savings despite an unexpected loss of income, as consumption might be valued even more highly if the household's income is reduced even further.

A household can also have a high MPC even if it has strong finances. The MPC can be expected to be smaller for wealthier households,[18] but in order to function as a buffer assets also need to be liquid. Hence, households with large but illiquid assets may also exhibit hand-to-mouth behaviour. The prevalence of resource-rich households with high MPCs has been documented in several studies on data from different countries, mainly for non-durable goods.[19]

Sensitivity of consumption to shocks

In this section, we discuss to what extent households with more debt are more sensitive to unexpected deteriorations – shocks – regarding their expenditures, income and wealth, respectively.[20] We focus on the individual household, but at times widen the perspective to the household sector at large. It is important to make that connection because what might hold for an individual household does not necessarily hold for many households simultaneously, which is a prerequisite for

[18] See Carroll and Kimball (1996).
[19] See, for example, Kaplan, Violante and Weidner (2014) and Fagereng, Holm and Natvik (2020).
[20] See also Englund (2020) and Svensson (2020) for a detailed discussion of the relationship between debt and sensitivity to shocks.

household behaviour to give rise to macroeconomic risks. The situation of individual households is also relevant for FI, but mainly from a consumer protection perspective. The analysis in this section is not comprehensive; we discuss different sensitivities one at a time and mostly without going into what factors might have triggered the shock and how other macroeconomic variables are affected.[21]

Interest rate sensitivity

From a theoretical viewpoint, it's not obvious that interest-rate increases have a more negative impact on consumption just because a household has debt. There are many factors to consider: the duration of fixed interest rates on the debt, how persistent the rate increase is, and whether higher rates are correlated with changes in other macroeconomic variables. If the interest rate on the debt is fixed over a longer horizon, the impact on consumption will be small, or even zero. If the rate is adjustable, the impact depends on how persistent the rate hike is – the more persistent, the larger the impact – and on the household's access to buffers that can be used to smooth consumption over time.

In addition, it is of critical importance if the increase in interest rates is correlated with other macroeconomic developments. An interest rate hike resulting from strong macroeconomic performance could very well be correlated with raised expectations regarding future income. From a long-run perspective, the household is then richer and may wish to increase consumption rather than reduce it. Under such circumstances, the expectation might be that the household will cover the cost of increased interest payments by drawing on buffers rather than cutting back on consumption. Rates can also go up at the same time as inflation picks up. In this case, expenditures would increase less in real terms than in nominal terms since income can also be expected to increase at a faster pace to compensate for the effects of inflation on household purchasing power. In this case, too, the expectation might be that the household will use buffers to smooth consumption over time.[22]

In practice, however, it is well-established that changes in interest payments lead to a change in consumption, at least for some households. How they are affected depends on the household's balance sheet and available buffers. More debt in relation to income implies that interest rate changes will have a larger impact on

[21] One variable that we do not discuss in the report is the extent to which households adapt their work hours to smooth out consumption. In theory, households with high debt could increase their earned income to offset higher interest fees or decreased wealth. In practice, though, it is far from easy for many households to quickly increase their work hours, particularly during an economic downturn or a crisis.
[22] A change in interest rates also affects households' assets. See Auclert (2019) for a theoretical model. For an empirical analysis, see Holm, Paul and Tischbirek (2020).

the household's cash flow. Adjustable-rate loans, which are common in Sweden, impact household expenditures faster. Therefore, increased interest payments crowd out both consumption and savings.[23] This cash flow channel has been shown to apply also to Swedish households.[24] When the Riksbank raises its policy rate (the repo rate), indebted households cut back more on consumption than households without debt. The difference is driven by households with adjustable rates, and mainly by households with small liquid assets. Studies on data from other countries find similar patterns.[25]

The cash flow channel means that highly indebted households have a greater importance for the transmission of monetary policy, but this does not necessarily mean that their consumption is more vulnerable.[26] In a normal business cycle, the Riksbank raises the interest rate when the economy is performing strongly and lowers it when the economy is performing weakly. As a result, part of household disposable income is redistributed over the business cycle. Increased interest rate sensitivity can make it easier for monetary policy to smooth fluctuations in aggregate demand; all else equal, smaller interest rate changes are needed to achieve the same stabilising effect on the economy. For the individual household, this can also make things easier, provided that the economic conditions faced by the household are reasonably in line with the overall business cycle.

This line of reasoning, however, hinges on the assumption that the interest rate can be lowered to make monetary policy more expansionary. In recent years, the policy rate in Sweden and many other countries has been low and probably close to an effective lower bound. The scope for interest rate cuts has been very limited. Low policy rates in turn reflect a secular decline in the neutral rate. If the low neutral rate persists for a long time, highly indebted households cannot expect interest rate cuts to free up disposable income in a downturn.

Moreover, the interest rates faced by households can increase for a number of reasons. The interest on households' debt reflects, to some extent, banks' financing costs and other market conditions. Turbulence in financial markets can lead to higher financing costs for banks, and these costs may be passed on to customers in the form of higher rates. In this case, the Riksbank can take measures that contribute to lowering market rates. Public intervention in a crisis, however, is often a financial risk for taxpayers and has redistributive consequences among households.

[23] See Kinnerud (2020) and Berger et al (2020).
[24] See Flodén et al (2020).
[25] See, for example, La Cava et al (2016), Di Maggio et al (2017) and Cloyne, Ferreira and Surico (2020).
[26] See, for example, Di Casola and Iversen (2019) and Svensson (2020).

Another reason could be banks seeking to increase profit margins on mortgages, even in the face of public interventions to suppress banks' financing costs, for example in order to offset credit losses on other debt. This is more likely to happen if interbank competition is weak or in a crisis when many lenders are making large losses simultaneously. We return to the issue of how crises evolve in a later section.

Large amounts of debt also make households sensitive to more fundamental changes in interest rates. In order to stabilise inflation, central banks can raise and lower a policy rate around a "neutral" level. This neutral rate varies over time, and in the view of many it is currently unusually low. The neutral rate could become higher in the future. Moreover, it cannot be completely ruled out that monetary policy might become contractionary when the economy is operating well below full capacity if other factors are causing inflation to be too high.

Meanwhile, debt, not least mortgages, is often a long-term engagement from which it is hard to quickly withdraw. The interest paid on debt, simply put, is a price that the borrower pays to consume "in advance", in the sense that one is consuming future income; for example, consuming a larger home without having to first accumulate savings to cover the entire purchasing price. Large debts leave households more exposed to unexpected changes in this price if they are unable to quickly adjust their debt level. In this case, it is significant that the purchase of a home is the predominant motive for taking on debt. The household has to live somewhere, and moving entails transaction costs. It can be difficult, therefore, to quickly adjust the amount of debt when borrowing turns out to be more expensive than anticipated. Instead, the household might choose to reduce consumption. In this case, it is noteworthy that many households are exposed to the same set of market rates and the same type of debt-financed asset. If many households simultaneously choose to reduce their debt, this can lead to downward pressure on house prices and additional reductions in household consumption.

Sensitivity to loss of income

Existing debt reduces available credit

Ultimately, the market sets the limit on how much a household can borrow. A credit evaluation should always precede the granting of credit. This means that the lender makes an assessment of how much it is willing to lend in light of information about the borrower's income and assets that can be held as collateral and interest rates. Having a high income relative to interest payments, i.e., a low interest ratio, increases the borrower's debt-carrying capacity. Assets that can be borrowed against, notably housing, can be used as collateral for the loan and reduce lenders' risk.

The more a household draws on its available credit in good times, the less room it has to take on more debt in order to deal with unexpected events, such as a loss of income. In this sense, high indebtedness makes households more vulnerable. Moreover, a loss of income risks resulting in the market setting a tighter limit on the household's available credit, since the household's debt servicing capacity has declined.[27] This is particularly the case if the loss of income risks being persistent or if the household experiences a loss of income at the same time as interest rates increase. In the latter case, the interest ratio – interest payments as a share of disposable income – can increase sharply as the numerator in the ratio increases at the same time as the denominator declines.

Instead of borrowing, households can use savings in liquid assets to offset a temporary loss of income, but all households do not have such savings to draw on. Households with high debt servicing costs and small liquid buffers are thus particularly vulnerable in the case of a loss of income. Among Swedish households with debt, this is a large group.[28]

Studies on micro data can shed light on mechanisms

Several studies on micro data from the great financial crisis 2007–2009 find a correlation between high indebtedness and households cutting back on consumption during the financial crisis.[29] In itself, the correlation is not controversial. The question is what mechanisms explain the observed pattern. Here, the state of knowledge has progressed, with consequences for how one interprets observed correlations in micro data.

Shedding light on what is driving this link is hard. There is a lack of good micro data offering a comprehensive view of households' consumption and balance sheets, and none of the studies discussed here are based on Swedish data. Interpreting a correlation between debt and consumption as a causal link going in only one direction requires a very good empirical strategy.

Consumption is also affected by other variables that may covary with income, assets and debt. Observed debt is not randomly allocated, as it would be in an experimental set-up; rather, it reflects household characteristics that affect how

[27] Whether a change in household borrowing reflects a change in supply or demand is often hard to observe in data. The time period being studied and institutional factors also matter. See Gelman et al. (2020), Ganong and Noel (2019), Braxton et al. (2020) and Hundtofte et al. (2019). Some households may also refrain from borrowing even if they appear able to do so. A negative attitude to debt has been linked to a lower propensity to use student loans (Callender and Mason, 2017), mortgages (Almenberg et al., 2021) and support program loans during the coronavirus pandemic (Paaso et al., 2020).
[28] See Andersson and Vestman (2021).
[29] See Dynan (2012), Mian, Rao and Sufi (2013), Andersen, Duus and Jensen (2016), Bunn and Rostom (2016), Kovacs et al. (2018) and Price et al. (2019).

much the households borrow.[30] Since all of the studies lack some relevant information about the households, there is a risk that the variables that are contained in the analysis are in fact picking up the effect of "missing" information, so-called omitted variable bias.

Studies of consumption and debt almost never have exogenous variation in debt, and hence risk making erroneous connections if relevant variables are not controlled for.[31] An exception is Verner and Gyöngyösi (2020), who look at changes in consumption following a large, unexpected depreciation of the Hungarian exchange rate during 2008. Many Hungarian households had mortgage debt denominated in euros or Swiss francs, and their debt – and the debt servicing costs – increased sharply in relation to their income and the value of their home. The increase in debt was equivalent to about 6 percent of GDP. Consumption declined more in regions where debt denominated in foreign currency was more common. This had negative spill-over effects through declines in employment and local demand and negative externalities for borrowers with debt denominated in domestic currency through larger house price declines in these regions.[32] However, the study does not pinpoint why households that experienced an increase in debt reduced their consumption more, apart from an increase in debt servicing costs.

Important to consider buffers and consumption patterns

To shed light on the factors that determine how much indebted households reduce consumption in, for example, a crisis, it is important to also consider what buffers they have. Baker (2018) illustrates this point using micro data on US households during the financial crisis. The starting point is a simple regression where the change in consumption is only determined by changes in income. When measures of indebtedness are added to this specification, the consumption response appears to be stronger for more indebted households, which is to say that their consumption is more sensitive to a loss of income. But when you also control for (liquid and illiquid) assets and available credit, that effect disappears. Rather, consumption appears to be more responsive to changes in income if the household has fewer liquid assets, a lower credit score or less available credit. Consumption is more

[30] For example, Dynan (2012) finds a correlation between debt and the consumption response, but the highly indebted households are systematically different from other households in ways that matter for consumption. Comparable data shows that they have less (for the most indebted, negative) financial assets, and a large share has been rejected when applying for additional credit (see Pence, 2012).
[31] By exogenous variation, we mean interpersonal differences in indebtedness that depend on factors the household itself does not affect.
[32] By negative externality, we mean than an agent in the economy acts in a manner that aligns with their own interest but also has negative consequences for other agents in the economy, without this being the purpose of the action.

sensitive to negative shocks than positive ones, a pattern that is consistent with liquidity and credit constraints playing a central role.[33]

Challenges when measuring the effect of debt are also in focus in a study on Danish households during the financial crisis. Andersen, Duus and Jensen (2016) contrast two mechanisms. In the first mechanism, which they refer to as a *household balance sheet effect*, debt makes consumption more sensitive to a loss of income because the household hits a borrowing constraint, or sees a material risk of doing so, and therefore attaches importance to precautionary savings.[34]

The second mechanism the authors refer to is *spending normalisation*. Highly indebted households might have had temporarily elevated consumption expenditures and subsequently normalised their level of spending. They may have had optimistic expectations of future income and taken on debt to finance a level of consumption that then turns out to be unsustainable in light of the household's long-run budget constraint. If many households follow the same pattern, this could entail macroeconomic risks. But a similar pattern can also arise if the household has a significant outlay for durable goods, for example a car, and uses debt to cover the expense. Subsequently, spending returns to a more normal level, but the level of debt, which could be paid down over the lifetime of the durable good, remains elevated. Micro data will then show a correlation between higher debt levels and households cutting back on consumption, but the observed correlation in this case is mostly a result of how the data measures consumption.

As pointed out by Andersen, Duus and Jensen, while earlier studies focus on the change in consumption and the level of debt, there are good reasons to also account for the level of consumption and the change in debt. Danish households with higher debt levels reduced their consumption spending more than other households between 2007 and 2009 despite higher income growth and more or less the same house price growth. But unlike other households, they also had an initial consumption level that exceeded their disposable income. After 2007 they reduced consumption to a level more in line with otherwise comparable households. When you consider both the debt level and how much debt increased in the run-up to the

[33] See Baker (2018). Available credit here refers to the size of existing lines of credit if the household has experienced a reduction in its credit limit or borrows at a high interest rate.
[34] This mechanism is sometimes referred to as the *debt overhang hypothesis*, see, for example, Svensson (2020). The question of whether high debt levels hold back consumption (a debt overhang) was of particular interest in the US during the financial crisis since large declines in house prices had resulted in many households being underwater, i.e., their mortgages exceeded the value of their homes. If there were a strong link between debt levels and consumption, it would be possible in such a situation to stimulate the economy by writing down debt principals. Ganong and Noel (2020) find that the option to postpone debt payments, but not debt write-downs, had a stimulating effect on the consumption of underwater borrowers.

crisis, it is only the latter that helps explain how much households cut back on consumption. [35]

What lessons are to be learned from the Danish findings? The approach is sound, and in many ways an improvement compared to several earlier studies, but it is nonetheless not without flaws. For example, a large number of households are excluded from the analysis, including all households who bought a new home during the period 2003–2011.[36] This means that much of the relevant information in the data is lost: both house prices and debt exhibit large variations during the period, and households that are active in the housing market are particularly relevant. Since the subsample that make no housing market transactions during this period can hardly be said to be a random selection, it is unclear to what extent they are representative of other households.[37] Svensson (2021a), however, reports a similar pattern in Australian data that does not suffer from the same selection problem. The results using Australian data, however, should be interpreted with caution since the impact of the financial crisis was relatively mild in Australia and Australian mortgages have special characteristics that provide built-in credit and liquidity buffers for the majority of borrowers. Most borrowers are allowed to pay down the principal ahead of schedule at no extra cost. Early amortisation payments entitle the borrower to a buffer in the form of a credit line or liquid assets.[38]

A key conclusion from Andersen, Duus and Jensen (2016) is that it is hard to interpret the results from studies on micro data that do not control for possible over-consumption and how much debt has increased. The results from Denmark show that it is unclear what can really be learned from studies such as Dynan (2012) and Kovacs et al. (2018), which do not consider these aspects. The latter study finds, for example, that highly indebted households cut back on consumption

[35] The results hold when estimated on car purchases. More of the highly indebted households buy a new car, and more of those that increase their debt in 2006–2007 buy a new car during 2007. The car purchases illustrate a spending normalisation: A large, debt-financed expense increases both debt and consumption expenditures. Subsequently, consumption spending declines as the car has already been acquired.
[36] Measuring consumption is difficult. Andersen, Duus and Jensen (2016) impute consumption as the difference between observed income and net asset purchases by the household. To limit measurement error, many individuals are excluded, including all those that acquired a home during the period studied. Their study uses data on the entire Danish population, but the final sample is reduced to about 500,000 households.
[37] The study lacks a sensitivity analysis regarding the threshold above which the household is categorised as having high debt. The threshold used is the lower bound of the top quartile of the debt distribution in their data, which corresponds to a debt-to-income ratio of 2.2. At the same time, the authors themselves show that the correlation between higher debt and the sensitivity of consumption is higher at higher debt levels and readily apparent only at debt ratios above approximately 3.5. They carry out a sensitivity analysis with debt as a continuous variable, but that is insufficient given that it is the highly indebted households that are of concern.
[38] See Price et al. (2019).

more than other households during the financial crisis. But the summary statistics show that these households initially had a higher level of consumption and subsequently reduced consumption to levels more in line with otherwise comparable households. Since the authors do not control for the change in debt or the level of consumption (or, for that matter, liquidity and credit constraints), it is hard to tell what is actually driving their results. When the empirical specification is extended to be more like the Danish study, the results also become similar to the results on Danish data.[39]

In this aspect, the state of knowledge has progressed thanks to more recent studies such as Andersen, Duus and Jensen (2016), Baker (2018) and Svensson (2020, 2021a, 2021b). That a change in debt has greater importance than the level of debt also fits better with consumption theory and cross-country studies of the correlation between aggregate consumption and aggregate debt. The latter typically find a connection between crises and a build-up of aggregate debt rather than the level of debt.

In previous reports, FI has pointed to experiences from Denmark, the UK and the US during the financial crisis as support for the view that highly indebted households may cut consumption more in a crisis.[40] As described above, more recent research casts a somewhat different light on these experiences. In order not to draw erroneous conclusions, it is important to consider (i) the prevalence of liquidity and credit constraints as illustrated by Baker (2018), and (ii), the change in debt and the level of consumption, as illustrated by Andersen, Duus and Jensen (2016).

The new results also matter for the choice of indicators for assessing risks linked to household debt and the interpretation of these indicators. To observe that debt has increased in relation to income, for example, is not sufficient to establish with certainty that risks have increased or resilience declined. Household debt-carrying capacity could also have increased, and the rest of the balance sheet is also important. In all, what is required is a comprehensive judgment based on both macro aggregates and micro data. How much has the debt increased, who is increasing their debt, and for what purpose? And what is the distribution of debt and assets? Answering these questions requires micro data. The lack of data on household balance sheets and consumption is a problem for the analysis of household resilience and the sensitivity of consumption.

[39] See Svensson (2021b).
[40] See, for example, Finansinspektionen (2014a).

Sensitivity to falling house prices

According to economic theory, households will reduce their consumption if they become less wealthy. Empirical evidence supports the view that this wealth effect is declining in wealth. In other words, the consumption of households with large and liquid assets will respond less to changes in wealth. This is consistent with the idea that household savings in part reflect a precautionary motive.[41]

Debt amplifies wealth effects if it causes net wealth to vary more over time. For a given initial level of net wealth, a household experiences bigger swings in its financial position if it has both large debts and large asset holdings, i.e., a large balance sheet with a considerable amount of leverage.

Housing makes up a large part of households' assets. A home differs from other assets: the household has to live somewhere, and these needs differ over the life cycle. If changes in house prices make a household richer or poorer depends on where the household finds itself in terms of its "housing career". Household that plan to increase their consumption of housing services, for example young families, benefit from lower prices because it becomes easier to acquire a larger home. Households planning to reduce their consumption of housing services, for example because their children have grown up and moved out, are disadvantaged since they are left with less home equity that can be withdrawn for other purposes. In other words, a fall in house prices creates both winners and losers.

Falling prices primarily redistribute wealth among households. The wealth effects among the winners and losers are greater if house prices are elevated and debt levels are high. As a starting point, one might expect changes in house prices to have a modest net effect on aggregate consumption, but this depends on the responsiveness of consumption in the different groups.[42] Falling prices can also affect aggregate consumption if house prices have previously been over-valued or the fall in prices makes financial frictions more binding through lenders adjusting their supply of credit.

A number of empirical studies find that changes in house prices can have a relatively large effect on aggregate household consumption.[43] The exact reason differs between studies, but in general the link is driven by households whose balance sheets contribute to a high MPC. This can be households that face credit constraints (high debt service ratios or high LTVs), recently have increased the size

[41] See, for example, Carroll and Kimball (1996). For a similar discussion of changes in income, see Jappelli and Pistaferri (2014).
[42] See Buiter (2008).
[43] See, for example, Mian, Rao and Sufi (2013) and Cerutti, Dagher and Dell'Ariccia (2015).

of their mortgages, face liquidity constraints, or have a large share of their net wealth in the form of home equity.[44]

One explanation for the link between changes in house prices and consumption is the so-called housing collateral channel.[45] Many households find it difficult to borrow against expected higher income in the future. By using a home as collateral, they are able to increase their borrowing. This creates a close link between the value of the collateral and available credit. When prices go up, homeowners are able to borrow more; when prices go down, the reverse applies. If a household's consumption is constrained by its ability to borrow, the collateral channel causes changes in house prices to have a larger effect on consumption. If this group is large, the effect on aggregate consumption can also be large.

Some studies also find that changes in house prices actually have a wealth effect on consumption, not driven by debt and credit constraints. Here, the link is driven by the value of home equity in relation to the total wealth of the household, including the expected value of future income. If households with a substantial share of home equity in relation to their total wealth make up a large part of aggregate consumption, a fall in house prices can also have a large aggregate effect through the redistribution of wealth. However, studies where credit constraints play a limited role typically look at a context where the rental market works smoothly and mortgages are non-recourse, so the borrower's home equity is bounded at zero.[46] This is not a good depiction of the conditions in Sweden.

Moreover, housing market activity can also affect how much house prices fluctuate. Higher credit growth reflects a number of factors, from fundamentals like overall economic conditions or lower interest rates to changes in the willingness to lend to households with certain characteristics and how much such households are willing to borrow. In particular, increased lending that coincides with an increase in the supply of housing, or an increased demand has been linked to boom-bust cycles in house prices. This might reflect the rapid shift of developers' and households' expectations between pessimism and optimism. This, in turn, can lead to speculation in new construction and existing homes, an increase in lenders'

[44] See Mian, Rao and Sufi (2013) and Aladangady (2017) for results that point to credit contraints. Berger, Guerrieri, Lorenzoni and Vavra (2018) show that MPCs are higher when households have lower income, less liquid assets and less available credit. See Kaplan, Mitman and Violante (2020b) for results where the value of housing relative to total assets plays a central role.
[45] See Muellbauer (2012). See also Mian and Sufi (2018), who refer to this as the *debt-driven household demand channel*.
[46] See Kaplan, Mitman and Violante (2020a). Central to their model and results is that households are unconstrained in their choice of housing services, for example by being able to rent an equivalent home if they are not able to buy one. Guren et al. (2020) show that an expected increase in sensitivity when more households have high leverage following a drop in house prices is reduced for households that had high leverage at the outset and for whom home equity is bounded at zero due to a non-recourse mortgage.

willingness to take risks, or institutional changes that cause a sharp increase in demand.

Sensitivity to changes in expectations

Despite rich data, studies on micro data only explain part of the variation in household consumption over time. One reason for this is that it is difficult to measure actual consumption. Both imputed consumption expenditures and survey measures suffer from measurement error. But often, important explanatory variables are also missing from the analysis. For example, Andersen, Duus and Jensen point to revised expectations among households that were overly optimistic before the financial crisis as a potentially important explanatory variable, but their data does not allow for testing this hypothesis.[47]

Data from the UK also points to the importance of expectations. In a survey carried out after the financial crisis, households were asked if they had cut back on consumption and if so, why.[48] Among those that had cut back on consumption, many reported that they were worried about their debt. On a follow-up question about why they had been worried about their debt, the most common response was that they were worried they would be unable to make debt payments if interest payments increased or if they experienced a loss of income. The second most common response was that their income was lower than they had expected when taking on the debt. These results indicate that highly indebted households may wish to reduce their debt in a recession because they are worried about their long-run ability to service the debt that they have already taken on. This is a different motive than credit constraints and has more to do with a downward adjustment of expectations regarding the level of, and uncertainty around, a household's disposable income.

In economic theory, expectations matter greatly for household consumption decisions. The household budget constraint for consumption over time is ultimately a reflection of expected income, wealth, house prices and market interest rates. If many households adjust their expectations at the same time, this can have macroeconomic consequences. Expectations also affect asset prices. The combination of many households with large balance sheets and very low interest

[47] Kaplan, Mitman and Violante (2020a) study the financial crisis in a macro model tailored to US conditions. From survey data, they infer that revised expectations are a more important driver than changes in lending terms when it comes to observed changes in house prices, which in turn affected consumption. Attanasio et al. (2020) find that revised expectations about future income mattered a great deal for the consumption patterns of US households during the financial crisis. Andersen and Leth-Petersen (2021) show that unexpected house price changes affect household borrowing and consumption spending.
[48] See Bunn and Rostom (2015).

rates leaves household portfolios more sensitive to even modest changes in expected future rates.

Economists often assume that agents in the economy have rational expectations. This means that they, in an uncertain world, use all available information to make unbiased forecasts about the future. In retrospect, these expectations may turn out to be wrong even if they were rational, but the errors are not systematic and over time they average out to zero. This assumption is sometimes misinterpreted as a statement about households de facto having such expectations. Modern macroeconomics uses the assumption as a starting point for analysis.[49] But this does not rule out frictions that affect how households form expectations, causing them to not gather or process all relevant information or have systematically biased expectations.[50]

Forming expectations can be described as proceeding in several steps. You start with a view of current conditions and earlier outcomes, and this is weighed together to form a comprehensive set of expectations about the future. This requires knowledge, time, effort and attention. Next, these expectations are continuously updated in the light of new information. Finally, these updated expectations are translated into appropriate actions, for example adjusting consumption today in the light of revised expectations about future income.

In practice, there is ample room for error along the way. The information at hand is incomplete and sometimes inaccurate. Households have limited cognitive ability and may find it difficult to use financial information. Many lack basic financial literacy.[51] Another form of "bounded" rationality is that households to a varying extent suffer from problems with insufficient self-control, for example focusing too much on the present and near future when making decisions and finding it hard to stick to long-run consumption plans, so-called time inconsistency.[52] Households also have limited time and energy and make rational trade-offs between using their attention for different purposes. All of these factors contribute to households not immediately updating their expectations in the light of new information or updating

[49] See Lucas (1974).
[50] See the discussion in, for example, Sims (1980) and Sargent (1993). For implications for macroeconomic models, see, for example, Mankiw and Reis (2002), Sims (2003) and Woodford (2003). For a recent survey of the literature, see Angeletos, Huo and Sastry (2020).
[51] See Lusardi and Mitchell (2014) for a survey. For results on Swedish data, see Almenberg and Säve-Söderbergh (2011).
[52] See, for example, Laibson (1997), Gul and Pesendorfer (2001), Meier and Sprenger (2010) and Schlafmann (2020).

inaccurately, as well as relying on rules-of-thumb to form expectations and translate expectations into actions.[53]

Sometimes, the errors give rise to systematic bias. For example, individuals may attach to much weight to certain data, mistakenly perceive non-existing patterns in data, consistently over- or underestimate a particular risk, be optimistic or pessimistic; these errors may affect others' beliefs in ways that lead to herding behaviour.[54] This kind of behaviour can potentially have serious repercussions, for example when it comes to asset prices.[55]

Several studies find that a household's expectations are disproportionately affected by historical experiences.[56] This pattern has been observed in Swedish survey data: younger individuals, who have mostly experienced rising house prices, have higher expectations regarding future house price growth.[57] A human tendency to extrapolate past experience when forecasting the future can contribute to macroeconomic risks when it involves important financial decisions and when many households are exposed to the same asset. Younger cohorts in the Swedish housing market have to a large extent experienced falling interest rates and rising house prices, while property taxes have been cut. If their expectations about the future attaches too much weight to their personal experience, they risk underestimating risks and taking on too much debt. And there is a risk that many households will revise their expectations at the same time.

Vulnerabilities in a crisis and the design of borrower-based measures

The discussion above focuses on how households with debt are affected by isolated shocks. It is also important to examine the role of debt in an economic crisis where

[53] Gennaioli and Shleifer (2010) and Bordalo, Gennaioli and Shleifer (2020) show how (limited) attention, together with prior experience, affects decision making. Coibion and Gorodnichenko (2012, 2015) find that forecasters do not fully update forecasts in response to shocks, in line with information being sticky.
[54] For example, Rozsypal and Schlafmann (2019) find that US households systematically underestimate future changes in income.
[55] For a discussion, see Kindleberger (1978), Minsky (1986), Shiller (2005) and Stiglitz (2021). For a formal model, see Geanakoplos (2010). See also Piazzesi and Schneider (2009) and Case, Shiller and Thompson (2012) who show that the rise in US prices before the financial crisis was accompanied by a large share of households having optimistic (and to some extent unmotivated) expectations of future house prices.
[56] Malmendier and Nagel (2016) find that interpersonal differences in experienced inflation is correlated with expectations of future inflation. Own experiences can also influence house price expectations. Kuchler and Zafar (2019) report that individuals living in regions where house price have increased more expect higher cross-regional price growth in the future.
[57] See Hjalmarsson and Österholm (2020).

many shocks occur at the same time, spill over onto other agents in the economy, and interact through general equilibrium effects.

Shocks to the real economy and to the financial system risk reinforcing each other through various vulnerabilities. As a macroprudential authority, FI has a responsibility to try to identify vulnerabilities. The nature of crises is such, however, that it is hard to identify and evaluate vulnerabilities *ex ante*. In this section, we begin by using the US financial crisis to illustrate vulnerabilities associated with that particular crisis. We wish to emphasise that the Swedish institutional setup is very different, and for this reason lessons from the US do not automatically apply to Sweden. Next, we outline two possible crisis scenarios that may be relevant for Sweden. The scenarios illustrate potential vulnerabilities in different crisis trajectories. We also discuss what, in each of these two scenarios, might constitute an appropriate borrower-based measure that increases households' resilience and lessens the impact of the crisis. Towards the end, we discuss the design of borrower-based measures in more general terms.

Vulnerabilities in the financial crisis

The financial crisis in the US in 2007–2009 serves to illustrate what could constitute vulnerabilities. The leading explanation for the trajectory of that particular crisis is that looser lending and product innovation in the US mortgage market, together with overly optimistic expectations about future house price growth, led to inflated house prices – a typical boom.[58] Vulnerabilities included new mortgage products, mortgage funding (e.g., mortgage-backed securities in vehicles funded by short-run debt), insufficient oversight of securities and lenders, and inflated expectations. There were also other vulnerabilities in the financial system, such as the low loss-absorbing capacity of lenders and investors and a high degree of interconnectedness between them.

The ensuing crisis – the bust that followed the boom – started with an economic slow-down in the form of declining household incomes, which resulted in weaker demand for housing and hence declining house prices. Since many US mortgages are non-recourse, the decline in house prices led to a rise in mortgage defaults. This led to increased stress in financial markets, which in turn reinforced the already unfavourable conditions through higher funding costs, higher mortgage rates and tighter lending terms. Some lenders foreclosed on the collateral and fire sales added to the downward pressure on house prices, an example of a negative externality.[59] In that particular crisis, non-recourse mortgages appear to also have

[58] Other notable examples where a rapid expansion of credit supply played an important part during the build-up phase of a crisis is (a) Sweden in the 1990s and (b) the period following the introduction of zero-amortisation mortgages in Denmark in 2003.
[59] An *aggregate demand externality* is when an action is individually rational for an agent in the economy but also imposes a cost on others through this action in a manner that

been a vulnerability. When household income and wealth declined, households cut back on consumption, making the recession deeper. Some studies also argue that households revised their expectations regarding future house price growth, which reduced demand for housing and contributed further to the fall in house prices.[60]

Two crisis scenarios and the link with borrower-based measures

The deepest economic crisis that Sweden has experienced in recent history is the crisis in the 1990s. Several important lessons have been drawn from that crisis: problems in the financial system and the real economy risk being mutually reinforcing, major structural changes that occur at the same time can have unintended and undesired macroeconomic consequences, and fiscal space is crucial for managing a deep economic crisis. But the detailed trajectory of the crisis reflected conditions that are less relevant today, such as the movement of interest rates when defending a fixed exchange rate.[61] As for the financial crisis in 2007–2009, it was to a large extent a crisis that started elsewhere but also affected Sweden, not least by making it more difficult for Swedish banks to secure funding in international capital markets.

To illustrate how household debt can affect the trajectory of a crisis, we choose instead to describe two hypothetical crisis scenarios that are more relevant today. The scenarios are only examples. We use the scenarios to show how different kinds of borrower-based measures, depending on circumstances, can make a difference in terms of the severity of a crisis.

The first scenario

The economy is hit by large shocks that lead to rising unemployment and falling house prices. Weaker economic development and increased uncertainty about the future cause households to increase their precautionary savings, weakening aggregate demand. The monetary policy rate is already at its lower effective bound and expectations of future rates are already low, so monetary policy has limited scope for offsetting the fall in aggregate demand through rate cuts or forward guidance. Because households give priority to interest payments and other housing

depresses aggregate demand. For example, a lender forecloses on a property used as collateral for debt, thereby contributing to further downward pressure on house prices. This is also an example of a self-reinforcing mechanism.

[60] See Kaplan, Mitman and Violante (2020a) for a macroeconomic analysis of this kind. See Bernanke (2010) for a detailed discussion of vulnerabilities and triggers in the financial crisis.

[61] Public finances were weak, and monetary policy was primarily tasked with defending a fixed exchange rate; hence, monetary policy was not able to provide a stimulus during the crisis. Meanwhile, the financial market and the commercial real estate market played a central role during the run-up to the crisis, a phase that was characterised by financial deregulation followed by excessively loose lending, especially to the commercial real estate sector, leading to a spike in prices followed by a sharp fall.

costs, while also increasing precautionary savings, consumption spending declines. The larger the share of interest payments and housing costs in overall household expenditures, the greater the (proportional) decline in other consumption. This results in a particularly large decline in consumption among highly indebted households. Weaker demand in the economy leads to a further decline in household disposable income. By cutting back on consumption, the individual household is generating a negative externality for other households. This sequence of events coincides with severe turbulence in financial markets. Rising risk premia and increasing funding costs for banks amplify the downturn in the real economy. Banks experience increased credit losses and raise their profit margins on loans in order to improve their earnings and capital ratios. Higher lending rates are quickly passed on to mortgages with adjustable rates, further dampening consumption spending. The relevant authorities are unable to intervene in financial markets – or choose not to do so – to the extent required to prevent higher lending rates.[62]

The scenario shows how different vulnerabilities interact. Some of these are beyond the scope of borrower-based measures, such as the policy rate being at an effective lower bound or weak competition in the banking sector. Other vulnerabilities, however, can be reduced through borrower-based measures. All else being equal, the effect on household consumption is smaller if households enter the crisis with less debt or larger liquid buffers. By contrast, large debts and small liquid buffers increase the risk that households will cut back sharply on consumption. That banks are able to raise interest rate margins is linked to the prevalence of adjustable-rate mortgages. Borrower-based mortgages that reduce household debt, increase liquid buffers or lengthen interest rate fixation periods can reduce vulnerabilities in this scenario.

Scenario 2

A sustained rise in house prices causes households' expectations of future house prices to increase rapidly, which leads to increased demand for housing. New construction responds slowly to increased demand, which means the housing supply increases slower than demand. Both house prices and household debt increases as new buyers take out larger mortgages. Optimistic households experience the largest increase in demand. Next, something happens in the economy that cause households to adjust their expectations downward, and optimistic households make the largest revisions. House prices fall, and households experience declining wealth, in particular highly leveraged homeowners where the difference between the market value of the house and the amount of debt can

[62] For example, the Riksbank has different tools at its disposal that can be used for such interventions. The scenario should not be interpreted as saying that the Riksbank or other public agencies are unable to intervene, but simply that there is a non-zero probability of scenarios where they fail to do so. This could, for example, be due to concerns about the solidity of the banking sector or being faced with a challenging trade-off with regard to other targets, such as inflation.

diminish rapidly. The greater the decline in wealth, the more the household cuts back on consumption. Many households have large balance sheets: they have purchased expensive homes while also being highly indebted. The impact on their net wealth is relatively severe. New construction becomes harder to sell, adding to the downward pressure on house prices. In this scenario, optimistic household expectations constitute a vulnerability, by inducing households to take on too much debt. A borrower-based measure that entails higher debt payments for households with higher leverage would function as a "brake" during the build-up to the crisis.

The two scenarios above are examples of crisis trajectories where borrower-based measures, if appropriately designed, can reduce vulnerabilities in a crisis. This can potentially increase household welfare. A welfare gain arises when household behaviour during the crisis to a lesser extent exposes the economy to market failures and negative externalities.

The severity of a crisis can vary.[63] Historical experience suggests that crises that mainly affect households are less severe and easier to manage with standard tools of macroeconomic stabilisation policy. Crises that also affect the financial system tend to be deeper and require more complex mitigation measures. Things become even more difficult if the crisis also spills over to (or even stems from) public finances, since then there is a risk that the scope for mitigating measures could be greatly restricted. Based on this simplified taxonomy of crises, it can be argued that borrower-based measures and other regulation can reduce the probability of a crisis, or the depth of a crisis, by weakening the links between, for example, falling house prices, household consumption and the health of the banking system, which in turn can have a positive impact on public finances.[64] Aside from the two scenarios outlined above, it is also possible to envisage other scenarios in which regulation fills this role. But it is also possible to envisage scenarios where regulation, depending on specific details, fails to achieve this effect or even makes the situation worse.

Flexibility of households important in the design of borrower-based measures

Borrower-based measures involve a trade-off between restricting households' choices and preventing the build-up of risks to macroeconomic stability. Borrower-based measures have the potential to reduce vulnerabilities in a crisis, as shown in the scenarios above. These scenarios also illustrate how what constitutes an appropriate measure is highly contingent on the specific trajectory of a crisis and

[63] The "taxonomy of crisis" outlined here draws on Blanchard (2018).
[64] From the crisis taxonomy it is also possible to draw the conclusion that the deeper the crisis, the more policy tools from different public agencies need to be utilised (see Blanchard, 2018). The depth and duration of a crisis also determines at what cost measures are worth undertaking.

on the preceding build-up of vulnerabilities. If scenarios like these are seen as possible, but it is hard to assign probabilities to them, it becomes even more difficult to design appropriate measures due to this genuine uncertainty.

A number of studies have examined how the design of mortgage contracts can contribute to macroeconomic stability. A general conclusion is that flexibility when it comes to debt servicing – the payment of interest and amortisation – can contribute to macroeconomic stability by temporarily lowering expenses for households with a high MPC.[65] If the household is able to postpone some debt payments, there is less risk that they will have to cut back on consumption in a downturn. This applies, for example, if households can postpone amortisation payments. In a similar spirit, mortgages with adjustable rates can also contribute to macroeconomic stabilisation, assuming that the central bank has room to cut interest rates.

In order to understand how borrower-based measures can increase household resilience to shock, it is also relevant to look at other parts of households' balance sheets. Borrower-based measures do not necessarily have to regulate debt payments. For example, it is possible to envisage measures that instead target households' liquid buffers. An example is Australian mortgages, where debt repayments ahead of schedule entitle borrowers to an equivalent buffer in the form either a credit line (a *redraw facility*) or liquid assets (an *offset account*). This mortgage buffer makes housing a more liquid asset for borrowers that have made early repayments and is taxed favourably. Most borrowers in Australia have the option to make repayments ahead of schedule at no additional cost, making this a common way to build liquid buffers.[66]

Sweden, like many other countries, has introduced regulation aimed at lenders but impacting borrowers. FI introduced an LTV cap in 2010.[67] This was followed by an amortisation requirement that was introduced in 2016 and tightened in 2018. In

[65] The research literature has examined how different dimensions of the mortgage contract affect borrowers and lenders. Using a stylised characterisation of the relationship between a rational borrower and a rational and risk-neutral lender, Piskorski and Tchistyi (2010), for example, show that the optimal contract under certain conditions is an adjustable-rate mortgage where the borrower has flexibility in choosing the rate of repayment. See also Campbell, Clara and Cocco (2020), Guren, Krishnamurthy and McQuade (2021) and Greenwald, Landvoigt and Van Nieuwerburgh (2020). Karlman, Kinnerud and Kragh-Sørensen (2020) study how different credit constraints affect household MPCs in response to negative wealth shocks and find limited effects.
[66] For a more detailed description, see Price et al. (2019).
[67] Sweden, like many other countries, introduced a loan-to-value cap prior to the establishment of macroprudential supervision, largely as a form of consumer protection. Nonetheless, this tool is now considered part of the macroprudential tool kit.

the next section, we look more closely at how amortisation requirements affect households.

Amortisation requirements affect households in several ways

Large debts can make household consumption more sensitive to shocks. And if you require borrowers to amortise at a faster rate than they would otherwise have chosen, their outstanding debt will be smaller – in the short run as well as the long run.[68] But even so, such a requirement has mixed effects on household resilience because mandatory amortisation also has other effects that matter for households' sensitivity to shocks.[69] In this section, we discuss how mandatory amortisation affects households' cash flow and balance sheets. We then proceed to discuss how amortisation requirements affect the sensitivity of consumption to different shocks.

Cash flow effects are negative in the short run and positive in the long run

An amortisation requirement affects borrowers' cash flow because repayments become more front-loaded, with more of the principal being repaid at an earlier time. Initially, debt servicing costs increase, provided that the stipulated amortisation rate exceeds what the borrower would otherwise have chosen. But in the long-run, debt servicing costs become lower, as both the outstanding principal and the interest payments decline at a faster rate, and because borrowers take on less debt to the extent that the amortisation requirement lowers house prices. According to the theory outlined above, earlier repayments initially lead to lower consumption or less saving in liquid assets.[70] The size of this effect – and its duration – depends on the level of interest rates, how much the household would

[68] In the absence of regulatory requirements, borrowers and lenders are free to agree on a pace at which debt is repaid. In many countries, amortisation is a standard feature of mortgages. In Sweden, banks have historically often required amortisation, albeit at different rates, and the extent to which this was required by banks themselves has also varied over time. Hence, many households amortised also prior to the amortisation requirement, but amortisation rates have increased among new borrowers. As a result, new borrowers take on slightly less debt than they would otherwise have done. Finansinspektionen (2017) estimates that the requirement caused new borrowers to reduce their debt-to-income ratio by 9 percent on average. Accordingly, absent the requirement, the average debt-to-income ratio among new borrowers would have been 377 percent, rather than 346 percent as observed.

[69] In addition, the fact that households are able to increase their debt at a later stage (home equity withdrawal) implies that it is unclear how much the debt level is actually reduced in the long run.

[70] Amortisation is a form of saving, not a cost. But paying down debt at a faster rate than the household would voluntarily have chosen entails a cost from the borrower's perspective to the extent that it prevents a rational household from sticking to its preferred consumption plan or preferred form of saving. See Bäckman and van Santen (2021).

have borrowed, the preferred amortisation rate in the absence of a requirement, and to what extent the requirement itself affects how much the household borrows.

The cash flow effect also depends on the specific details of an amortisation requirement.[71] In Sweden, the requirement has a "safety valve" that makes it possible to get a temporary exemption in special circumstances such as unemployment, sickness or divorce. As a result, many of the situations in which mandatory amortisation would be a particularly large strain on the household can be avoided. To the extent that households use this safety valve, their cash flow, during that time, will be affected positively also in the short run.

Negative effect on liquid assets

Amortisation requirements are likely to affect both the size of the balance sheet and its composition. Balance sheets become smaller if an amortisation requirement makes the household buy a less expensive home and the household to a large extent prefers saving by paying down debt rather than accumulating financial assets. This makes the household's net wealth less sensitive to fluctuations in asset prices over time. But the crowding-out of other forms of saving also changes the composition of the balance sheet, and this can negatively impact the household's resilience to shocks, as liquid assets are a more dependable buffer than a hypothetical ability to borrow. If mandatory amortisation to a large extent replaces saving in liquid assets with low risk, this could even make households more vulnerable, not less. Their cash flow is burdened with larger debt payments for some time, and they are less able to use buffer savings to offset a loss of income.[72] This problem can be mitigated by ensuring that the amortisation requirement retains flexibility in such situations where it is more likely that a household will need to draw on available buffers. Moreover, this flexibility can be triggered when not just individual, but also macroeconomic, circumstances are such that the negative effects of the requirement would otherwise be particularly apparent.[73]

Figure 1 below illustrates schematically how an amortisation requirement affects the consumption, mortgage debt and liquid assets of four different household types. One can view consumption, asset holdings and the amount of debt as communicating vessels.[74] To what extent consumption and liquid assets are affected by an amortisation requirement depends on how much the household would have saved absent the requirement and in what form (paying down debt or

[71] See also Finansinspektionen (2014b).
[72] See Svensson (2020).
[73] An example of this is that FI clarified in 2020 that a deep economic crisis can also constitute special circumstances for granting a temporary exemption from amortisation, even if the borrower has not yet experienced a loss of income. This gives households improved scope for accumulating a liquid buffer in times of elevated uncertainty compared to a more rigid amortisation requirement.
[74] Consumption here includes the consumption of housing services.

increasing holdings of liquid assets). In Figure 1, this is illustrated with four types that represent corner solutions in these two dimensions. For households in the top left quadrant, who save a lot and prefer to do so mainly by paying down debt, an amortisation requirement makes little difference. But for the other types, such a requirement affects outcomes in a way that affects their resilience in different ways. For households in the top right quadrant, the requirement causes a redirection of saving. If the household keeps consumption unchanged, the requirement causes the household to pay off debt at a faster rate but also to hold fewer liquid assets. As a result, the net effect on its resilience can be either positive or negative.[75]

1. Short-run effects on saving and consumption

	Save through amortisation	Save in liquid assets
High savings	No change in consumption	No change in consumption
	No change in debt	Lower debt: increased resilience
	No change in liquid assets	Fewer liquid assets: decreased resilience
Low savings	Consume less	Consume less
	Lower debt: increased resilience	Lower debt: increased resilience
	No change in liquid assets	Fewer liquid assets: decreased resilience

For households that save little absent a requirement, i.e., the two types in the bottom half of Figure 1, the effect on consumption is negative as long as the requirement is binding. This entails a cost in terms of lower welfare for these households. For households that save little but do so by paying down debt, an amortisation requirement has little effect on liquid assets and reduces debt (the bottom left quadrant). Resilience increases when such a household is required to

[75] Whether an amortisation requirement makes these households more resilient or not depends on not only other assumptions but also on the probability assigned to different crisis scenarios.

amortise, provided it still chooses to take out a mortgage and purchase a home.[76] For households that save little but do so by increasing their holdings of liquid assets (the bottom right quadrant), the effect on resilience is ambiguous. The effect depends not only on what kind of crisis trajectory is more likely, but also on what kind of liquid assets the household prefers to hold and to what extent amortisation crowds out other saving. For the economy as a whole, the overall net effect on resilience also depends on the prevalence of each of the four types in Figure 1. It is also worth bearing in mind that these four categories are not exhaustive.[77]

The effect on welfare for the four types described in Figure 1 depends on the effects on consumption and on the composition of savings. Households that consume less than intended experience a welfare loss – provided, at least, that they, in the absence of regulation, are able to choose an optimal or near-optimal consumption path (see footnote 70 and the previous discussion). Households that due to an amortisation requirement redirect their saving from the accumulation of assets to paying down debt also experience a welfare loss.

In sum, this discussion serves to illustrate, albeit in simple terms, how the resilience of households depends on circumstance that can differ greatly between households. This heterogeneity at the micro level can be important for understanding risks at the macro level. This also implies that if there is a wish to use macro models to analyse risks and measures linked to household debt, it is appropriate to focus on macro models that explicitly account for household heterogeneity, drawing on micro data.

A key issue when assessing household resilience, and where micro matters, is to what extent mandatory amortisation crowds out saving in liquid assets. That is ultimately an empirical question requiring micro data at the household level. The empirical base is limited because few countries have introduced amortisation requirements in regulation (in many countries, paying down the debt at a pre-agreed rate is a standard feature of mortgages), and there is no micro data on the assets and debts of Swedish households at the time when the amortisation requirement was introduced. The limited number of international studies in this area have contradictory findings. Economic theory suggests a large crowding-out effect, but there is not much empirical support for this view. When a restriction on zero-amortisation loans was imposed on Dutch first-time buyers, those that were affected chose to consume less, and to some extent work more, but their saving in

[76] Another category that is not captured in Figure 1 is households that postpone entering the (owner-occupied) housing market as a consequence of regulation. If the household postpones entry, and in the meanwhile rents housing, it is not evident that they are more resilience if renting is more expensive than owning.
[77] Other household types are also conceivable, such as households that consume too much relative to their income and wealth. In this case, an amortisation requirement can be relevant from a consumer protection perspective.

financial assets was not affected.[78] When zero-amortisation mortgages were introduced in Denmark, many households increased their mortgage debt in order to increase consumption, not savings in the form of liquid assets, at least in the short run.[79] Different age groups also reacted differently. Consumption increased in particular among younger and older households, in line with the predictions of a life cycle model. By contrast, prime working age households that took out zero-amortisation mortgages increased their saving in financial assets.[80]

A different context where the substitution of one form of saving for another has important ramifications is the design of pension systems. A number of studies have examined how a change in mandatory pension saving affects saving in other financial assets. In general, these studies find limited substitution, which implies that total saving is affected. For some households this effect appears to be large.[81]

But mandatory amortisation also affects the initial financing of a home purchase. If households respond to an amortisation requirement by taking on less debt without adjusting what they purchase to the same extent, they will have less liquid assets after the purchase. A down payment requirement (LTV cap) can have a similar negative effect on households' liquid assets.

A study from Norway looks at the effect of the introduction and subsequent tightening of an LTV cap and finds a persistent crowding-out effect on liquid assets.[82] Unlike the Norwegian case, Dutch borrowers gradually returned to previously observed levels of liquid assets after the introduction of an LTV cap.[83] It is hard to say what the effect has been for Swedish households since Sweden since 2007 lacks micro data offering a comprehensive view of households' assets and debts. That there is some degree of crowding out is likely, however. But if mandatory amortisation does not have a large impact on other forms of saving, the negative effect on consumption and welfare would be relatively large in normal times, although the positive effect on resilience would also be relatively large. In other words, the trade-off between welfare in normal times and welfare gains in the form of increased resilience in crises then becomes particularly pronounced.

Available credit increases over time but remains uncertain

Amortisation gradually increases the borrower's ability to take on new debt if needed. To the extent that an amortisation requirement also makes banks' credit

[78] See Bernstein and Koudjis (2021).
[79] See Bäckman and Khorunzhina (2020).
[80] See Larsen et al (2020).
[81] See Poterba, Venti and Wise (1995), Arnberg and Barslund (2014), Chetty et al. (2014) and Goodman (2020).
[82] See Aastveit, Juelsrud and Getz Wold (2020).
[83] Van Beekum et al. (2019).

evaluations stricter, this positive effect of amortisation on the ability to take on debt is to some extent counteracted by a negative effect on how much banks are willing to lend.[84] But simply being able to take on new debt is a far less reliable buffer than a pre-agreed credit line or liquid assets. In terms of resilience to shocks, the crucial issue is under what personal or macroeconomic circumstances the household is truly able to take on more debt. Households may find it hard, or be unwilling, to borrow under stressed (personal or economy-wide) financial conditions. In order to take on debt, the borrower has to contract with a counterparty on terms set by the market. In a serious crisis, it is likely that the scope for new borrowing would be reduced or even become non-existent. Many borrowers may experience a decline in their debt-carrying capacity, and system-wide financial stress can lead to a contraction in the supply of credit.[85] Similarly, it is important that buffer savings have moderate risk. Direct holdings of high-risk stocks and mutual funds are typically liquid but may drop sharply in value exactly when buffers are needed for consumption spending.

Reduced sensitivity to both small and large interest rate changes

An amortisation requirement makes households borrow less and pay down debt faster. This reduces their sensitivity to changes in interest rates, all else equal. The implication for macroeconomic risks depends on, among other things, whether monetary policy is unconstrained in setting the policy rate, so that household interest expenditures adjust in a manner that stabilises aggregate demand. If this is the case, less debt means that larger changes in the policy rate are required in order to achieve the same change in interest expenditures and hence in aggregate demand. In some scenarios, these conditions are satisfied, while in others they are not.[86]

In terms of sensitivity to more long-run and persistent changes in interest rates, an amortisation requirement probably has beneficial effects, as a more front-loaded time profile of amortisation payments make debts decline faster. This can be valuable if future mortgage rates end up being higher than households have anticipated. This could, for example, be the case if the neutral rate, which has been in secular decline, were to start increasing, if monetary policy needs to be

[84] As far as the current Swedish amortisation requirement is concerned, banks to a large extent already took amortisation into consideration in the credit evaluation process (when deciding how much they were willing to lend) before the regulation was introduced. But the requirement still constituted some degree of tightening. This is especially the case for borrowers required to amortise 3 per cent, an amortisation rate that banks in most cases did not account for in their credit evaluations.
[85] See, for example, Jensen and Johannesen (2017).
[86] As mentioned previously, a situation in which banks raise their profit margins on lending could constitute such a scenario.

contractionary despite low resource utilisation in the economy, or if banks sharply increase their margins on mortgages in order to compensate for higher funding costs or increased credit losses.

Flexibility is key for managing loss of income

A rigid amortisation requirement risks making borrowers more sensitive to a loss of income for as long as debt payments remain higher than they would have been, absent the requirement.[87] By allowing for exemptions in special circumstances, an amortisation requirement can safeguard a degree of flexibility regarding households' cash flows in relation to many types of income shocks. Such exemptions can ease debt payments in situations where the household experiences a loss of income.

Even if such flexibility is incorporated in the design, an amortisation requirement can make households more sensitive to a loss of income. For some households, an amortisation requirement may cause them to postpone their entry into the housing market rather than buying a less expensive home. If, in the meantime, they rent accommodation in the form of an expensive sub-let, they may be more sensitive to a loss of income, as more of their cash flow is required to cover the cost of housing services. If the rental contract is such that it is difficult to quickly reduce expenditure on rent, other parts of consumption will have to be reduced more.

Reduced risk of runaway house prices

Our discussion has focused on short-run responses to minor shocks, mainly temporary fluctuations in income, interest rates or wealth. Changes in expectations themselves can also constitute a form of shock. This is important to bear in mind as expectations are sometimes subject to large and persistent revisions, for example in connection with economic regime-shifts or large reforms – as occurred in Sweden during the 1990s. In this case, household debt can affect households' consumption plans in the short run as well as in the longer run. Many studies focus on short-run responses, but long-run effects are also important.

If rising house prices reflect overly optimistic expectations of future house price growth, new borrowers are likely to be highly leveraged and less inclined to save in liquid assets as the opportunity cost is perceived to be high. Optimism contributes to increased indebtedness and smaller buffers. A broad reset of expectations can then have a particularly significant impact on the macroeconomy.[88]

Many countries that experienced rapid growth in household debt, house prices and consumption before the financial crisis subsequently experienced a deeper downturn and also a slower recovery after the crisis. In the US, the drop in

[87] See Finansinspektionen (2014b).
[88] See, for example, Braconier and Palmqvist (2017).

consumption was particularly pronounced in regions where house prices had increased particularly steeply when housing supply responded insufficiently to the increase in demand. [89]

One of the purposes of the credit market regulation introduced after the financial crisis has been to avoid precisely this kind of dynamic, so-called boom-bust episodes.[90] But similar patterns should not be ruled out also in more moderate cycles. Australia was only moderately affected by the financial crisis, and yet many highly indebted households cut back on consumption after the crisis.[91] An amortisation requirement that is expressed in relation to the purchase price then has a built-in "brake": when house prices (and new mortgages) increase faster than incomes, the stipulated amortisation will take up a greater share of borrowers' disposable income.[92] In order to prevent self-reinforcing spirals of rising expectations, debt and asset prices, amortisation requirements linked to loan-to-value or debt-to-income ratios can potentially fill an important role.

Conclusion

In this FI analysis, we describe, on the basis of standard economy theory and in the light of recent empirical research, how the resilience of households, and their welfare, is affected by debt and amortisation.

Indebted households are exposed to changes in interest rates, income and house prices. Through the so-called cash flow channel, a higher debt-to-income ratio makes household consumption more sensitive to changes in the interest rate. This is in itself a double-edged sword. On the one hand, the transmission of monetary policy becomes stronger, provided that the Riksbank is not constrained by an effective lower bound on the policy rate. On the other hand, household consumption spending declines more in response to shocks that cause mortgage rates to increase. Households that have taken on a lot of debt may also have less scope for dealing with a loss of income, for example by increasing their borrowing. A general conclusion is that household buffers, in the form of both being able to borrow and having liquid assets, are important for assessing household resilience when facing income losses.

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[89] See Mian, Rao and Sufi (2013).
[90] For a discussion, see, for example, Broadbent (2019).
[91] Price et al. (2019) base their main result on a regression where the level of consumption is explained by a number of variables, including the level of debt. Svensson (2021a) shows, however, that debt growth is driving the consumption dynamics and the decline in consumption constitutes a normalisation of household spending.
[92] An amortisation requirement can also be expressed in relation to the debt principal at origination. This is the case in Sweden. If an increase in house prices also leads to larger mortgages, the requirement also generates a "breaking" effect in line with that outlined above.

A drop in house prices leads to redistribution among households at different steps on the housing ladder. The net impact on aggregate household consumption depends on the MPCs of winners and losers. The wealth effects for winners and losers are amplified if house prices are elevated and leverage is high. Falling house prices can also make highly indebted households revise their expectations of future consumption. In addition, falling house prices can make it harder for households to increase their borrowing when they experience a reduction in home equity. If many households use credit to sustain consumption in a downturn, this can have consequences for the path of aggregate consumption.

In a crisis, many shocks interact. This increases the risk that many households simultaneously cut back on consumption, further worsening the crisis. Assessing resilience in a crisis is more complex than simply adding the effects of isolated minor shocks. Debt has often played a central role in crises, both in triggering them and shaping their subsequent trajectory. This reflects an interplay between expectations, asset prices and debt. Moreover, crises effect both borrowers and lenders, and actions that are rational for an individual agent may have negative consequences for others. We illustrate this with two crisis scenarios. What constitutes a suitable preventive borrower-based measure differs in the scenarios, and the fact that the probabilities of either scenario is unknown illustrates the difficulty in designing borrower-based measures.

Debt makes households more sensitive to economic shocks, but this does not necessarily imply that a measure that reduces debt also increases resilience. To judge the effect of measures that reduce debt, it is necessary to consider both debt and assets since households' liquid assets constitute the most important buffer. It is also necessary to consider the effect on households' cash flow. Flexibility in how households can allocate their disposable income increases their resilience.

Based on these insights, we look in more depth at the effects of mandatory amortisation. The discussion is in general terms but has relevance for Sweden and FI's amortisation requirement. The main conclusion is that an amortisation requirement affects different households in different ways. In terms of resilience, the net effect depends primarily on to what extent mandatory amortisation crowds out saving in liquid assets and what flexibility households have in redirecting cash flow from amortisation to buffer saving or consumption in the face of increased economic uncertainty.

An amortisation requirement affects household welfare in several ways. The welfare effect in normal times depends on to what extent household consumption, including the consumption of housing services, is affected by the requirement. Calculating the overall welfare effect is more complex. The conclusion will hinge on the weight given to welfare costs in normal times relative to potential welfare gains in crises and the probabilities assigned to different crisis scenarios with and

without the regulation. Such calculations are characterised by genuine uncertainty. The welfare cost is immediate for affected borrowers, and for some it can be substantial. The welfare gains are harder to evaluate and to a large extent indirect, in the sense that the objective is mainly to avoid, or reduce the severity of, future crises. The welfare calculations are further complicated by considerations of the possibility that myopic households may engage in debt-financed, unsustainable consumption, for example when house prices increase. From a consumer protection perspective, this is relevant for FI, regardless of whether this category of households is large enough to generate macroeconomic risks.

After the financial crisis, a large amount of new research examined risks linked to household debt. In our view, research in this area has matured in the sense that more recent studies have pointed out shortcomings in previous work and to some extent deepened our understanding of the underlying mechanisms. A conclusion from this research is that households are heterogeneous in ways that matter a great deal when it comes to shedding light on risks linked to households' debt and consumption. Assessing macroeconomic risks connected to household debt requires a broad set of indicators. For example, high debt-to-income ratios are not in themselves sufficiently informative to conclude that resilience has diminished.

Our analysis indicates that household resilience depends on conditions that to a large extent differ between households. Therefore, micro data containing a comprehensive picture of households' debt, assets and consumption is an important foundation for assessing macroeconomic risks and household resilience. The lack of such data in Sweden is a major obstacle for the design and evaluation of borrower-based macroprudential measures. From this perspective, the recently launched public enquiry into statistics regarding household balance sheets is a most welcome development.

The interplay between asset prices, expectations and debt can be of importance for how a crisis unfolds. For this reason, it is also relevant to measure households' expectations regarding house prices and interest rates. The National Institute of Economic Research conducts a regular survey of interest rate expectations. They had also surveyed households' house price expectations for a while but had ceased doing so by 2017. Our analysis suggests that it would be valuable to resume those measurements and extend the scope to also include specific measures of expectations among the subset of households that is active in the housing market.

A related conclusion is that if one wishes to use macro models to analyse how borrower-based measures affect resilience, welfare and the rest of the economy, the analysis should draw on models where households differ in characteristics and the economic circumstances that they face, and where this heterogeneity reflects micro data. As increasing importance is being attached to this class of models within macroeconomic research, the approach also becomes increasingly relevant for

policy. But it is important that the models be tailored to the conditions in Sweden, not least in terms of the specifics of the housing and mortgage markets.

References

Aastveit K. A., R. E. Juelsrud and E. Getz Wold (2020), *Mortgage regulation and financial vulnerability at the household level*, Norges Bank Research: Working Paper 6.

Aladangady A. (2017), *Housing wealth and consumption: Evidence from geographically linked microdata*, American Economic Review.

Almenberg, J., A. Lusardi, R. Vestman and J. Säve-Söderbergh (2021), *Attitudes to debt and debt behavior*, Scandinavian Journal of Economics.

Almenberg, J. and J. Säve-Söderbergh (2011), *Financial literacy and retirement planning in Sweden*, Journal of Pension Economics and Finance.

Andersen, A., C. Duus and T. Laerkholm Jensen (2016), *Household debt and spending during the financial crisis: Evidence from Danish micro data*, European Economic Review.

Andersen, H. Y. and S. Leth-Petersen (2021), *Housing wealth or collateral: How home value shocks drive equity extraction and spending*, Journal of the European Economic Association.

Andersson M., T. Aranki, M. Gjirja and N. Olsén Ingefeldt (2018), *The mortgage cap slowed growth of household debt*, FI analysis 12.

Andersson M. and T. Aranki (2019), *Fewer vulnerable households after stricter amortisation requirement*, FI analysis 17.

Andersson, M. and R. Vestman (2021), *Liquid assets of Swedish households*, FI analysis 28.

Angeletos, G-M., Z. Huo and K.A. Sastry (2020), *Imperfect macroeconomic expectations: Evidence and theory*, NBER Working Paper 27308.

Attanasio, O., K. P. Larkin, M. O. Ravn and M. Padula (2020), *(S)Cars and the great recession.* NBER Working Paper 27956.

Auclert, A. (2019), *Monetary policy and the redistribution channel*, American Economic Review.

Baker S. (2018), *Debt and the response to household income shocks: Validation and application of linked financial account data,* Journal of Political Economy.

Berger, D., V. Guerrieri, G. Lorenzoni and J. Vavra (2018), *House prices and consumer spending*, Review of Economic Studies.

Berger, D., K.W. Milbrandt, F. Tourre and J. Vavra (2020), *Mortgage prepayment and path-dependent effects of monetary policy,* Working paper.

Bernanke, B. (2010), *Statement before the Financial Crisis Inquiry Commission*. Washington, D.C.

Bernstein A., and P. Koudjis (2021), *The mortgage piggy bank: Building wealth through amortization*, NBER Working Paper 28574.

Bhutta, N., and B. J. Keys (2016), *Interest rates and equity extraction during the housing boom*, American Economic Review.

Blanchard, O. (2018), *Money and banking*, Nobel Symposium 26-28 maj, Stockholm.

Bordalo P., N. Gennaioli and A. Shleifer (2020), *Memory, attention, and choice*, The Quarterly Journal of Economics.

Braconier, H. and S. Palmqvist (2017), *Makrotillsynens roll i Sverige*. Ekonomisk Debatt 45(4).

Braxton, J., K. Herkenhoff and G. Phillips (2020), *Can the unemployed borrow? Implications for public insurance*, NBER Working Paper.

Broadbent, B. (2019), *Debt dynamics*, https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/debt-dynamics-speech-by-ben-broadbent.pdf

Browning, M. and T. F. Crossley (2009), *Shocks, stocks and socks: smoothing consumption over a temporary income loss*. Journal of the European Economic Association 7(6).

Buiter, W.H (2008), *Housing wealth isn't wealth*, NBER Working Paper 14204.

Bunn, P. and M. Rostom (2015), *Household debt and spending the United Kingdom*, Bank of England Working Paper.

Bäckman, C. and N. Khorunzhina (2020), *Interest-only mortgages and consumption growth: Evidence from a mortgage market reform*, Working Paper.

Bäckman, C. and P. Van Santen (2021), *The amortization elasticity of mortgage demand*, Working paper.

Callender, C. and G. Mason (2017), *Does student loan debt deter Higher Education participation? New evidence from England*, Annals of the American Academy of Political and Social Science.

Campbell, J. Y., N. Clara and J. F. Cocco (2020), *Structuring mortgages for macroeconomic Stability*, NBER Working Paper 27676.

Carroll, C. and M. Kimball (1996), *On the concavity of the consumption function*, Econometrica.

Case, K., R. Shiller and A. Thompson (2012), *What have they been thinking? Homebuyer behaviour in hot and cold markets*, Brookings Papers on Economic Activity.

Cerutti, E., J. Dagher and G. Dell'Ariccia (2015), *Housing finance and real-estate booms: A cross-country perspective*, IMF Staff Discussion Note 12/15.

Cloyne, J., C. Ferreira and P. Surico (2020), *Monetary policy when households have debt: New evidence on the transmission mechanism*, Review of Economic Studies.

Coibon, O. and Y. Gorodnichenko (2012), *What can survey forecasts tell us about information rigidities?*, Journal of Political Economy.

Coibon, O. and Y. Gorodnichenko (2015), *Information rigidity and the expectations formation process: A simple framework and new facts*, The American Economic Review.

Di Casola, P. and J. Iversen (2019), *Monetary policy with high household debt and low interest rates*, Sveriges Riksbank Staff Memo October 2019.

Di Maggio, M., A. Kermani, B. Keys, T. Piskorski, R. Ramcharan, A. Seru and V. Yao (2017), *Interest rate pass-through: Mortgage rates, household consumption and voluntary deleveraging*, American Economic Review.

Dynan, K. (2012), *Is household debt overhang holding back consumption?,* Brookings Papers on Economic Activity.

Englund, P. (2020), *Bostadsmarknadens risker*. Fores.

Fagereng, A., M. B. Holm and G. J. Natvik (2020), *MPC Heterogeneity and household balance sheets*, Working Paper.

Farhi, E. and I. Werning (2016), *A theory of macroprudential policies in the presence of nominal rigidities*, Econometrica.

Finansinspektionen (2014a), *Stabilitetsrisker kopplade till hushållens skuldsättning.* Promemoria.

Finansinspektionen (2014b), *Åtgärder mot hushållens skuldsättning – amorteringskrav*. Promemoria.

Finansinspektionen (2017), *The amortisation requirement reduced household debt*, FI-analysis 10.

Flodén, M., M. Kilström, J. Sigurdsson and R. Vestman (2020), *Household debt and monetary policy: revealing the cash-flow channel*, The Economic Journal.

Ganong, P. and P. Noel (2019), *Consumer spending during unemployment: Positive and normative implications*, American Economic Review.

Ganong, P. and P. Noel (2020), *Liquidity versus wealth in household debt obligations: Evidence from housing policy in the great recession*, American Economic Review.

Garriga, C., F. Kydland and R. Sustek (2017), *Mortgages and monetary policy*, Review of Financial Studies.

Gathergood, J. (2012), *Self-control, financial literacy and consumer over-indebtedness,* Journal of Economic Psychology.

Geanakoplos, J. (2010), *The leverage cycle,* NBER Macroeconomic Annual.

Gelman, M., S. Kariv, M. Shapiro, D. Silverman and S. Tadelis (2020), *How individuals respond to a liquidity shock: Evidence from the 2013 government shutdown,* Journal of Public Economics.

Gennaioli, N. and A. Shleifer (2010), *What comes to mind*, Quarterly Journal of Economics.

Greenwald, D., T. Landvoigt and S. Van Nieuwerburgh (2020), *Financial fragility with SAM?* (under utgivning) Journal of Finance.

Gul, F. and W. Pesendorfer (2001), *Temptation and self-control*, Econometrica.

Guren, A., A. Krishnamurthy and T. McQuade (2021), *Mortgage design in an equilibrium model of the housing market*, Journal of Finance.

Guren A., A. McKay, E. Nakamura and J. Steinsson (2020), *Housing wealth effects: the long view*, Review of Economic Studies.

Hjalmarsson, E. and P. Österholm (2020), *Heterogeneity in households' expectations of housing prices – evidence from micro data*, Journal of Housing Economics.

Holm, M. B., P. Paul and A. Tischbirek (2020), *The transmission of monetary policy under the microscope*, (under utgivning) Journal of Political Economy.

Hundtofte, S., A. Olafsson and M. Pagel (2019), *Credit smoothing*, NBER Working paper.

Jappelli, T. and L. Pistaferri (2014), *Fiscal policy and MPC heterogeneity*, American Economic Journal: Macroeconomics.

Jensen, T. L. and N. Johannesen (2017), *The consumption effects of the 2007–2008 financial crisis: Evidence from households in Denmark.* American Economic Review 107(11).

Kaplan, G., K. Mitman and G. L Violante (2020a), *The housing boom and bust: Model meets evidence*, Journal of Political Economy.

Kaplan, G., K. Mitman and G. L Violante (2020b), *Non-durable consumption and housing net worth in the great recession: Evidence from easily accessible data*, Journal of Public Economics.

Kaplan, G. and G. L. Violante (2014), *A model of the consumption response to fiscal stimulus payments*, Econometrica.

Kaplan, G., G. L. Violante and J. Weidner (2014), *The wealthy hand-to-mouth*, Brookings Papers on Economic Activity.

Karlman, M., K. Kinnerud and K. Kragh-Sørensen (2020), *Mortgage lending standards: Implications for consumption dynamics*, Working paper.

Kindleberger C. P. (1978), *Manias, panics, and crashes: A history of financial crises*.

Kinnerud, K. (2021), *Monetary policy and the mortgage market,* Working paper.

Korinek, A. and A. Simsek, (2016), *Liquidity trap and excessive leverage*, American Economic Review.

Kovacs, A., M. Rostom and P. Bunn (2018), *Consumption response to aggregate shocks and the role of leverage*, Working Paper.

Kuchler, T. and B. Zafar (2019), *Personal experiences and expectations about aggregate outcomes*, The Journal of Finance.

La Cava, G., H. Hughson and G. Kaplan (2016), *The household cash flow channel of monetary policy*, Reserve Bank of Australia Research Discussion Paper 2016-12.

Laibson, D. (1997), *Golden eggs and hyperbolic discounting*, Quarterly Journal of Economics.

Larsen, L. S., C. Munk, R. Sejer Nielsen and J. Rangvid (2020), *How do interest-only mortgages affect consumption and saving over the life cycle?* Working paper.

Lucas, R. (1974), *Econometric policy evaluation: A critique*, in Brunner, K.; Meltzer, A. (ed.), *The Phillips Curve and Labor Markets. Carnegie-Rochester Conference Series on Public Policy.* New York: American Elsevier.

Lusardi, A. and O. Mitchell (2014), *The economic importance of financial literacy: Theory and evidence*, Journal of Economic Literature.

Malmendier, U. and S. Nagel (2016), *Learning from inflation experiences*, Quarterly Journal of Economics.

Mankiw, G. and R. Reis (2002), *Sticky information versus sticky prices: A proposal to replace the new Keynesian Phillips curve*, The Quarterly Journal of Economics.

Meier, S. and C. Sprenger (2010), *Present-biased preferences and credit card borrowing*, American Economic Journal: Applied Economics.

Mian A., K. Rao and A, Sufi (2013), *Household balance sheets, consumption, and the economic slump*, Quarterly Journal of Economics.

Mian, A., and A. Sufi (2018), *Finance and business cycles: The credit-driven household demand channel*, Journal of Economic Perspectives.

Minsky, H. (1986), *Stabilizing an unstable economy*, New Haven, CT: Yale University Press.

Muellbauer, J. (2012), *When is a housing market overheated enough to threaten stability*, in Heath, A., F. Packer and C. Windsor (eds.), Property Markets and Financial Stability, Reserve Bank of Australia.

Paaso, M., V. Pursiainen and S. Torstila (2020), *Entrepreneur debt aversion and financing decisions: Evidence from COVID-19 support programs*, CEPR Press 48.

Pence, K. (2012), *Comment on Dynan: Is a household debt overhang holding back consumption?* Brookings Papers on Economic Activity.

Piazzesi, M. and M. Schneider (2009), *Momentum traders in the housing market: Survey evidence and a search model*, American Economic Review.

Piskorski, T. and A. Tchistyi (2010), *Optimal mortgage design*, Review of Financial Studies.

Piskorski, T. and A. Seru (2018), *Mortgage market design: Lessons from the great recession*, Brookings Papers on Economic Activity.

Price, F., B. Beckers and G. La Cava (2019), *The effect of mortgage debt on consumer spending: Evidence from household-level data*, Reserve Bank of Australia Working Paper.

Rozsypal, F. and K. Schlafmann (2019), *Overpersistence bias in individual income expectations and its aggregate implications*, Working paper.

Sargent, T. (1993), *Bounded rationality in macroeconomics: The Arne Ryde memorial lectures*, Oxford University Press.

Schlafmann, K. (2020), *Housing, mortgages, and self-control*, (under utgivning) The Review of Financial Studies.

Shiller, R. (2005), *Irrational exuberance,* 2nd edition, Princeton: Princeton University Press.

Sims, C. (1980), *Macroeconomics and reality*, Econometrica.

Sims, C. (2003), *Implications of rational inattention,* Journal of Monetary Economics.

Stiglitz, J.E. (2021), *Economic fluctuations and pseudo-wealth*, NBER Working Paper 28415.

Svensson, L.E.O. (2020), *Macroprudential policy and household debt: What is wrong with Swedish macroprudential policy?*, Nordic Economic Policy Review.

Svensson, L.E.O. (2021a), *Household debt overhang did hardly cause a larger spending fall during the financial crisis in Australia*, CEPR discussion paper DP16094.

Svensson, L.E.O. (2021b), *Household debt overhang did hardly cause a larger spending fall during the financial crisis in the UK*, CEPR discussion paper DP16059.

Thaler, R.H. and H.M. Shefrin (1981), *An economic theory of self-control,* Journal of Political Economy.

Van Beekum, S., M. Gabarro, R. M. Irani and J.-L. Peydró (2019), *Take it to the limit? The effects of household leverage caps*, Working paper.

Verner, E. and G. Gyöngyösi (2020), *Household debt valuation and the real economy: Evidence from a foreign currency debt crisis*, American Economic Review.

Woodford, M. (2003), *Imperfect common knowledge and the effects of monetary policy*, in Aghion, P., R. Frydman, J. Stiglitz and M. Woodford (eds.). Knowledge, information and expectations in modern macroeconomics. Princeton: Princeton University Press.