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Household Risk Management and Actual Mortgage Choice in the Euro Area

by

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Abstract

Mortgages constitute the largest part of household debt. An essential choice when taking out a mortgage is between fixed-interest-rate mortgages (FRMs) and adjustable-interest-rate mortgages (ARMs). However, so far, no comprehensive cross-country study has analyzed what determines household demand for mortgage types, a task that this paper takes up using new data for the euro area. Our results support the hypothesis of Campbell and Cocco (2003) that the decision is best described as household risk management: income volatility reduces the take-out of ARMs, while increasing duration and relative size of the mortgages increase it. Controlling for other supply factors through country fixed effects, loan pricing also matters, as expected, with ARMs becoming more attractive when yield spreads rise. The paper also conducts a simulation exercise to identify how the easing of monetary policy during the financial crisis affected mortgage holders. It shows that the resulting reduction in mortgage rates produced a substantial decline in debt burdens among mortgage-holding households, especially in countries where households have higher debt burdens and a larger share of ARMs, as well as for some disadvantaged groups of households, such as those with low income.

JEL classification: D12, E43, E52, G21
Bank classification: Credit and credit aggregates; Transmission of monetary policy

Résumé

Les prêts hypothécaires constituent la majeure partie de la dette des ménages, et le choix d'un taux d'intérêt fixe ou variable représente une considération essentielle au moment de contracter un tel prêt. Cependant, jusqu'à maintenant, aucune étude multipays approfondie n'avait analysé les facteurs qui déterminent la demande des ménages à l'égard de chaque type de prêt hypothécaire; c'est donc à cela que se sont attachés les auteurs en exploitant des données inédites sur la zone euro. Les résultats obtenus viennent étayer l'hypothèse de Campbell et Cocco (2003) selon laquelle la décision des ménages viserait avant tout à gérer le risque : de fait, la volatilité du revenu décourage la souscription de prêts hypothécaires à taux variables, alors que l'allongement de la durée et l'augmentation de la taille relative du prêt ont l'effet contraire. Une fois pris en compte d'autres facteurs d'offre (par l'entremise des effets fixes par pays), il apparaît que le coût des prêts importe également, comme on pourrait s'y attendre, les prêts à taux variables devenant plus intéressants lorsque les écarts de rendement s'accroissent. Les auteurs réalisent aussi une simulation dans le but de mesurer l'incidence qu'a sur les emprunteurs hypothécaires l'assouplissement de la politique monétaire effectué pendant la crise financière. L'exercice montre que la réduction des taux hypothécaires découlant de cet assouplissement a provoqué une diminution substantielle du poids de la dette pour les détenteurs de prêts hypothécaires, en particulier dans les pays où les ménages sont plus endettés et ont davantage recours aux prêts à taux variable, ainsi que chez certains groupes défavorisés comme les ménages à faible revenu.

Classification JEL : D12, E43, E52, G21
Classification de la Banque : Crédit et agrégats du crédit; Transmission de la politique monétaire

Non-technical summary

Mortgages constitute the largest part of household debt, and an essential choice when taking out a mortgage is the one between fixed-interest-rate mortgages (FRMs) and adjustable-interest-rate mortgages (ARMs). This paper studies the determinants of mortgage choice in the euro area over the previous decades. It uses micro data from the new Eurosystem Household Finance and Consumption Survey (HFCS), which covers information on mortgage choice for nearly 9,000 households in the euro area, and furthermore contains a rich set of information with regard to the mortgage contract as well as other characteristics of the household.

Using these data, the paper first demonstrates that mortgages on the household main residence constitute an important part of household balance sheets, making up 63% of total debt of euro area households. The data also show considerable variation in mortgage choice, first and foremost across euro area countries, ranging from an average of 13% ARMs in France to 85% in Luxembourg and Portugal, but also with regard to the year of mortgage take-out and household characteristics. For instance, the share of ARMs is highest for low-education households and rises with income.

Our estimates of the determinants of household decisions to take out an ARM or FRM are well in line with the hypothesis of Campbell and Cocco (2003), according to which households base their decision on a risk-management approach. We find that higher income volatility reduces the propensity to take out ARMs; in other words, FRMs are seen as providing insurance against adjustable interest rates (payment risk). For mortgages with longer maturities and larger relative size, relatively more ARMs are chosen by households; as for such mortgages, the insurance premium for FRMs is bound to be very large, thus making FRMs relatively expensive compared with ARMs. In addition, the pricing of mortgages also enters the household's decision rule: if the spread between long-term and short-term interest rates rises, adjustable rates (which should be closer to short-term rates) become more attractive than fixed rates (which are proxied by long-term rates), at least in the initial periods.

Furthermore, the paper conducts simulation exercises to identify which mortgage holders saw particularly large declines in their debt burden owing to the substantial easing of monetary policy during the crisis. It shows that the resulting reduction in mortgage rates produced a substantial decline in the debt burden among mortgage-holding households, especially in countries where households have a higher debt burden and a larger share of ARMs, as well as for some groups of disadvantaged households, such as those with low income. Other distributional effects of monetary policy, e.g., on savers versus borrowers, or on the financial sector versus the household sector, are beyond the scope of this paper.

1. Introduction

In several advanced economies, household debt increased substantially in the years leading up to the global financial crisis. Increasing levels of debt were often accompanied by concurrent booms in house prices and stock markets, leaving debt-to-asset ratios comparatively low, but exposing many households to a substantial risk if asset prices were to fall. Similarly, the servicing of the debt seemed possible in a benign economic environment, but was at risk of becoming unsustainable if conditions were to deteriorate. Of course, this risk materialized during the crisis: stock markets and house prices fell sharply, triggering a substantial drop in household wealth and an often unsustainable increase in the debt-to-asset ratios. Furthermore, many households also experienced a drop in income, or at least greater income uncertainty resulting from higher unemployment in these economies, making it more difficult or impossible for them to meet their debt-servicing obligations.

While the need for household deleveraging has been identified by several policy institutions (see, e.g., European Central Bank 2012 or International Monetary Fund 2012), an important question is how such deleveraging can be brought about without endangering macroeconomic and financial stability. One factor that might have eased the adjustment burden is the large decline in interest rates that was brought about because of the accommodative monetary policies in several economies. To assess the relief that this brought to households, it is important to understand how the effects were distributed. An important dimension of this assessment is the type of mortgage contract that households have – first, because the bulk of household debt tends to be mortgage debt, a decrease in debt-service payments on mortgages will have a measurable impact on the financial situation of mortgage holders; and second, because there are typically two main types of mortgage contracts, namely, adjustable-rate mortgages (ARMs) and fixed-rate mortgages (FRMs), which led to vastly different effects of the decline in interest rates on household debt burdens. Households with an ARM could benefit more directly from reduced interest rates (even if after some delay), whereas those with an FRM could not benefit, or would have to revert to an often costly refinancing of their mortgage.

In light of these factors, this paper addresses two questions. First, it studies the determinants of mortgage choice in the euro area over previous decades. Campbell and Cocco (2003) developed a related theory, which stipulates that under borrowing constraints and income risks, ARMs are relatively less attractive to risk-averse households with a large mortgage, risky income, high default costs or low moving probability. This paper is the first to put the findings by Campbell and Cocco to an empirical test for the euro area as a whole. The analysis focuses on the demand side, as does the model of Campbell and Cocco. However, it is important to note that the household decisions might be constrained by the type of mortgages offered. For instance, European Commission (2011) finds that there is a dominant mortgage type in most euro area countries, although this seems to have become less common since the 1990s.

The second part of this paper conducts simulation exercises to identify which mortgage holders saw particularly large declines in their debt burden following the substantial easing of monetary policy during the financial crisis.

This paper uses recently collected micro data from the Eurosystem Household Finance and Consumption Survey (HFCS), which covers information on mortgage choice for nearly 9,000 households in the euro area, and contains detailed information on mortgage contracts as well as other household characteristics. Using these data, the paper first demonstrates (section 3) that mortgages on the household main residence constitute an important part of household balance sheets, making up 63% of the total debt of euro area households. The data also show considerable variation in mortgage choice across euro area countries (from 13% ARMs in France to 85% in Luxembourg and Portugal), but also with regard to the year of mortgage take-out and household characteristics. For instance, in the euro area, the share of ARMs is highest for low-education households and rises with income. By identifying the point in time when a given mortgage was taken out, we can exploit time-series variation in our data even if the survey contains only one cross-section. Our estimates of the determinants of household decisions to take up an ARM or FRM are well in line with the hypothesis of Campbell and Cocco (2003), according to which households base their decision on a risk-management approach. While we observe household characteristics only at the time of the survey rather than at the time of mortgage take-out, we are able to match the macroeconomic conditions to the point in time when the mortgage choice was actually made. Accordingly, the results with regard to household characteristics should be interpreted as descriptive rather than causal. Still, in line with our hypothesis, we find that higher income volatility is related to a reduced propensity to take out ARMs (which is in line with the notion that FRMs are perceived as insurance against adjustable interest rates), whereas, for mortgages with longer maturities and larger relative size, relatively more ARMs are chosen by households (for such mortgages, the insurance premium of FRMs is bound to be very large, thus making FRMs relatively expensive compared with ARMs). In addition, households also consider the pricing of mortgages: if the spread between long-term and short-term interest rates rises, adjustable rates (which should be closer to short-term rates) become more attractive than fixed rates (which are proxied by long-term rates), at least in the initial periods.

In the second step, this paper focuses on the effects of the monetary policy easing during the financial crisis across mortgage holders. While other distributional effects of monetary policy, e.g., on savers versus borrowers, or on the financial sector versus the household sector, would be interesting to examine, they are beyond the scope of this study. This paper shows that the monetary easing led to particularly large reductions in the debt burden of households in several euro area countries (mainly countries with households that have higher debt burdens and countries with a larger share of ARMs, such as Cyprus,

Luxembourg, the Netherlands, Portugal and Spain), as well as for a number of disadvantaged household groups, such as those with low income.

The paper proceeds as follows: section 2 provides an overview of the related literature. The data are explained in section 3. Section 4 reports the findings on the determinants of mortgage choice in the euro area. Section 5 studies the effects of the easing of monetary policy on mortgage holders, and section 6 concludes.

2. Literature review

This paper is related to two distinct strands of the literature. The first studies the determinants of mortgage choice, with the Campbell and Cocco (2003) theory providing the workhorse model for most empirical specifications. Campbell and Cocco pitch the consumer problem in the context of a risk-management analysis, where the household needs to trade off an inflation risk under an FRM against a payment risk given by an ARM. The inflation risk of the FRM arises because nominal interest payments are fixed, which can lead to swings in real interest payments if inflation changes. A prepayment option partially insures the household against this risk, since a new mortgage contract can be taken out if nominal interest rates on the new contract are sufficiently lower than those on the existing contract. However, as pointed out by Campbell and Cocco, this insurance comes at a cost, and makes FRMs expensive when inflation is stable, and cheap when inflation rises. In contrast, the main risk of an ARM has to be seen in the possible fluctuations of nominal payments, affecting household disposable income. In the presence of borrowing constraints (such as during times of low income and low house prices), variations in interest payments can force households to reduce their consumption. Based on this risk trade-off, Campbell and Cocco find that ARMs are relatively less attractive to risk-averse households with a large mortgage, risky income, high default costs or low probability of moving. Campbell and Cocco support these hypotheses with some empirical findings that show that the share of FRM contracts in the United States is strongly negatively correlated with the level of long-term interest rates.

Other empirical evidence also generally supports these hypotheses. Both pricing variables and household characteristics are usually found to be important determinants of mortgage choice. With regard to pricing, Brueckner and Follain (1988) show that increases in the FRM rate and in the FRM-ARM rate differential raise the probability of choosing an ARM. In a similar vein, Vickery (2007) reports a large price sensitivity of consumers, with a 10-basis-point increase in FRM interest rates reducing the FRM market share by 10.4 percentage points. An alternative approach in studying mortgage choice is taken by Cunningham and Cappone (1990), who look at terminations of mortgages, and find these to be affected by interest rate expectations, in particular for FRMs. Interest rate expectations are also identified as a relevant determinant in Sa-Aadu and Sirmans (1995), since borrowers are less likely to opt for ARMs when interest rates are

expected to rise. Finally, Koijen et al. (2009), in the context of a utility framework of mortgage choice, identify the long-term bond risk premium as a crucial determinant. The underlying idea is that, in order to assess the future payment streams under an ARM, households will have to form an expectation of future short-term interest rates. Koijen et al. show that an average of short-term interest rates from the recent past provides a good proxy for these expectations, suggesting that households form adaptive expectations. In contrast, Badarinza et al. (2013) suggest that this finding is not due to a forward-looking component, but instead arises because of a strong role for current cost-minimization motives.

With regard to household characteristics, Dhillon et al. (1987) find that households with co-borrowers, married couples and short expected housing tenures have the greatest probability of taking out ARMs. In addition to the roles of pricing, mobility expectations and income volatility found in the previous literature, affordability and risk attitudes are stressed by Coulibaly and Li (2009), who show that more risk-averse borrowers prefer FRMs, and financially constrained households tend to choose ARMs. Amromin et al. (2011) identify households with high incomes and prime credit scores as being more likely to take out complex mortgages that enable households to postpone loan repayment. With significantly higher delinquency rates than traditional mortgage borrowers, these households appear to be more strategic in their default decisions than traditional borrowers. An interesting aspect of mortgage choice is uncovered in Webb (2012), who shows that households' propensity to choose an ARM over an FRM increases with the number of previous mortgages the household has used, which he traces back to a process whereby households learn about mortgage products by participating in the mortgage market. With the exception of Badarinza et al. (2013), all previous studies relate to the United States; evidence for other countries is rather scarce. Using a large data set for the United Kingdom, Bacon and Moffatt (2012) also report a substantial reaction to changes in relative prices of ARMs and FRMs, as well as a reduction in demand for FRMs when interest rates are high (suggesting that borrowers then expect them to fall in the future, making FRMs less attractive). Paiella and Pozzolo (2007) make use of Italy's Survey on Household Income and Wealth (SHIW) that now feeds into the HFCS, and confirm the importance of the interest rate spread and the fact that the demand of FRM holders for mortgage loans exhibits a much higher price elasticity. They also find that borrower characteristics do not significantly influence the decision. Dungey et al. (2013), in contrast, using a large sample of Australian households, corroborate the U.S. findings that household characteristics are relevant. In particular, their results suggest that consumer choice of mortgage type reflects household income risk and wealth risk, as well as mobility risk. This paper relates to this literature and is the first to empirically test the relevance of pricing and household variables in the euro area.

This paper also relates to a literature that studies the distributional effects of monetary policy. A long-standing literature has dealt with the distributional effects of inflation, with several channels being at

work. For instance, an unexpected increase in inflation will hurt savers and benefit borrowers (Doepke and Schneider 2006), and at the same time it will harm households that tend to hold relatively more currency (Albanesi 2007). Easterly and Fischer (2001) show that the poor are more likely than the rich to cite inflation as a top national concern. This is in line with the results of Romer and Romer (1999), who argue that low inflation and stable aggregate demand growth are associated with improved well-being of the poor in the long run.

Less attention has been devoted to the distributional effects of monetary policy actions. Coibion et al. (2012) report that contractionary monetary policy shocks systematically increase inequality in labour earnings, total income, consumption and total expenditures in the United States. Finally, Bank of England (2012) studies the distributional effects of the asset purchases conducted by the Bank of England in response to the financial crisis, and concludes inter alia that asset purchases have boosted the value of households' financial wealth, with larger effects on the wealthier households.

This paper aims to contribute to this literature in two ways: first, by studying the determinants of mortgage choice using cross-country data and, second, by identifying the effect of the recent monetary policy easing on debt burdens of mortgage-holding households across the euro area.

3. Data

As mentioned previously, in this paper we make use of the Eurosystem HFCS, a new household wealth survey that provides ex ante comparable data for 15 euro area countries (all except Estonia, Ireland and Latvia).[4] However, since no data on the type of mortgage interest rate are available for Finland, our sample contains 14 countries for our purposes. Several long-standing previous surveys such as the Italian SHIW, the Spanish EFF or the Dutch Household Survey now feed into the HFCS, following adaptations that made their data comparable to those of other countries.

The first wave of the survey is now available. It was conducted around 2010, but the reference periods were not fully harmonized. In particular, the reference period for the Spanish data is 2008-2009, whereas it is 2009 for Greece. For the purposes of this paper, this does not constitute an obstacle, since we model the household decision at the time of mortgage take-out, not at the time of the survey. Therefore, differences in fieldwork periods across countries are not important for our dependent variable. However, we sometimes use household and mortgage characteristics at the time of the survey as proxies for circumstances at the time of mortgage take-out. As will be discussed, we believe that cross-country differences in reference periods do not significantly affect the quality of these proxies.

4 For more details on the survey, see http://www.ecb.europa.eu/home/html/researcher_hfcn.en.html.

Another important feature of the HFCS is that missing observations (i.e., questions that were not answered by the respondents) are multiply imputed. In fact, five data sets are provided, an issue that we will take into account when assessing the statistical significance of our estimates.[5]

We are interested in the following question, asked in relation to mortgages on the household main residence (HMR): *"Does the loan have an adjustable interest rate; that is, does the loan agreement allow the interest rate to vary from time to time during the life of the contract?"* Possible answer categories are *"Yes", "No", "Don't know"* and *"No answer"*.[6] Importantly, if the household holds several mortgages on its main residence, this question is asked several times. This is the case for 20% of the weighted sample of HMR mortgage owners. In such cases, we concentrate on the mortgage that was taken out first, but conduct a robustness test using the last mortgage, which shows that the main results of our analysis are unchanged.

From the data, it is apparent that HMR mortgages constitute an important part of household balance sheets. As also reported in Household Finance and Consumption Network (2013a), which provides an overview of the main results from the first wave, 19% of all euro area households have a mortgage on their main residence, with a median outstanding value of €65,200.[7] Furthermore, such mortgage debt constitutes 63% of total euro area household debt. Table 1 provides a breakdown by country, and illustrates that there is considerable heterogeneity with regard to the share of mortgage debt. For instance, mortgage debt accounts for only 42% of total household debt in Slovenia, but for 90% or more in Belgium, Luxembourg and Portugal. These differences reflect several facts, but most importantly varying prevalence of home ownership and mortgage take-out. Institutional differences across countries are also important. In particular, Bover et al. (2013) show that in countries with longer repossession periods, the percentage of people who borrow is smaller, the youngest group of households borrow lower amounts (conditional on borrowing), and mortgage interest rates paid by low-income households are higher.

Since we are interested in the type of mortgage that households hold, the data set in our econometric analysis is considerably smaller than the full data set provided in the HFCS. Corresponding information is provided in Table 2, which shows that of more than 51,000 observations in total, we are effectively left with a little less than 9,000 for which information on the mortgage type is available. Most of this difference arises because we can consider only households that own their main residence and have a mortgage. In addition, we lose another 149 observations because of missing information on the mortgage type. With

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5 Variables necessary to construct wealth and income aggregates are multiply imputed in each country. Some countries imputed other variables, too. For more information, see section 6 and subsection 9.2.7 of Household Finance and Consumption Network (2013b), which describes the most relevant methodological features of the survey, including information on sampling design and weighting.

6 Austria, Cyprus, Germany, Spain, Luxembourg and Slovakia multiply imputed the response categories *"Don't know"* and *"No answer"*. For the remaining countries (Belgium, France, Greece, Italy, Malta, the Netherlands, Portugal and Slovenia), we observe 149 households with missing values. In the analysis, we include all multiply imputed values to reduce any possible bias. The 149 missing values had to be dropped. However, we assume that any possible bias is small.

7 In the euro area, 32% of all HMR owners hold HMR mortgage debt. As expected, the share is largest for households up to 40 years of age (63%), and decreases for older households (41-55 years: 45%; 56-70 years: 21%; more than 70: 5%).

missing observations for some variables used as regressors, the econometric models are effectively estimated on a sample of around 8,500 observations. In comparison with much of the existing literature, this remains a sizable data set.

Tables 1-3 here

A first glimpse at the prevalence of fixed versus adjustable mortgage rates is provided in Table 3. Across countries, there are substantial differences, with ARMs accounting for 13% of all HMR mortgages in France and for 85% in Luxembourg and Portugal.[8] At the same time, there is considerable heterogeneity with regard to the year of mortgage take-out – in particular, when studying the country-specific figures, while the differences over time in the euro area aggregate are less pronounced.[9] These facts suggest that country-specific characteristics as well as time-varying factors are important determinants for mortgage choice. Table 3 also contains a breakdown by some household characteristics, illustrating that these are also relevant. For instance, households where the reference person has only a low level of education have a considerably larger share of ARMs than more highly educated households – the share drops from 59% for the group with the lowest education to around 40-45% for those with a higher level of education. The differences with regard to income are less pronounced, but some variation is also evident in the euro area aggregate, with ARMs constituting 44% of all mortgages taken out by low-income households, a ratio that increases to 50% for the top income quintile.

Turning to the possible determinants, we can divide these into i) household characteristics, ii) mortgage characteristics, and iii) macroeconomic conditions and the market environment. Tables A1 and A2 in the annex provide definitions and summary statistics. For all of these, one would ideally want to observe conditions prevailing at the time of mortgage take-out. Unfortunately, as mentioned previously, this is not always possible with our data set. While we can match the macroeconomic conditions to the year of the mortgage choice, this is only possible for some of the household and mortgage characteristics. We are therefore basing our estimates on the assumption that many of these characteristics are sufficiently persistent to provide a useful, although noisy, measure of conditions at the time of the mortgage decision.[10] This assumption might not be as unrealistic as it seems at first sight. Within certain limits, a household might be able to refinance its mortgage if the household characteristics change in a way that would suggest a change in mortgage type. If the household chooses not to do so, one might assume that the current

[8] The cross-country breakdown allows cross-checking the data with those obtained from other sources. European Central Bank (2009) provides results from a questionnaire that was sent by the National Central Banks in euro area countries to representative panels of banks, relating to mortgages taken out in 2007. The numbers reported there are rather close to the ones in our data set, with the notable exception of the Netherlands, where the HFCS data are constructed from two different questions. The rate is defined as variable if there is either no time of interest rate fixation or if the time of interest rate fixation is smaller than the mortgage duration. Beyond this cross-checking exercise, we furthermore believe the data to be of high quality because there is a very low item non-response for this question, at 5.3%.

[9] The sample contains 70 mortgages taken out prior to 1980, 427 from 1981-1990, 2,757 from 1991-2000, and 5,713 since 2001.

[10] The median mortgage was taken out in 2004, the mortgage at the 10th percentile in 1995.

household characteristics still warrant the current mortgage contract. We have cross-checked the assumption of persistent household characteristics using the SHIW, i.e., the Italian part of the HFCS.[11] This survey has a long history and includes a panel component, which allows tracking the same households over time. Focusing on the position of the panel households in the income distribution, we find that between 1998 and 2010, 81% of these households have either stayed in the same quintile, or moved by at most one quintile. This number increases to 93% between the 2008 and the 2010 surveys. The wealth distribution is even more stable over time, with 87% having moved at most one percentile since 1998, and 93% since 2008. In addition, these numbers are likely to overstate wealth mobility, given that they do not correct for measurement error (Biancotti et al. 2008).

One possibility to attenuate this problem would be to restrict the sample to recent mortgage take-outs. However, this would have reduced the available sample dramatically, and we would lose a significant amount of variation in the macroeconomic environment compared with our current setup. Of course, we conduct a corresponding sensitivity analysis, and find our results to be robust overall.

Possible determinants 1: Household characteristics

Natural control variables are gender, age and marital status. These variables relate to what the survey labels the "financially knowledgeable person" (FKP), i.e., the person who is best informed about the household finances.[12] To capture the affordability aspect of FRMs, we consider liquid wealth, which combines sight accounts, savings accounts, mutual funds, bonds, shares, managed accounts minus non-collateralized debt, i.e., outstanding balances of credit lines, overdrafts and credit card debt. We measure this variable as the quintile of the household's position in the national distribution of liquid wealth, because such measurement generates an implicit adjustment for the (substantial) differences in purchasing power across euro area countries.

By analogy, we also convert household income into quintiles in relation to the national income distribution, which once more allows adjusting for purchasing power differences across countries in a convenient fashion. High income earners in a given country can better afford FRMs, so we expect higher income to be related to more FRMs; alternatively, higher incomes could signal that the payment risk in ARMs is easier to bear for households, therefore favouring ARMs.

We also control whether the reference person works in the public or the financial sector. Working in the public sector might give us a proxy for households with low income uncertainty (and thus a *higher* probability of choosing an ARM) and/or relatively higher risk aversion[13] (and thus a *lower* probability of choosing an ARM). Controlling for households working in the financial sector could be important if, for

11 For a similar analysis, see also Bover (2008).

12 Results are robust to defining the reference person according to the Canberra Group (UNECE 2011).

13 While the HFCS includes a direct question on risk aversion, this variable was not available for France and therefore was not included in our benchmark specification.

instance, such households have a different access to financial products.[14] We also include education, in line with several studies that have found this to be a good proxy for financial sophistication (see, inter alia, Calvet et al. 2007, 2009a, 2009b). At the same time, education might be related to expected income, given that persons with more education tend to experience steeper income growth over their careers. In order to control for expected and past income developments, we additionally control for the slope of income growth using two variables – whether income in the previous year was above or below regular income, and whether or not expected income growth exceeds expected inflation. These variables put income into perspective and control for the presence of temporary shocks around the time of the interview, providing more justification for the assumption that household income at the time of the interview is representative of income at the time of mortgage take-out. As these two variables are not available for France, they are not included in the benchmark regressions, but enter a separate regression that excludes France.

Apart from public sector affiliation, other variables are used to capture the volatility of labour income and unemployment risk, namely, whether the reference person is unemployed or self-employed, and whether she is subject to a temporary contract. All of these should signal higher income volatility, and therefore make ARMs relatively less attractive. In contrast, the number of income earners in the household should indicate stability of income expectations, and thus make ARMs more attractive.

Importantly, other than gender and age, we cannot construct any of the household characteristics at the time of the mortgage take-out, and must assume that they are relatively persistent. For instance, we implicitly assume that a person who is currently unemployed might have anticipated this when taking out the mortgage, or at least might have had more volatile income expectations. Alternatively, we assume that the current situation does not warrant a different mortgage type, as the household would otherwise re-contract its mortgage. As mentioned previously, we acknowledge that these assumptions are rather strong; accordingly, we conduct a robustness test restricting the analysis to mortgages that were taken out at most six years prior to the survey.[15] It is also important to note that measuring household income and wealth according to the quintile of the national income and wealth distribution makes these variables less prone to major movements over time, in light of a rather persistent income and wealth distribution in Europe.

Possible determinants 2: Mortgage characteristics

The literature survey identified that not only household characteristics, but also pricing variables are important determinants of mortgage choice. Accordingly, we include several characteristics of the mortgage contract that might affect the interest margin (see, e.g., Cunningham and Capone 1990, Campbell and Cocco 2003). They include the length of the mortgage and whether or not this mortgage refinances an earlier one. For longer mortgages, we would expect the "insurance" premium of the FRM to become

[14] They may also face higher income uncertainty (e.g., if they have a large fraction of performance-related pay) and be less risk-averse.

[15] For our sample of HMR mortgage holders, six years is the median time since mortgage take-out.

disproportionately expensive, such that longer durations should favour ARMs. However, given that a refinanced mortgage is typically shorter than an original one, we would expect to find a relatively larger share of FRMs among refinanced mortgages.

We also include the loan-to-income ratio and the debt-service-to-income ratio.[16] It is important to note that we have already controlled for income in the regression, so these regressors should not capture income effects. We expect that an increase in these ratios will raise the propensity to choose an ARM. For the loan-to-income ratio, relatively large loans are bound to be subject to a large interest rate margin reflecting larger credit risk. This will make fixed rates more expensive for the borrower. On the other hand, payment risk is larger, which in turn makes FRMs relatively more attractive. The same reasoning applies to the debt-service-to-income ratio.

The inclusion of mortgage characteristics implies a sequential decision by households, such that the mortgage type is only determined once all other mortgage characteristics have been decided. As this is not necessarily the case, we have re-estimated our models without mortgage characteristics, and find our results to be robust.

Possible determinants 3: Macroeconomic conditions and the market environment

The most important set of macroeconomic and market conditions that we control for relate to the pricing of mortgages. Following the literature, we include the yield spread between the long-term and short-term interest rates as well as the level of the nominal long-term interest rate. A high spread makes ARMs more attractive compared with FRMs, at least initially. The level of long-term interest rates allows us to test whether, for a given rate differential, the probability of choosing an ARM increases with interest rates. The underlying idea is that, as mortgages in general become less affordable, ARMs, which are relatively cheaper in the short run, become more attractive. Following the contributions of Koijen et al. (2009) and Badarinza et al. (2013), we also experiment with other measures of the spread, comparing long-term rates to an average of current and past short-term interest rates, on the assumption that households form adaptive expectations about the future course of short-term interest rates.

Another relevant determinant of mortgage choice could be inflation uncertainty. We measure this by the volatility of inflation over the five years prior to mortgage take-out. If inflation is very volatile, Campbell and Cocco (2003) suggest that borrowers are uncertain about the real cost of mortgage repayments if they take out an FRM, thus diminishing its attractiveness. Accordingly, we should expect the choice of ARMs to become more common. European Central Bank (2009, 28) and Badarinza et al. (2013) argue along these lines to suggest that macroeconomic stability may facilitate longer-term planning, which may explain why fixed rates have been dominant in countries with historically low inflation.

[16] While the HFCS includes a variable that allows for the construction of the initial loan-to-value ratio, this variable is not available for France and therefore not included in our benchmark specification.

We also include the country-specific unemployment rate and GDP growth at the time of mortgage take-out. A better macroeconomic environment should encourage households to accept the payment risk inherent in ARMs. In particular, variations in unemployment should affect the stability of income expectations, with ARMs becoming more attractive in environments of low unemployment and high GDP growth. Finally, the market environment is probably crucial in determining mortgage choice. Tax advantages, mortgage supply and cultural traits are inherently difficult to measure across countries. Consequently, we resort to country fixed effects, which will control for all factors that vary across countries, but not over time. As a robustness test, we also control for time variations by using quintiles over the years of mortgage take-out.[17]

4. The determinants of mortgage choice in the euro area

We will now analyze the determinants of mortgage choice in the euro area. We set the dependent variable to 1 if a household has an ARM, and 0 for an FRM. This binary variable is analyzed using a probit model, which we formulate as

$$\Pr\left(\mathrm{ARM}_{it}=1 \mid x\right)=\Pr\left(\mathrm{ARM}_{it}^{*}>0 \mid x\right)=\Phi\left(x\right) \tag{1}$$

$$\mathrm{ARM}_{it}^{*}=\beta_0+\beta_1 c_i+\beta_2^t h_{it}+\beta_2^T h_{iT}+\beta_3^t l_{it}+\beta_3^T l_{iT}+\beta_4^t m_{it}+\varepsilon_{it} \tag{2}$$

This model implies that the probability that household *i* takes out an ARM at time *t* is a function of various determinants *x*, which affect a latent variable ARM_{it}^{*}. If that latent variable is larger than 0, the household holds an ARM – otherwise, it has an FRM. The latent variable itself is modified in equation (2) as a function of country fixed effects c_i, a vector of household characteristics at year *t* (the time of mortgage choice) and *T* (the time of the survey), h_{it} and h_{iT}, a vector of mortgage characteristics at year *t* and *T*, l_{it} and l_{iT}, and macro variables at year *t*, m_{it}. β_0 to β_4 denote vectors of the respective coefficients, and ε_{it} an error term.

When estimating the model, we use weights to account for the fact that the survey does not always represent the same fraction of the overall population across countries. Our weights readjust each observation to reflect its relative importance for the euro area as a whole. In so doing, we follow Faiella (2010) and Magee et al. (1998), which recommend the use of weights for two similar surveys, namely the Italian SHIW and the Canadian Survey of Consumer Finances. They argue that, in surveys with complex survey design, the use of weights protects against the omission of relevant information, which otherwise would have to be modelled explicitly by incorporating all available geographic and operational variables that determine sampling rates. Another reason for using weights is to consider the possibility of

[17] The median time lag between mortgage take-out and the date of the survey varies over euro area countries. It is six years for Belgium, Germany, France, Greece, Italy and the entire euro area. It is only four years for Cyprus and Slovenia and five years for Slovakia. Seven years are observed for Spain, Luxembourg and the Netherlands. In Austria, Malta and Portugal, the median time lag is more than seven years.

endogenous sampling (Solon et al. 2013), since the HFCS oversamples wealthy households, and that mortgage choice varies with wealth.

One objection to our modelling approach could be that mortgage choice follows a sequential decision process: households first decide whether to take out a mortgage, and only subsequently decide whether this mortgage should be an ARM or an FRM. Although the decision could be a joint one based on affordability, we also implemented a Heckman selection model. Following Christelis et al. (2013), the first stage is a probit model regarding the decision to take out a mortgage, and the second stage estimates another probit model for the type of mortgage. While the different functional forms might be sufficient to identify the model (Sartori 2003), we have also tried an explicit exclusion restriction, whereby households that have inherited their main residence are less likely to take out a mortgage, whereas there should be no obvious effect on the type of mortgage they choose. In all possible variations, we always find the two stages to be independent (for each implicate separately as well as when combining the five implicates). In light of this, we simply model the mortgage choice decision in an independent manner.

Table 4 here

Table 4 provides the first set of results. It reports weighted average marginal effects. Standard errors account for the multiply imputed nature of the data, thereby properly reflecting the uncertainty of the imputed values. The following findings emerge.

First, with regard to ***household characteristics***, the various proxies for income volatility provide mixed results. There is no effect from the number of income earners in the household (which should allow income pooling and thus reduce income volatility) or from self-employment or temporary work contracts (which should proxy for higher income volatility). Households with an unemployed reference person (which should have relatively more volatile income) are less likely to opt for ARMs. The effect for the unemployed is furthermore economically large, as they are 7 to 8 percentage points less likely to hold an ARM.

Income exerts substantial effects on mortgage choice. As posited above, higher income could make FRMs relatively more affordable, or alternatively make it easier for households to carry the payment risk inherent in ARMs. The latter clearly dominates in our sample, with economically large effects. The probability of holding an ARM is 12 percentage points higher for a household in the top income quintile compared with a household in the lowest income quintile.

Second, ***mortgage characteristics*** matter. The duration of the mortgage contract is important, with every 10 additional years increasing the propensity to hold an ARM by 8 percentage points. The loan-to-income ratio does not exert statistically significant effects on mortgage choice, but the debt-service-to-income ratio does, and in an economically significant manner. Compared with the lowest quintile, households in the top quintile of the debt-service-to-income ratio distribution are 7 percentage points more likely to have an

ARM. This suggests that households with a high debt burden are less concerned about the increased payment risk of ARMs but instead select an ARM since FRMs become too expensive.[18]

Finally, with respect to the ***macroeconomic conditions and market environment***, the coefficients on unemployment at the time of the mortgage take-out show that in more favourable economic environments (consistent with more stable income expectations), the share of ARMs does indeed increase. Inflation uncertainty does not seem to matter. Note, however, that any effect from inflation volatility in this regression would be in addition to the country fixed effect, which controls for different levels of inflation volatility across countries over the entire sample.

The pricing of mortgages is also important. The level of long-term interest rates does not seem to favour one particular type of mortgage contract, but the various proxies for the term spread have an effect. The first panel in Table 4 uses the contemporaneous yield spread between the long-term and short-term interest rates in the year the mortgage originated; panel (2) uses lagged macroeconomic determinants, and panels (3) and (4) follow Koijen et al. (2009) and assume that households form adaptive expectations based on the average of the previous two and three years, respectively. Among these variants, the largest effect is found for the contemporaneous yield spread – a 100-basis-point increase in the spread increases the share of ARMs by 3 percentage points. These findings suggest that expectations are not necessarily formed in an adaptive fashion, in line with Badarinza et al. (2013).

Table 5 here

We conducted a battery of robustness tests, the results of which are reported in Table 5. First, a number of relevant variables are missing in the French part of the HFCS. The second set of results in Table 5 presents regressions excluding France, but including the additional variables.[19] While none of the additional variables exerts any significant effect, it is important to note that the main results remain unchanged. In particular, controlling for income deviations from medium-term income or for income expectations does not alter the findings regarding income itself.

Results are furthermore robust to excluding data for the Netherlands, as shown in panel (3) of Table 5 (against the background that the Dutch HFCS data on the relative share of ARMs do not conform with those from other sources), to the inclusion of time elapsed since the mortgage take-out (reported in panel (4) of Table 5), to the inclusion of time variations (based on the quintiles of the take-out of a mortgage in the national data, to allow for a possible financial sector development that might have favoured ARMs over FRMs or vice versa – displayed in panel (5) of Table 5). Interestingly, these results show that choosing ARMs has become considerably less frequent over time. The results also barely change if we consider the

[18] There could have been reverse causality – households with FRMs, on average, should have a higher debt-service ratio, given that the interest rates on FRMs are, unconditionally, higher. In this case, we would have expected the results to go in the opposite direction, however.

[19] When estimating the previous model without the French observations, our results remain qualitatively unchanged.

most recent mortgage that a household has taken out rather than the first mortgage on its balance sheet, as can be seen in panel (6) of Table 5.[20]

A major limitation of our data is that we cannot match household characteristics at the time of mortgage take-out, but only observe them later (and for at least some households considerably so). To provide some sensitivity analysis, panel (7) of Table 5 reports estimates based on a sample restricted to mortgages taken out at most six years prior to the survey. This cut-off matches the median time elapsed since the take-out, effectively halving the number of observations. Most results are unaffected. With regard to household characteristics, the role of income is stable. Being unemployed is no longer significant, but temporary labour contracts, which we also consider as a proxy for income uncertainty, become significant. Results are furthermore stable for the duration of the mortgage and the yield spread. In contrast, unemployment rates at the time of mortgage take-out become statistically insignificant, suggesting that there is simply too little variation over the six years prior to the survey.

So far, all regressions include mortgage characteristics, which assumes that households make sequential decisions, with the mortgage type determined only once all other mortgage characteristics have been decided on. Since this need not be the case, we have re-estimated our equations without mortgage characteristics. Results are provided in panel (8) of Table 5, and show that the findings for the other determinants are stable.

It might be interesting to estimate the models country by country, and to test for cross-country differences in the findings. We have done so, only to find that the estimates often lose their statistical significance (robust cross-country evidence appears only for the yield spread and the length of loan, where we find significant effects in four out of the five countries with the largest number of mortgage choice observations). This suggests that national sample sizes are too small or the variation within countries is not sufficient to identify most of our effects. Therefore, we do not test for cross-country differences.

A final remark for these models relates to the country fixed effects. As one would expect, these are generally large and statistically significant, suggesting that to explain the cross-country variation, our current determinants are not sufficient. Clearly, the market environment (e.g., the ease with which households can access the two types of mortgages) is bound to matter; however, it would be a daunting task beyond the intentions of this paper to assemble a satisfactory list of corresponding explanatory variables.

To summarize the findings of this section, it is apparent that mortgage choice depends on household and mortgage characteristics as well as the macroeconomic environment. Relevant household characteristics are the position in the income distribution and income volatility. Among mortgage characteristics, both

[20] The number of observations is slightly larger for this regression, since some households reported information for the latest mortgage, but not for the first mortgage.

duration and relative size matter, and for the macroeconomic environment, loan pricing and the stability of income expectations as proxied by unemployment appear to be important.

5. The easing of monetary policy during the financial crisis – effects on mortgage holders

In response to the global financial crisis and the ensuing European sovereign debt crisis, several central banks (and the Eurosystem being no exception) have substantially eased monetary policy, not only making use of their standard monetary policy tools, but also employing a wide set of non-standard measures. While the Eurosystem does not directly set mortgage rates, its easing of monetary policy affected mortgage rates in the euro area. As can be seen in Figure 1, there was a marked decline in mortgage rates, especially for those with a short initial period of fixation (which we take as a proxy for rates paid under ARMs in the euro area).

Figure 1 here

From a peak of 5.8% in October 2008, mortgage rates with an initial period of fixation up to one year dropped to a low of 2.6% in June 2010 (which is when most HFCS countries were collecting data), and remained around 3% throughout the sample. This implies an effective reduction of these mortgage rates by around 300 basis points in the euro area in response to the crisis.

We now consider the following counterfactual: what would have happened, ceteris paribus, if the Eurosystem had not eased its monetary policy, and mortgage rates had remained at their October 2008 level. As mortgage rates evolved differently across countries, we use the country-specific differences of mortgage rates (with an initial period of fixation of up to one year) between October 2008 and the average rate in 2010 (when most surveys were conducted). The figures for each country are displayed in Table 6, and show considerable heterogeneity, with the smallest declines observed in Cyprus, Malta and Slovakia, and the largest declines in Slovenia and Spain.

Table 6 here

To conduct this thought experiment, we make a few simplifying assumptions. First, we assume that all households with an FRM are locked in, i.e., they would not have refinanced and are therefore not affected by the changes in mortgage rates.[21] Second, we do not take into account the impact of monetary easing on household income. In addition, we focus on one particular type of distributional effects, namely those related to mortgage holders. Other effects, e.g., on savers versus borrowers, or on the financial sector versus the household sector, are beyond the scope of this paper.

Figures 2 and 3 here

[21] Financial fragmentation in the euro area might have affected the possibility to refinance differently across countries, an issue not considered here.

Figure 2 provides a first glance at the result of this simulation.[22] For each quintile of the income distribution, it reports the change in the median debt-service-to-income ratio among ARM holders (Figure 2a) or the change in the share of ARM holders with a debt-service-to-income ratio above 30% (Figure 2b). While the median debt-service-to-income ratio for ARM holders would increase from 19.8% to 25.6% in the euro area, the results show that there are large distributional effects. For instance, monetary easing reduced the median debt-service-to-income ratio of households in the lowest income quintile from 44% to 32%. Debt relief is also noticeable for the higher-income groups, although it is not nearly as large. At the top end of the income distribution, instead of the observed 12%, the median debt-service-to-income ratio could have been around 16% in the absence of monetary easing.

Figure 2b shows the fraction of ARM households with a debt-service-to-income ratio above 30%.[23] The share of such strongly indebted households among ARM holders in the euro area overall would have increased to 40% in the absence of the monetary easing rather than the 27% observed. Again, there are sizable distributional effects, with substantially smaller effects at the top end of the income distribution.

Figure 3 provides a breakdown by country. This illustrates large differences in the number of households with a high debt burden. In addition, loose monetary policy benefited mortgage-holding households in some countries more than others.

Tables 7 and 8 here

Table 7 gives a more complete picture of the main beneficiaries of the decline in mortgage rates among all mortgage-holding households. It considers all households in our sample with a debt-service-to-income ratio below 30%. For these households, we construct a dummy variable equal to one if their debt-service-to-income ratio rises to above 30% under the high-mortgage-rate scenario. Households that remain below 30% are assigned a value of zero. This variable is then modelled using a probit model as in equations (1) and (2), with the same independent variables (except for the variables that proxy for the macroeconomic and market environment at the time of the mortgage take-out, which are not meaningful for the current exercise and therefore dropped).

Panel (1) in Table 7 reports estimates of a regression that includes only country fixed effects, indicating how much debt relief accrued to the individual countries of the euro area. The benchmark country is Germany, so coefficients indicate how much more likely it is for a household to cross the 30% threshold in each country compared with Germany. The largest effects are found for countries with many households

[22] The simulation is performed as follows: for each ARM, the outstanding volume is multiplied by the country-specific reduction in adjustable mortgage rates between October 2008 and the average of 2010 (see Table 6). The resulting figure is then added to the debt-service payments of the household. Simulations of similar magnitude can be derived from the literature on interest rate pass-though. Sander and Kleimeier (2004) and Kleimeier and Sander (2006) estimate a long-run pass-through from policy rates to mortgage rates in the order of 0.6 and 0.7. An increase of the monetary policy rate by 400 basis points would then drive up mortgage rates by 240 to 280 basis points.

[23] Other studies use 40% as a threshold to single out households with a strong debt burden (see, e.g., Bricker et al. 2012). In these cases, the ratio is typically taken with respect to disposable income. As the HFCS measures gross income, a comparable debt burden figure should use a ratio below 40%.

close to the 30% threshold and a high prevalence of ARMs, in particular, Cyprus, Luxembourg, the Netherlands, Portugal and Spain. Looking at the example of Spain, we find that in the high-mortgage-rate scenario, households would have been 19 percentage points more likely to face such high debt burdens.

The econometric model is subsequently expanded in panels (2) to (4) of Table 7, adding household and mortgage characteristics to the country fixed effects. In the course of the model expansion, country fixed effects become smaller, but generally remain statistically significant. Estimates suggest that the decrease in mortgage rates reduced debt burdens, in particular, for a number of relatively disadvantaged household groups, such as those with little liquid wealth and those with low income (the household position in the income distribution shows up directly in panels (2) and (3); while this direct effect of income disappears in panel (4), it is found indirectly for households with high loan-to-income ratios or with high debt-service-to-income ratios). Furthermore, households with long loan contracts also experience significant reductions in their debt burdens.

We subjected these results to several robustness tests, which are reported in Table 8. The first column repeats the benchmark results from Table 7. The second column is based on a sample that discards households that hold only FRMs, restricting the analysis to ARM holders only. The third column restricts the sample to households whose debt-service-to-income ratio would have exceeded 40% with the higher mortgage rates, and the fourth column demonstrates what would have happened if the Eurosystem's monetary easing had resulted in a drop of mortgage rates by 300 basis points across all countries (i.e., it neglects cross-country differences in mortgage rate reductions, since it is not clear whether the different transmission of monetary policy came about as a result of supply or demand differences). Our results are qualitatively unaffected by the various changes. We therefore conclude that the substantial easing of monetary policy led to a reduction in mortgage rates that lightened debt burdens, in particular, for mortgage-holding households in several euro area countries, as well as a number of relatively disadvantaged household groups.[24]

6. Conclusions

In the years leading up to the global financial crisis, household debt increased substantially in several euro area countries. When house prices as well as stock markets collapsed during the crisis, many households were faced with unsustainable debt levels. The easing of the Eurosystem's monetary policy has been a relief for many of these households. In particular, households with ARMs saw a direct decline in mortgage payments.

Against this background, this paper uses a new data set, the Eurosystem HFCS, to examine household choice between fixed- and adjustable-rate mortgages, and the impact of monetary easing on different

[24] Of course, the easing of monetary policy has had several other distributional effects (see, e.g., Bank of England 2012). The analysis here is restricted to the effects on mortgage holders through the reduction in mortgage rates.

household groups. This paper is the first to study determinants of mortgage choice across the euro area, and finds results that are in line with the risk-management theory developed by Campbell and Cocco (2003). For instance, households are less likely to choose an ARM in times of high income volatility. Mortgage characteristics also come into play (with longer durations and relatively larger mortgages that have more credit risk being subject to adjustable rates more often), and mortgage types are sensitive to their relative prices.

Furthermore, the paper conducts simulation exercises to identify which mortgage holders saw particularly large declines in their debt burden owing to the substantial easing of monetary policy during the crisis. The fall in mortgage rates led to a substantial reduction in debt burdens, in particular, for mortgage-holding households in countries where households have higher debt burdens and a larger share of ARMs, as well as for some disadvantaged groups of households, such as those with low income. This suggests interesting distributional effects of monetary policy, which we leave for future research.

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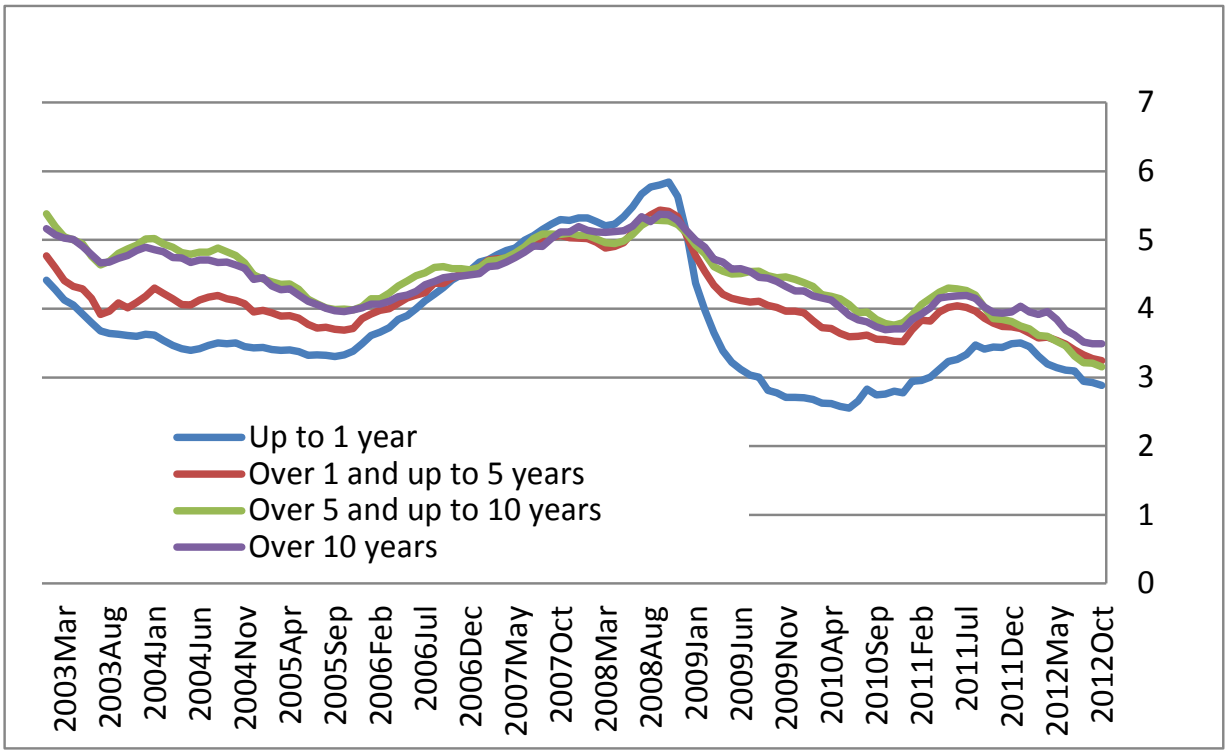
http://www.fuqua.duke.edu/finance/phd-students/731584/StuartWebb_JMP.pdf.

Figure 1: Mortgage rates in the euro area (in %)



Note: This figure plots mortgage rates in the euro area, divided according to their initial period of fixation. Source: ECB MFI interest rate statistics.

Figure 2a: Effects of mortgage rates on the median debt-service-to-income ratio among ARM holders in the euro area, by income quintiles

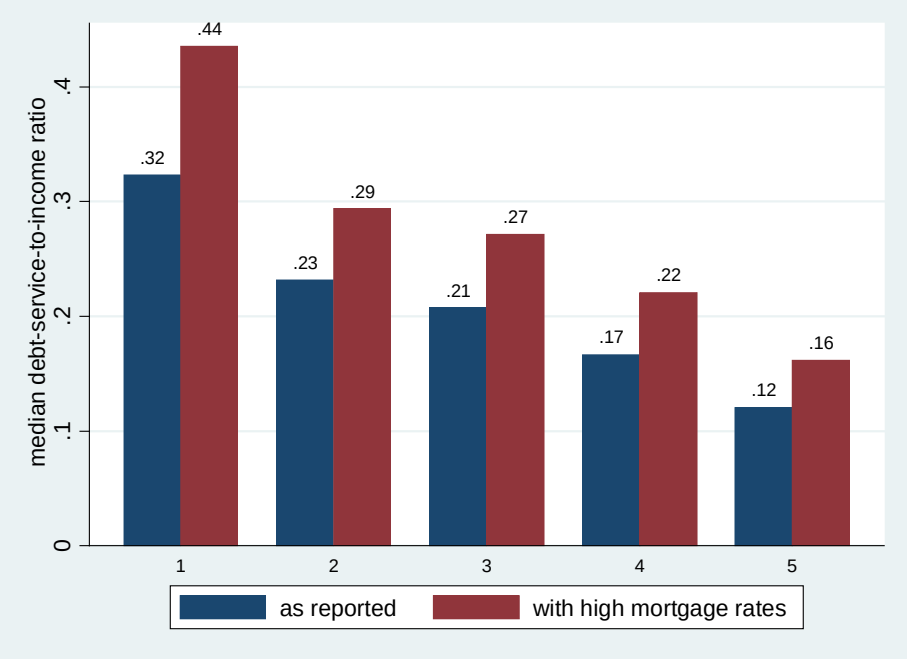
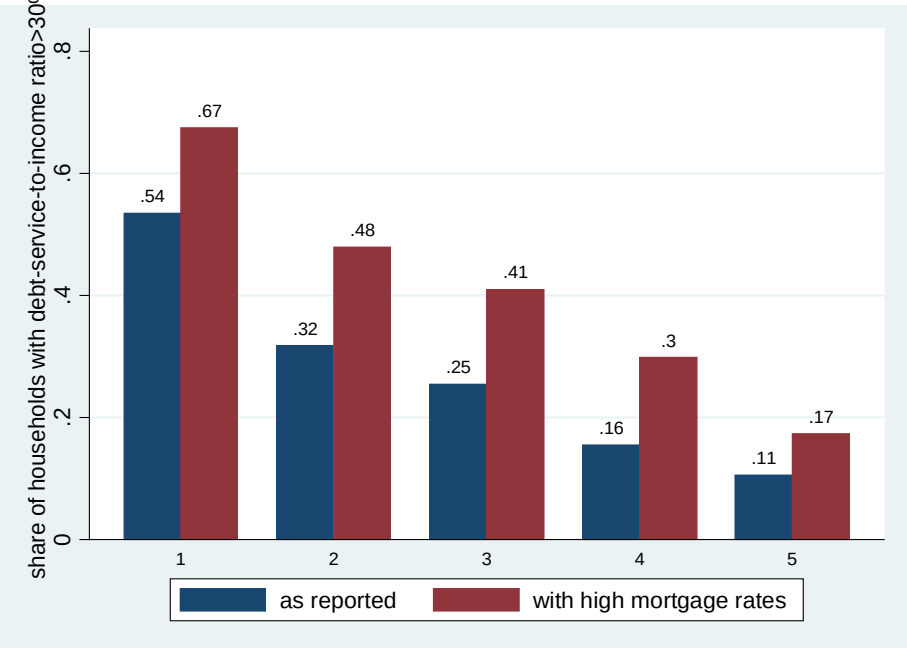


Figure 2b: Effects of mortgage rates on the share of ARM holders that have a debt-service-to-income ratio above 30% in the euro area, by income quintiles



Note: These figures show the effects of mortgage rates on the median debt-service-to-income ratio among ARM holders (a) and on the share of ARM holders that have a debt-service-to-income ratio above 30% (b). The effects are reported separately across quintiles of the income distribution. The blue bars denote the data in the HFCS, the red bars the situation under the high-mortgage-rate scenario. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Figure 3a: Effects of mortgage rates on the median debt-service-to-income ratio among ARM holders, by country

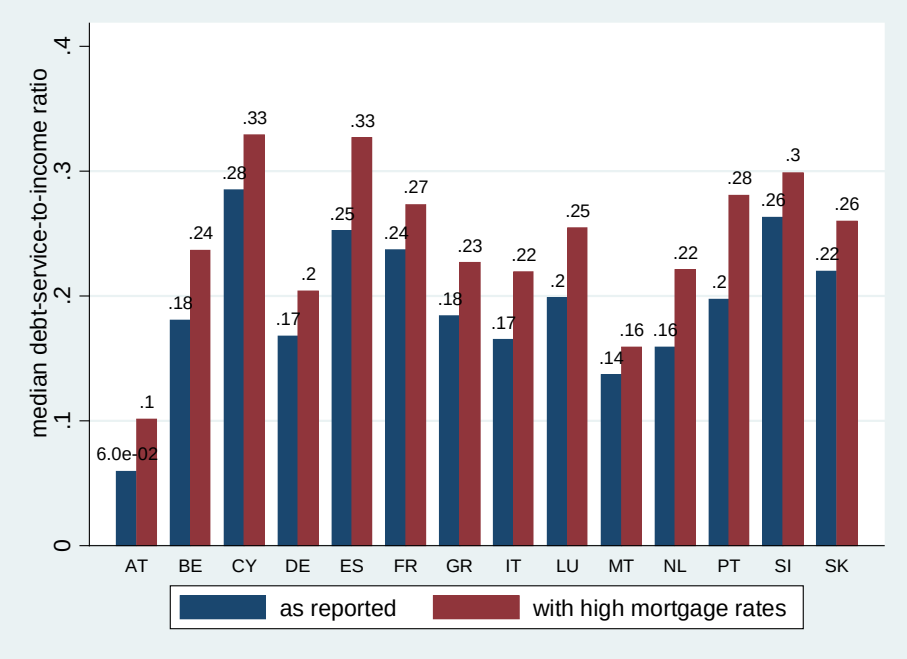
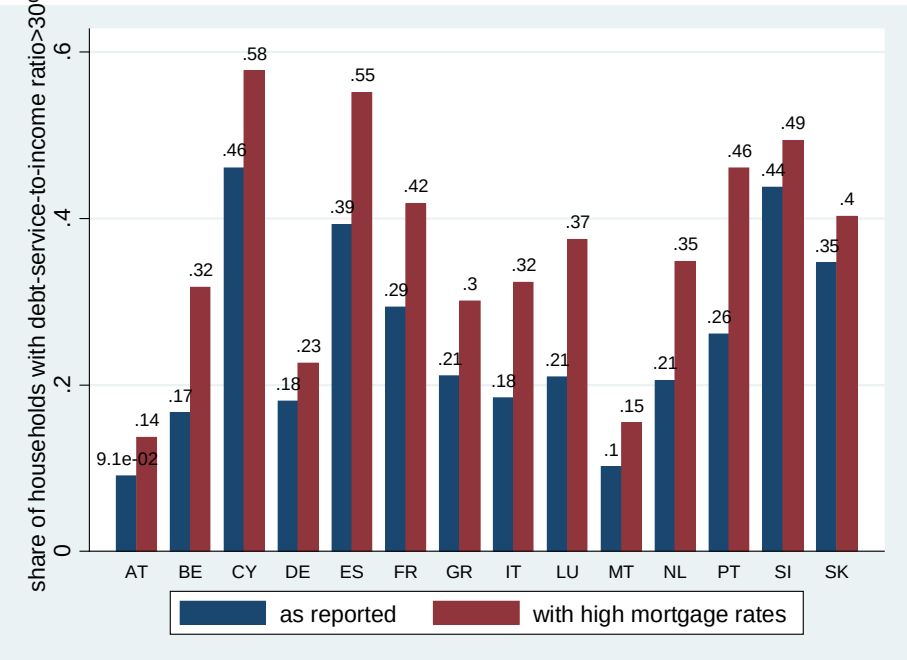


Figure 3b: Effects of mortgage rates on the share of ARM holders that have a debt-service-to-income ratio above 30%, by country



Note: These figures show the effects of mortgage rates on the median debt-service-to-income ratio among ARM holders (a) and on the share of ARM holders that have a debt-service-to-income ratio above 30% (b). The effects are reported separately across the euro area countries. The blue bars denote the data in the HFCS, the red bars the situation under the high-mortgage-rate scenario. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 1: The share of mortgage debt in total household liabilities

Country	Share of total liabilities (in %)	
	mortgage debt	HMR mortgage debt
Austria	84	72
Belgium	90	80
Cyprus	86	56
France	76	52
Germany	88	59
Greece	79	61
Italy	74	66
Luxembourg	90	68
Malta	76	51
Netherlands	83	77
Portugal	92	80
Slovakia	81	77
Slovenia	42	39
Spain	86	61
Euro area	83	63

Note: This table shows the share of mortgage debt in total household liabilities. The first column reports the share for total mortgage debt and the second for mortgage debt related to the household main residence (HMR). Euro area totals are constructed using final sampling weights. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 2: Number of observations in the sample

Country	Observations	Owners of main residence	Mortgage holders and mortgage choice info
Austria	2,380	1,181	381
Belgium	2,327	1,725	640
Cyprus	1,237	990	547
France	15,006	10,003	2,179
Germany	3,565	2,013	809
Greece	2,971	1,986	353
Italy	7,951	5,636	546
Luxembourg	950	665	328
Malta	843	643	88
Netherlands	1,301	964	695
Portugal	4,404	3,055	986
Slovakia	2,057	1,591	229
Slovenia	343	285	27
Spain	6,197	5,388	1,165
Euro area	51,532	36,124	8,973

Note: This table shows the number of observations contained in the sample. The first column reports all observations, the second the number of households that own their main residence, the third the number of households that hold a mortgage on the household main residence and have information on the choice of mortgage contract. Euro area totals are constructed using final sampling weights. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 3: Prevalence of mortgage types (in %)

Country	Total	Education			Year of acquisition (country-specific quintiles)					Household income (country-specific quintiles)					Employment sector	
		Low	Middle	High	1	2	3	4	5	1	2	3	4	5	Financial	Public
Austria	66.7	59.5	66.4	74.0	56.7	72.5	69.5	71.1	62.4	51.2	67.4	67.5	73.4	74.4	57.6	64.9
Belgium	31.6	37.6	36.4	26.8	33.2	27.2	41.8	14.4	36.4	31.2	32.4	38.6	30.6	25.4	34.8	26.9
Cyprus	64.8	35.6	67.4	69.2	56.7	66.7	62.6	72.1	71.8	60.0	71.7	57.4	70.6	64.1	87.6	71.9
France	12.8	17.6	11.4	12.4	13.1	13.3	20.1	10.5	5.1	13.0	12.5	13.0	12.6	13.0	18.6	9.0
Germany	19.5	22.4	21.6	16.1	34.4	20.3	14.5	9.5	17.7	17.0	15.9	16.4	21.3	27.0	7.8	20.3
Greece	48.2	43.6	49.6	50.6	48.5	61.0	50.3	38.6	42.5	42.2	34.5	49.4	63.7	51.3	0.0	55.1
Italy	51.6	48.0	50.8	57.5	54.6	51.3	55.6	36.5	56.5	43.8	48.8	46.3	57.2	62.6	59.4	42.4
Luxembourg	85.1	86.3	87.1	82.0	83.0	85.6	93.3	81.2	81.5	92.6	83.0	82.0	81.0	86.8	82.7	90.8
Malta	76.3	65.2	79.4	86.4	76.2	71.7	87.9	81.8	60.9	76.0	70.7	74.9	86.1	74.2	79.7	78.6
Netherlands	82.7	82.5	79.7	85.5	85.1	80.7	85.4	82.4	77.2	87.7	80.6	83.8	77.7	83.5	94.3	78.1
Portugal	84.5	83.7	86.4	84.5	72.9	88.0	89.4	92.5	79.7	84.8	90.5	85.1	79.6	82.2	85.6	83.1
Slovakia	42.2	100.0	42.0	40.5	41.0	42.3	56.0	38.0	37.6	36.1	41.7	38.2	49.8	45.4	7.6	35.1
Slovenia	72.9	61.2	62.8	100.0	54.0	48.5	100.0	*	100.0	100.0	84.3	17.1	63.2	98.5	100.0	71.2
Spain	82.9	78.9	81.4	87.7	69.1	85.7	92.1	92.8	79.3	78.2	79.4	85.0	80.3	91.9	100.0	85.8
Euro area	45.5	59.3	39.7	44.6	47.7	44.7	47.6	41.0	46.7	43.7	43.7	44.8	45.5	50.1	44.6	43.6

Note: This table reports the share of adjustable-rate mortgages among the oldest active mortgages related to the household main residence. * Because of the low number of households in the Slovenian sample, the fourth quintile of the year of acquisition does not exist. Euro area totals are constructed using final sampling weights. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 4: Determinants of mortgage choice – benchmark model

	(1)		(2)		(3)		(4)	
Household characteristics								
Gender: male	0.022	*(0.017)*	0.022	*(0.017)*	0.022	*(0.017)*	0.022	*(0.017)*
Number of income earners	-0.004	*(0.015)*	-0.004	*(0.015)*	-0.003	*(0.015)*	-0.004	*(0.015)*
Temporary labour contract	-0.013	*(0.035)*	-0.015	*(0.035)*	-0.015	*(0.036)*	-0.014	*(0.037)*
Self-employed	0.005	*(0.027)*	0.008	*(0.027)*	0.005	*(0.028)*	0.005	*(0.028)*
Unemployed	-0.074 **	*(0.035)*	-0.076 **	*(0.035)*	-0.075 **	*(0.035)*	-0.076 **	*(0.035)*
Income, quintile 2	0.011	*(0.027)*	0.010	*(0.027)*	0.009	*(0.027)*	0.009	*(0.027)*
Income, quintile 3	0.037	*(0.029)*	0.039	*(0.029)*	0.037	*(0.029)*	0.036	*(0.029)*
Income, quintile 4	0.050	*(0.036)*	0.051	*(0.036)*	0.047	*(0.036)*	0.048	*(0.037)*
Income, quintile 5	0.123 ***	*(0.038)*	0.123 ***	*(0.037)*	0.120 ***	*(0.038)*	0.120 ***	*(0.038)*
Liquid wealth, quintile 2	0.002	*(0.024)*	0.001	*(0.024)*	0.001	*(0.025)*	0.001	*(0.025)*
Liquid wealth, quintile 3	-0.039	*(0.025)*	-0.040	*(0.025)*	-0.039	*(0.025)*	-0.039	*(0.025)*
Liquid wealth, quintile 4	0.014	*(0.026)*	0.011	*(0.025)*	0.013	*(0.026)*	0.013	*(0.026)*
Liquid wealth, quintile 5	-0.014	*(0.026)*	-0.011	*(0.026)*	-0.013	*(0.026)*	-0.011	*(0.027)*
Education: medium	-0.008	*(0.021)*	-0.007	*(0.021)*	-0.009	*(0.021)*	-0.010	*(0.021)*
Education: high	-0.013	*(0.023)*	-0.014	*(0.023)*	-0.015	*(0.023)*	-0.017	*(0.024)*
Financial sector	-0.037	*(0.034)*	-0.037	*(0.033)*	-0.038	*(0.034)*	-0.042	*(0.034)*
Public sector	-0.036	*(0.023)*	-0.033	*(0.023)*	-0.035	*(0.023)*	-0.033	*(0.023)*
Mortgage characteristics								
Length of loan at take-out	0.008 ***	*(0.001)*	0.007 ***	*(0.001)*	0.008 ***	*(0.001)*	0.008 ***	*(0.001)*
Refinancing of earlier loan	-0.005	*(0.019)*	-0.004	*(0.019)*	-0.006	*(0.019)*	-0.007	*(0.020)*
Loan-income ratio, quintile 2	-0.009	*(0.032)*	-0.009	*(0.033)*	-0.012	*(0.032)*	-0.014	*(0.033)*
Loan-income ratio, quintile 3	-0.011	*(0.031)*	-0.009	*(0.032)*	-0.014	*(0.032)*	-0.016	*(0.032)*
Loan-income ratio, quintile 4	0.003	*(0.035)*	0.004	*(0.036)*	-0.002	*(0.036)*	-0.005	*(0.036)*
Loan-income ratio, quintile 5	0.002	*(0.040)*	0.005	*(0.040)*	-0.004	*(0.040)*	-0.006	*(0.041)*
Debt-service-income ratio, quintile 2	0.034	*(0.030)*	0.034	*(0.030)*	0.033	*(0.031)*	0.034	*(0.031)*
Debt-service-income ratio, quintile 3	0.037	*(0.028)*	0.039	*(0.028)*	0.036	*(0.028)*	0.037	*(0.028)*
Debt-service-income ratio, quintile 4	0.056	*(0.034)*	0.057 *	*(0.034)*	0.055	*(0.034)*	0.057	*(0.035)*
Debt-service-income ratio, quintile 5	0.068 *	*(0.039)*	0.065 *	*(0.038)*	0.066 *	*(0.039)*	0.067 *	*(0.039)*
Macroeconomic conditions at time of mortgage take-out								
Unemployment rate	-0.008 *	*(0.004)*	-0.011 ***	*(0.004)*	-0.005	*(0.004)*	-0.004	*(0.004)*
GDP growth	0.005	*(0.004)*	-0.001	*(0.005)*	0.001	*(0.004)*	0.002	*(0.004)*
Inflation volatility	-0.000	*(0.002)*	-0.001	*(0.002)*	0.001	*(0.002)*	0.001	*(0.002)*
Long-term interest rate	0.002	*(0.005)*	0.006	*(0.004)*	-0.000	*(0.005)*	-0.002	*(0.005)*
Yield spread	0.032 ***	*(0.007)*	0.026 ***	*(0.007)*	0.021 **	*(0.008)*	0.005	*(0.008)*
Country fixed effects	Yes		Yes		Yes		Yes	
Socio-demographics	Yes		Yes		Yes		Yes	
Number of observations	8,515		8,472		8,504		8,473	

Note: This table reports weighted average marginal effects based on estimates of equations (1) and (2). All models control for country fixed effects and age, age^2, the number of dependent children in the household and marital status of the reference person. Panel (1) contains the benchmark model, panel (2) uses lagged macroeconomic determinants. Panels (3) and (4) follow Koijen et al. (2009) and assume that households form adaptive expectations based on the average of the previous two and three years, respectively. ***/**/* denote statistical significance at the 1%/5%/10% levels, respectively. Numbers in italics report standard errors. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 5: Determinants of mortgage choice – robustness tests

	(1) benchmark		(2) excluding FR		(3) excluding NL		(4) incl. time elapsed		(5) time fixed effects		(6) last mortgage		(7) take-out <= 6 years		(8) excl. mortgage charact.	
Household characteristics																
Gender: male	0.022	*(0.017)*	0.018	*(0.019)*	0.024	*(0.018)*	0.023	*(0.017)*	0.023	*(0.017)*	0.021	*(0.017)*	0.028	*(0.021)*	0.020	*(0.017)*
Number of income earners	-0.004	*(0.015)*	-0.003	*(0.017)*	-0.008	*(0.016)*	-0.004	*(0.015)*	-0.004	*(0.015)*	-0.007	*(0.014)*	0.004	*(0.020)*	-0.008	*(0.015)*
Temporary labour contract	-0.013	*(0.035)*	-0.032	*(0.040)*	-0.004	*(0.036)*	-0.009	*(0.035)*	-0.006	*(0.035)*	-0.010	*(0.036)*	-0.066 *	*(0.036)*	-0.010	*(0.038)*
Self-employed	0.005	*(0.027)*	0.006	*(0.036)*	-0.003	*(0.029)*	0.007	*(0.027)*	0.008	*(0.028)*	-0.001	*(0.027)*	0.023	*(0.028)*	0.002	*(0.027)*
Unemployed	-0.074 **	*(0.035)*	-0.083 **	*(0.040)*	-0.071 **	*(0.036)*	-0.073 **	*(0.035)*	-0.073 **	*(0.035)*	-0.076 **	*(0.035)*	-0.022	*(0.049)*	-0.081 **	*(0.035)*
Income, quintile 2	0.011	*(0.027)*	0.021	*(0.032)*	0.024	*(0.030)*	0.013	*(0.027)*	0.014	*(0.027)*	0.013	*(0.027)*	0.006	*(0.036)*	0.002	*(0.026)*
Income, quintile 3	0.037	*(0.029)*	0.048	*(0.034)*	0.052	*(0.032)*	0.040	*(0.029)*	0.041	*(0.029)*	0.040	*(0.031)*	0.053	*(0.040)*	0.022	*(0.027)*
Income, quintile 4	0.050	*(0.036)*	0.060	*(0.044)*	0.078 **	*(0.039)*	0.054	*(0.036)*	0.054	*(0.036)*	0.072 *	*(0.037)*	0.071	*(0.050)*	0.026	*(0.033)*
Income, quintile 5	0.123 ***	*(0.038)*	0.137 ***	*(0.046)*	0.154 ***	*(0.042)*	0.128 ***	*(0.038)*	0.130 ***	*(0.037)*	0.130 ***	*(0.038)*	0.120 **	*(0.051)*	0.086 **	*(0.036)*
Current income: low	--	--	0.000	*(0.027)*	--	--	--	--	--	--	--	--	--	--	--	--
Current income: high	--	--	0.022	*(0.035)*	--	--	--	--	--	--	--	--	--	--	--	--
Income expectations: low	--	--	-0.018	*(0.022)*	--	--	--	--	--	--	--	--	--	--	--	--
Income expectations: high	--	--	0.016	*(0.030)*	--	--	--	--	--	--	--	--	--	--	--	--
Liquid wealth, quintile 2	0.002	*(0.024)*	-0.009	*(0.030)*	0.009	*(0.026)*	0.000	*(0.024)*	0.001	*(0.024)*	-0.005	*(0.025)*	0.002	*(0.030)*	-0.013	*(0.024)*
Liquid wealth, quintile 3	-0.039	*(0.025)*	-0.038	*(0.030)*	-0.039	*(0.027)*	-0.042 *	*(0.025)*	-0.043 *	*(0.025)*	-0.038	*(0.025)*	-0.029	*(0.033)*	-0.052 **	*(0.025)*
Liquid wealth, quintile 4	0.014	*(0.026)*	0.001	*(0.031)*	0.003	*(0.028)*	0.011	*(0.026)*	0.010	*(0.025)*	0.009	*(0.026)*	-0.027	*(0.033)*	-0.002	*(0.025)*
Liquid wealth, quintile 5	-0.014	*(0.026)*	-0.033	*(0.033)*	-0.020	*(0.029)*	-0.017	*(0.026)*	-0.019	*(0.026)*	-0.008	*(0.027)*	-0.034	*(0.035)*	-0.032	*(0.027)*
Education: medium	-0.008	*(0.021)*	0.012	*(0.026)*	-0.004	*(0.023)*	-0.006	*(0.021)*	-0.008	*(0.021)*	0.001	*(0.021)*	0.016	*(0.026)*	-0.006	*(0.021)*
Education: high	-0.013	*(0.023)*	-0.003	*(0.028)*	-0.017	*(0.026)*	-0.011	*(0.023)*	-0.013	*(0.023)*	-0.007	*(0.023)*	-0.002	*(0.028)*	-0.008	*(0.024)*
Financial sector	-0.037	*(0.034)*	-0.072 *	*(0.040)*	-0.049	*(0.037)*	-0.035	*(0.033)*	-0.037	*(0.034)*	-0.047	*(0.032)*	-0.034	*(0.045)*	-0.028	*(0.033)*
Public sector	-0.036	*(0.023)*	-0.038	*(0.027)*	-0.032	*(0.025)*	-0.035	*(0.023)*	-0.035	*(0.022)*	-0.038 *	*(0.023)*	0.020	*(0.029)*	-0.038 *	*(0.023)*
Risk aversion	--	--	-0.010	*(0.015)*	--	--	--	--	--	--	--	--	--	--	--	--
Mortgage characteristics																
Length of loan at take-out	0.008 ***	*(0.001)*	0.008 ***	*(0.001)*	0.005 ***	*(0.001)*	0.007 ***	*(0.001)*	0.008 ***	*(0.001)*	0.007 ***	*(0.001)*	0.005 ***	*(0.002)*	--	--
Refinancing of earlier loan	-0.005	*(0.019)*	-0.001	*(0.024)*	-0.028	*(0.022)*	-0.002	*(0.019)*	0.000	*(0.019)*	-0.005	*(0.020)*	0.037	*(0.025)*	--	--
Loan-income ratio, quintile 2	-0.009	*(0.032)*	--	--	-0.016	*(0.035)*	-0.009	*(0.032)*	-0.013	*(0.032)*	0.003	*(0.033)*	-0.009	*(0.056)*	--	--
Loan-income ratio, quintile 3	-0.011	*(0.031)*	--	--	-0.012	*(0.033)*	-0.009	*(0.032)*	-0.013	*(0.032)*	0.005	*(0.033)*	-0.001	*(0.045)*	--	--
Loan-income ratio, quintile 4	0.003	*(0.035)*	--	--	0.015	*(0.037)*	0.009	*(0.036)*	0.006	*(0.036)*	0.016	*(0.037)*	0.029	*(0.047)*	--	--
Loan-income ratio, quintile 5	0.002	*(0.040)*	--	--	0.002	*(0.043)*	0.013	*(0.041)*	0.014	*(0.040)*	0.015	*(0.041)*	0.050	*(0.049)*	--	--
Debt-service-income ratio, quintile 2	0.034	*(0.030)*	0.017	*(0.033)*	0.044	*(0.033)*	0.036	*(0.030)*	0.036	*(0.030)*	0.034	*(0.032)*	0.022	*(0.055)*	--	--
Debt-service-income ratio, quintile 3	0.037	*(0.028)*	0.013	*(0.029)*	0.042	*(0.030)*	0.041	*(0.028)*	0.039	*(0.028)*	0.039	*(0.030)*	0.013	*(0.042)*	--	--
Debt-service-income ratio, quintile 4	0.056	*(0.034)*	0.052	*(0.034)*	0.069 *	*(0.037)*	0.059 *	*(0.034)*	0.059 *	*(0.034)*	0.070 *	*(0.036)*	0.023	*(0.048)*	--	--
Debt-service-income ratio, quintile 5	0.068 *	*(0.039)*	0.057	*(0.036)*	0.078 **	*(0.040)*	0.071 *	*(0.038)*	0.069 *	*(0.038)*	0.064 *	*(0.039)*	0.019	*(0.055)*	--	--
Loan-value ratio, quintile 2	--	--	0.017	*(0.030)*	--	--	--	--	--	--	--	--	--	--	--	--
Loan-value ratio, quintile 3	--	--	0.043	*(0.033)*	--	--	--	--	--	--	--	--	--	--	--	--
Loan-value ratio, quintile 4	--	--	-0.039	*(0.030)*	--	--	--	--	--	--	--	--	--	--	--	--
Loan-value ratio, quintile 5	--	--	0.021	*(0.030)*	--	--	--	--	--	--	--	--	--	--	--	--
Macroeconomic conditions at time of mortgage take-out																
Unemployment rate	-0.008 *	*(0.004)*	-0.010 **	*(0.005)*	-0.011 **	*(0.004)*	-0.008 *	*(0.004)*	-0.014 ***	*(0.004)*	-0.008 *	*(0.004)*	0.008	*(0.010)*	-0.015 ***	*(0.004)*
GDP growth	0.005	*(0.004)*	0.004	*(0.005)*	0.007	*(0.004)*	0.003	*(0.005)*	-0.001	*(0.005)*	0.004	*(0.004)*	0.006	*(0.005)*	0.004	*(0.004)*
Inflation volatility	-0.000	*(0.002)*	-0.000	*(0.002)*	-0.001	*(0.002)*	0.000	*(0.002)*	0.000	*(0.002)*	0.000	*(0.002)*	-0.023	*(0.014)*	0.000	*(0.002)*
Long-term interest rate	0.002	*(0.005)*	-0.001	*(0.005)*	0.003	*(0.005)*	-0.008	*(0.006)*	-0.004	*(0.006)*	0.002	*(0.005)*	-0.051 *	*(0.027)*	0.002	*(0.004)*
Yield spread	0.032 ***	*(0.007)*	0.025 ***	*(0.009)*	0.031 ***	*(0.008)*	0.028 ***	*(0.008)*	0.026 ***	*(0.008)*	0.029 ***	*(0.008)*	0.047 ***	*(0.013)*	0.034 ***	*(0.008)*
Time elapsed	--	--	--	--	--	--	0.005 **	*(0.002)*	--	--	--	--	--	--	--	--
Year of mortgage take-out, quintile 2	--	--	--	--	--	--	--	--	-0.022	*(0.028)*	--	--	--	--	--	--
Year of mortgage take-out, quintile 3	--	--	--	--	--	--	--	--	-0.008	*(0.033)*	--	--	--	--	--	--
Year of mortgage take-out, quintile 4	--	--	--	--	--	--	--	--	-0.074 **	*(0.032)*	--	--	--	--	--	--
Year of mortgage take-out, quintile 5	--	--	--	--	--	--	--	--	-0.109 ***	*(0.040)*	--	--	--	--	--	--
Country fixed effects	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Socio-demographics	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	8,515		6,203		7,863		8,515		8,515		8,525		4,079		8,694	

Note: This table reports weighted average marginal effects based on estimates of equations (1) and (2). All models control for country fixed effects and age, age^2, the number of dependent children in the household and marital status of the reference person. Panel (1) contains the benchmark model. Panel (2) excludes data for France and introduces variables that are available for all countries but France. Panel (3) excludes data for the Netherlands. Panel (4) introduces a variable that measures how many years have elapsed since the mortgage was taken out. Panel (5) introduces time quintiles based on the national distribution of mortgage take-outs. Panel (6) explains mortgage choice for the last (rather than the first) mortgage that a given household has taken out; panel (7) contains only mortgages taken out at most six years prior to the survey, and panel (8) drops mortgage characteristics. ***/**/* denote statistical significance at the 1%/5%/10% levels, respectively. Numbers in italics report standard errors. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 6: Mortgage rates in euro area countries (in %)

	Austria	Belgium	Cyprus	France	Ger-many	Greece	Italy	Luxem-bourg	Malta	Nether-lands	Portugal	Slovakia	Slovenia	Spain
October 2008	6.04	6.02	6.45	5.36	6.34	5.92	5.56	4.89	4.88	5.98	5.67	6.52	7.25	6.04
Average rate over 2010	2.69	2.91	4.73	3.22	3.21	3.42	2.33	2.00	3.39	3.65	2.43	4.85	3.21	2.44
Difference	3.35	3.11	1.73	2.14	3.14	2.49	3.23	2.89	1.49	2.33	3.24	1.66	4.04	3.60

Source: ECB MFI interest rate statistics, monthly frequency; balance sheet item: lending for house purchase excluding revolving loans and overdrafts; original maturity: up to 1 year; MFI interest rate data type: annualized agreed rate.

Table 7: Determinants of debt relief in the monetary policy counterfactual simulation

	(1)		(2)		(3)		(4)	
Country fixed effects								
Austria	0.051	*(0.048)*	0.040	*(0.044)*	0.042	*(0.044)*	0.042	*(0.036)*
Belgium	0.089 ***	*(0.025)*	0.073 ***	*(0.023)*	0.076 ***	*(0.023)*	0.058 ***	*(0.023)*
Cyprus	0.154 ***	*(0.025)*	0.150 ***	*(0.024)*	0.153 ***	*(0.024)*	0.103 ***	*(0.024)*
France	0.033	*(0.022)*	0.009	*(0.021)*	0.013	*(0.020)*	-0.014	*(0.021)*
Greece	0.090 ***	*(0.023)*	0.087 ***	*(0.023)*	0.093 ***	*(0.022)*	0.040	*(0.024)*
Italy	0.114 ***	*(0.027)*	0.097 ***	*(0.026)*	0.099 ***	*(0.025)*	0.045 *	*(0.025)*
Luxembourg	0.172 ***	*(0.026)*	0.163 ***	*(0.024)*	0.167 ***	*(0.024)*	0.118 ***	*(0.024)*
Malta	0.065	*(0.022)*	0.050	*(0.021)*	0.052	*(0.020)*	0.023	*(0.021)*
Netherlands	0.156 ***	*(0.058)*	0.143 ***	*(0.056)*	0.144 ***	*(0.056)*	0.089 ***	*(0.056)*
Portugal	0.194 ***	*(0.023)*	0.189 ***	*(0.023)*	0.195 ***	*(0.022)*	0.117 ***	*(0.024)*
Slovakia	0.059 *	*(0.021)*	0.036	*(0.022)*	0.044	*(0.021)*	-0.007	*(0.023)*
Slovenia	0.081	*(0.091)*	0.061	*(0.089)*	0.072	*(0.089)*	0.007	*(0.099)*
Spain	0.186 ***	*(0.034)*	0.179 ***	*(0.033)*	0.185 ***	*(0.032)*	0.129 ***	*(0.032)*
Household characteristics								
Gender: male	--	--	0.021 *	*(0.012)*	0.023 *	*(0.012)*	0.016	*(0.011)*
Number of income earners	--	--	-0.005	*(0.011)*	-0.007	*(0.011)*	-0.007	*(0.011)*
Temporary labour contract	--	--	0.029	*(0.020)*	0.031	*(0.020)*	0.023	*(0.015)*
Self-employed	--	--	0.007	*(0.016)*	0.008	*(0.016)*	0.008	*(0.015)*
Unemployed	--	--	-0.008	*(0.022)*	-0.010	*(0.022)*	-0.017	*(0.018)*
Income, quintile 2	--	--	-0.029 *	*(0.015)*	-0.030 **	*(0.015)*	0.004	*(0.014)*
Income, quintile 3	--	--	-0.036 **	*(0.016)*	-0.035 **	*(0.015)*	0.010	*(0.014)*
Income, quintile 4	--	--	-0.052 ***	*(0.017)*	-0.050 ***	*(0.018)*	0.020	*(0.017)*
Income, quintile 5	--	--	-0.096 ***	*(0.023)*	-0.087 ***	*(0.023)*	0.001	*(0.022)*
Liquid wealth, quintile 2	--	--	--	--	-0.030 *	*(0.016)*	-0.048 ***	*(0.016)*
Liquid wealth, quintile 3	--	--	--	--	-0.031 *	*(0.017)*	-0.051 ***	*(0.016)*
Liquid wealth, quintile 4	--	--	--	--	-0.034 *	*(0.017)*	-0.053 ***	*(0.017)*
Liquid wealth, quintile 5	--	--	--	--	-0.061 ***	*(0.019)*	-0.065 ***	*(0.017)*
Education: medium	--	--	0.024 *	*(0.013)*	0.027 **	*(0.012)*	0.021 *	*(0.011)*
Education: high	--	--	0.025 *	*(0.015)*	0.030 **	*(0.014)*	0.011	*(0.012)*
Financial sector	--	--	-0.023	*(0.027)*	-0.021	*(0.028)*	-0.031	*(0.023)*
Public sector	--	--	-0.024 *	*(0.013)*	-0.023 *	*(0.012)*	-0.020 *	*(0.011)*
Mortgage characteristics								
Length of loan at take-out	--	--	--	--	--	--	0.002 ***	*(0.001)*
Refinancing of earlier loan	--	--	--	--	--	--	0.012	*(0.010)*
Loan-income ratio, quintile 2	--	--	--	--	--	--	0.001	*(0.020)*
Loan-income ratio, quintile 3	--	--	--	--	--	--	0.017	*(0.020)*
Loan-income ratio, quintile 4	--	--	--	--	--	--	0.055 ***	*(0.019)*
Loan-income ratio, quintile 5	--	--	--	--	--	--	0.108 ***	*(0.021)*
Debt-service-income ratio, quintile 2	--	--	--	--	--	--	0.003	*(0.021)*
Debt-service-income ratio, quintile 3	--	--	--	--	--	--	0.012	*(0.021)*
Debt-service-income ratio, quintile 4	--	--	--	--	--	--	0.075 ***	*(0.020)*
Debt-service-income ratio, quintile 5	--	--	--	--	--	--	0.127 ***	*(0.022)*
Country fixed effects	Yes		Yes		Yes		Yes	
Socio-demographics	No		Yes		Yes		Yes	
Number of observations	7,739		6,712		6,712		6,556	

Note: This table reports weighted average marginal effects based on estimates of equations (1) and (2). The dependent variable is a dummy variable that is equal to one when a household has a debt-service-to-income ratio below 30% would have a debt-service-to-income ratio above 30% under the high-mortgage-rate scenario. The models contain socio-demographic controls for age, age^2, the number of dependent children in the household and marital status of the reference person. ***/**/* denote statistical significance at the 1%/5%/10% levels, respectively. Numbers in italics report standard errors. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Table 8: Determinants of debt relief in the monetary policy counterfactual simulation, robustness tests

	(1)		(2)		(3)		(4)	
Country fixed effects								
Austria	0.042	*(0.036)*	-0.002	*(0.072)*	0.054 *	*(0.027)*	0.034	*(0.045)*
Belgium	0.058 ***	*(0.023)*	0.098 **	*(0.045)*	0.007	*(0.024)*	0.054 **	*(0.024)*
Cyprus	0.103 ***	*(0.024)*	0.074	*(0.049)*	0.059 ***	*(0.021)*	0.137 ***	*(0.025)*
France	-0.014	*(0.021)*	0.038	*(0.042)*	0.002	*(0.018)*	-0.000	*(0.021)*
Greece	0.040	*(0.024)*	0.007	*(0.050)*	0.026	*(0.019)*	0.050 *	*(0.024)*
Italy	0.045 *	*(0.025)*	0.039	*(0.051)*	0.033 *	*(0.022)*	0.040	*(0.026)*
Luxembourg	0.118 ***	*(0.024)*	0.097 **	*(0.048)*	0.069 ***	*(0.020)*	0.120 ***	*(0.025)*
Malta	0.023	*(0.021)*	-0.112	*(0.045)*	0.064 **	*(0.020)*	0.116 ***	*(0.022)*
Netherlands	0.089 ***	*(0.056)*	0.054	*(0.128)*	0.083 ***	*(0.026)*	0.114 ***	*(0.032)*
Portugal	0.117 ***	*(0.024)*	0.091 **	*(0.051)*	0.071 ***	*(0.018)*	0.106 ***	*(0.023)*
Slovakia	-0.007	*(0.023)*	-0.075	*(0.046)*	0.047 **	*(0.018)*	0.043 *	*(0.023)*
Slovenia	0.007	*(0.099)*	-0.182	*(0.205)*	0.019	*(0.057)*	0.002	*(0.101)*
Spain	0.129 ***	*(0.032)*	0.109 ***	*(0.061)*	0.085 ***	*(0.022)*	0.112 ***	*(0.026)*
Household characteristics								
Gender: male	0.016	*(0.011)*	0.029	*(0.021)*	0.013	*(0.008)*	0.022 **	*(0.010)*
Number of income earners	-0.007	*(0.011)*	-0.017	*(0.022)*	-0.001	*(0.007)*	-0.007	*(0.011)*
Temporary labour contract	0.023	*(0.015)*	0.029	*(0.030)*	0.007	*(0.014)*	0.035 **	*(0.015)*
Self-employed	0.008	*(0.015)*	0.012	*(0.028)*	0.025 *	*(0.015)*	0.014	*(0.014)*
Unemployed	-0.017	*(0.018)*	0.026	*(0.031)*	-0.020	*(0.014)*	-0.007	*(0.018)*
Income, quintile 2	0.004	*(0.014)*	0.013	*(0.029)*	-0.002	*(0.010)*	0.005	*(0.014)*
Income, quintile 3	0.010	*(0.014)*	0.015	*(0.028)*	0.003	*(0.011)*	0.008	*(0.014)*
Income, quintile 4	0.020	*(0.017)*	0.036	*(0.031)*	-0.012	*(0.013)*	0.018	*(0.016)*
Income, quintile 5	0.001	*(0.022)*	0.000	*(0.036)*	0.007	*(0.016)*	0.004	*(0.022)*
Liquid wealth, quintile 2	-0.048 ***	*(0.016)*	-0.079 ***	*(0.031)*	-0.028 ***	*(0.010)*	-0.048 ***	*(0.016)*
Liquid wealth, quintile 3	-0.051 ***	*(0.016)*	-0.102 ***	*(0.032)*	-0.055 ***	*(0.011)*	-0.044 ***	*(0.016)*
Liquid wealth, quintile 4	-0.053 ***	*(0.017)*	-0.103 ***	*(0.034)*	-0.038 ***	*(0.011)*	-0.051 ***	*(0.016)*
Liquid wealth, quintile 5	-0.065 ***	*(0.017)*	-0.132 ***	*(0.034)*	-0.056 ***	*(0.016)*	-0.058 ***	*(0.017)*
Education: medium	0.021 *	*(0.011)*	0.013	*(0.020)*	-0.003	*(0.010)*	0.022 **	*(0.011)*
Education: high	0.011	*(0.012)*	0.010	*(0.022)*	-0.007	*(0.010)*	0.010	*(0.012)*
Financial sector	-0.031	*(0.023)*	-0.067	*(0.050)*	0.032 **	*(0.014)*	-0.031	*(0.021)*
Public sector	-0.020 *	*(0.011)*	-0.023	*(0.021)*	0.005	*(0.010)*	-0.013	*(0.011)*
Mortgage characteristics								
Length of loan at take-out	0.002 ***	*(0.001)*	0.002 *	*(0.001)*	0.001 ***	*(0.000)*	0.002 ***	*(0.001)*
Refinancing of earlier loan	0.012	*(0.010)*	0.027	*(0.021)*	0.008	*(0.009)*	0.007	*(0.011)*
Loan-income ratio, quintile 2	0.001	*(0.020)*	0.025	*(0.034)*	-0.003	*(0.019)*	-0.008	*(0.022)*
Loan-income ratio, quintile 3	0.017	*(0.020)*	0.042	*(0.037)*	-0.010	*(0.019)*	0.012	*(0.023)*
Loan-income ratio, quintile 4	0.055 ***	*(0.019)*	0.110 ***	*(0.038)*	-0.007	*(0.016)*	0.049 **	*(0.021)*
Loan-income ratio, quintile 5	0.108 ***	*(0.021)*	0.223 ***	*(0.041)*	0.029 *	*(0.016)*	0.103 ***	*(0.023)*
Debt-service-income ratio, quintile 2	0.003	*(0.021)*	0.011	*(0.036)*	0.016	*(0.022)*	0.007	*(0.022)*
Debt-service-income ratio, quintile 3	0.012	*(0.021)*	0.014	*(0.035)*	0.032	*(0.021)*	0.011	*(0.021)*
Debt-service-income ratio, quintile 4	0.075 ***	*(0.020)*	0.133 ***	*(0.035)*	0.071 ***	*(0.020)*	0.081 ***	*(0.021)*
Debt-service-income ratio, quintile 5	0.127 ***	*(0.044)*	0.322 ***	*(0.044)*	0.146 ***	*(0.022)*	0.134 ***	*(0.023)*
Country fixed effects	Yes		Yes		Yes		Yes	
Socio-demographics	Yes		Yes		Yes		Yes	
Number of observations	6,556		3,364		7,500		6,556	

Note: This table reports weighted average marginal effects based on estimates of equations (1) and (2). The dependent variable is a dummy variable that is equal to one when a household that has a debt-service-to-income ratio below a certain threshold would have a debt-service-to-income ratio above the threshold under the high-mortgage-rate scenario. The models contain socio-demographics controls for age, age^2, the number of dependent children in the household and marital status of the reference person. Panel (1) contains the benchmark model with the debt-service-to-income ratio threshold at 30%. Panel (2) conditions on ARM-holding households. Panel (3) uses a debt-service-to-income ratio threshold of 40%. Panel (4) assumes a mortgage rate difference of 300 basis points in the two interest rate scenarios, equally across all countries. ***/**/* denote statistical significance at the 1%/5%/10% levels, respectively. Numbers in italics report standard errors. Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.

Annex - Table A1: Variable definitions

Variable name	Description	Time of measurement
Country fixed effects (Source: HFCS)		
Austria to Spain; Germany is reference category	Dummy = 1 if household resident in the respective country	*T*
Household characteristics (Source: HFCS)		
Gender: male	Dummy = 1 if reference person is male	*t*
Age, age2	Age and age squared of the reference person at the year of the mortgage take-out	*t*
Single	Dummy = 1 if reference person is single	*T*
Married	Dummy = 1 if reference person is married or has a consensual union on a legal basis	*T*
Divorced	Dummy = 1 if reference person is divorced	*T*
Widowed	Dummy = 1 if reference person is widowed	*T*
Number of dependent children	Number of dependent children	*T*
Number of income earners	Number of income earners in the household	*T*
Temporary labour contract	Dummy = 1 if the reference person has a temporary working contract	*T*
Self-employed	Dummy = 1 if main labour status of reference person is self-employed	*T*
Unemployed	Dummy = 1 if main labour status of reference person is unemployed	*T*
Other employment categories (reference category)	Dummy = 1 if main labour status of reference person is employee, retired or	*T*
Income, quintiles 1 (reference category) to 5	Country specific quintile dummies for total gross household income	*T*
Current income: low	Dummy = 1 if total income is lower than usual in reference period	*T*
Current income: normal (reference category)	Dummy = 1 if total income is normal in reference period	*T*
Current income: high	Dummy = 1 if total income is higher than usual in reference period	*T*
Income expectations: low	Dummy = 1 if future income expectations are below price expectations	*T*
Income expectations: normal (reference category)	Dummy = 1 if future income expectations are about the same as price expectations	*T*
Income expectations: high	Dummy = 1 if future income expectations are more than price expectations	*T*
Liquid wealth, quintiles 1 (reference category) to 5	Country specific quintile dummies for net liquid wealth	*T*
Education: low (reference category)	Dummy = 1 if reference person has low education (ISCED=0,1,2)	*T*
Education: medium	Dummy = 1 if reference person has medium education (ISCED=3,4)	*T*
Education: high	Dummy = 1 if reference person has high education (ISCED=5,6)	*T*
Financial sector	Dummy = 1 if reference person works in the financial sector (NACE: K)	*T*
Public sector	Dummy = 1 if reference person works in the public sector (NACE: O, P, Q)	*T*
Risk aversion	Self-assessed risk aversion, 1 (low) to 4 (high)	*T*
Mortgage characteristics (Source: HFCS)		
Length of loan at take-out	Length of the loan at the time of borrowing/refinancing	*t*
Refinancing of earlier loan	Dummy = 1 if this loan refinances an earlier loan	*t*
Time	Number of years since mortgage take-out	*T*
Loan-income ratio, quintiles 1 (reference category) to 5	Country specific quintile dummies for initial loan to current income ratio	*T*
Debt-service-income ratio, quintiles 1 (reference category) to 5	Country specific quintile dummies for current debt service to current income ratio	*T*
Loan-value ratio, quintiles 1 (reference category) to 5	Country specific quintile dummies for initial loan to initial value ratio	*t*
Macroeconomic conditions at time of mortgage take-out		
Unemployment rate	National unemployment rate	*t*
GDP growth	Nominal national GDP growth rate	*t*
Inflation volatility	Variance of the national CPI inflation, year of mortgage take-out and the 4 years	*t*
Long-term interest rate	Nominal national long-term interest rate	*t*
Yield spread	Spread between nominal national long-term and short-term interest rate	*t*
Year fixed effects (Source: HFCS)		
Years, quintiles 1 (reference category) to 5	Country specific quintile dummies for the year of mortgage take-out	*t*

Note: Time of measurement is given as *t* (the time of mortgage choice) or *T* (the time of the survey). ISCED: International Standard Classification of Education. NACE: Statistical classification of economic activities in the European Community.

Annex - Table A2: Summary statistics of the sample used in the baseline model

Variable name	Obs	Mean	Std. Dev.	Min	Max
Country fixed effects					
Austria	8515	2.5%	0.157	0	1
Belgium	8515	4.7%	0.211	0	1
Cyprus	8515	0.4%	0.062	0	1
France	8515	18.2%	0.386	0	1
Germany	8515	29.1%	0.454	0	1
Greece	8515	1.9%	0.135	0	1
Italy	8515	7.9%	0.269	0	1
Luxembourg	8515	0.2%	0.050	0	1
Malta	8515	0.0%	0.020	0	1
Netherlands	8515	11.9%	0.324	0	1
Portugal	8515	3.7%	0.189	0	1
Slovakia	8515	0.3%	0.054	0	1
Slovenia	8515	0.6%	0.080	0	1
Spain	8515	18.5%	0.388	0	1
Household characteristics					
Gender: male	8515	60.4%	0.489	0	1
Age	8515	38	11.1	18	91
Age2	8515	1551	946.2	324	8281
Single	8515	16.0%	0.367	0	1
Divorced	8515	8.7%	0.281	0	1
Widowed	8515	3.4%	0.181	0	1
Number of dependent children	8515	0.95	1.042	0	7
Number of income earners	8515	1.73	0.661	0	6
Temporary labour contract	8515	4.2%	0.201	0	1
Self-employed	8515	11.7%	0.321	0	1
Unemployed	8515	3.8%	0.192	0	1
Income, quintile 1	8515	19.8%	0.398	0	1
Income, quintile 2	8515	20.0%	0.400	0	1
Income, quintile 3	8515	20.0%	0.400	0	1
Income, quintile 4	8515	20.3%	0.402	0	1
Income, quintile 5	8515	20.0%	0.400	0	1
Current income: low	6399	21.4%	0.410	0	1
Current income: high	6399	12.7%	0.333	0	1
Income expectations: low	6336	38.0%	0.485	0	1
Income expectations: high	6336	15.3%	0.360	0	1
Liquid wealth, quintile 1	8515	20.4%	0.403	0	1
Liquid wealth, quintile 2	8515	19.9%	0.399	0	1
Liquid wealth, quintile 3	8515	19.7%	0.398	0	1
Liquid wealth, quintile 4	8515	20.0%	0.400	0	1
Liquid wealth, quintile 5	8515	20.0%	0.400	0	1
Education: medium	8515	43.0%	0.495	0	1
Education: high	8515	36.7%	0.482	0	1
Financial sector	8515	4.3%	0.203	0	1
Public sector	8515	18.9%	0.391	0	1
Risk aversion	6413	3.58	0.627	1	4
Mortgage characteristics					
Length of loan at take-out	8515	20.51	8.498	0	97
Refinancing of earlier loan	8515	22.7%	0.419	0	1
Loan-income ratio, quintile 1	8515	19.9%	0.399	0	1
Loan-income ratio, quintile 2	8515	20.0%	0.400	0	1
Loan-income ratio, quintile 3	8515	20.1%	0.401	0	1
Loan-income ratio, quintile 4	8515	20.2%	0.402	0	1
Loan-income ratio, quintile 5	8515	19.8%	0.398	0	1
Debt-service-income ratio, quintile 1	8515	19.8%	0.399	0	1
Debt-service-income ratio, quintile 2	8515	20.1%	0.401	0	1
Debt-service-income ratio, quintile 3	8515	20.0%	0.400	0	1
Debt-service-income ratio, quintile 4	8515	20.1%	0.401	0	1
Debt-service-income ratio, quintile 5	8515	20.0%	0.400	0	1
Loan-value ratio, quintile 1	6420	20.0%	0.400	0	1
Loan-value ratio, quintile 2	6420	20.2%	0.401	0	1
Loan-value ratio, quintile 3	6420	19.9%	0.399	0	1
Loan-value ratio, quintile 4	6420	19.9%	0.399	0	1
Loan-value ratio, quintile 5	6420	20.0%	0.400	0	1
Time	8515	7.80	5.790	0	43
Macro variables					
Unemployment rate	8515	8.77	3.073	0.5	21.3
GDP growth	8515	2.10	2.286	-8.0	13.9
Inflation volatility	8515	0.84	2.404	0.0	70.3
Long-term interest rate	8515	4.90	1.919	2.4	27.7
Yield spread	8515	1.08	1.030	-6.9	6.7
Yield spread, previous 2 years	8504	0.96	0.932	-6.3	6.0
Yield spread, previous 3 years	8473	0.85	0.954	-6.8	6.3
Year fixed effects					
Years, quintile 1	8515	21.5%	0.411	0	1
Years, quintile 2	8515	22.5%	0.418	0	1
Years, quintile 3	8515	22.2%	0.416	0	1
Years, quintile 4	8515	18.7%	0.390	0	1
Years, quintile 5	8515	15.0%	0.357	0	1

Source: Eurosystem Household Finance and Consumption Survey, authors' calculations.