Mortgage Choice and Inflation Experiences in the Euro Area*

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Abstract

Households' mortgage choice in the eurozone shows considerable heterogeneity, both across and within country. The persistence of different preferences when choosing between an adjustable rate mortgage (ARM) versus a fixed rate mortgage (FRM) two decades after introducing a common currency is a puzzle. We argue that these patterns can be explained by the long-lasting effect of personal experiences of high-inflation periods prior to joining the eurozone. Using representative micro-data of 9 countries from the Eurosystem's *Household Finance and Consumption Survey*, we show that past exposure to higher inflation predicts significantly lower probability of holding an FRM. We link our results to the theoretical literature on households' risk management in mortgage financing decisions and argue that prepayment penalties in the eurozone increase the *inflation risk* (i.e. the uncertainty of real payments) of an FRM. In line with this, we provide evidence that personal inflation experiences affect risk attitudes: households that experienced high and volatile inflation report lower willingness to take financial risk.

Keywords: experience effects, household surveys, inflation, mortgage choice

JEL Classifications: D14, D91, E31, G41, G51

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1 Introduction

After more than two decades under a common monetary policy, eurozone economies still exhibit considerable heterogeneity in households' choice between fixed rate mortgages (FRM) and adjustable rate mortgages (ARM). Countries such as France or Germany have over 90% of FRM while Portugal and Spain exhibit less than 20% in our representative survey data (see Figure 1) of mortgages taken after joining the common currency. The heterogeneity also prevails within country, varying across time and age groups. For example, Greece and Italy exhibit roughly the same FRM-share, but in the case of Greece, among young households taking a mortgage, 49% chose an FRM, while among older households the share decreases to 32%. In Italy, on the other hand, the share of FRM among young households is also 49% while it is 62% for older households. While institutional inertia and supply factors explain part of these patterns, the persistence of the heterogeneity remains a puzzle Campbell (2013). Notwithstanding, even accounting for socio-economic (such as age, gender, education, income and wealth, etc.) and mortgage characteristics (spread between ARM and FRM, term, etc.), the usual suspects in the literature, do not suffice to explain it.

Understanding the persistence of the heterogeneity in households' mortgage choice matters. Buying a house is the largest financial decision of most families, and the associated mortgage remains the largest liability on their balance sheet for decades. Moreover, there is a macroeconomic significance as well. Households with an ARM can benefit from reductions in interest rates, resulting in a stronger transmission mechanism of monetary policy under a dominance of ARM compared with FRM (Di Maggio et al., 2017; Garriga et al., 2017). These differences in housing finance are particularly interesting in the eurozone, which admits a uniform monetary policy on countries with considerable heterogeneity in their shares of FRM.

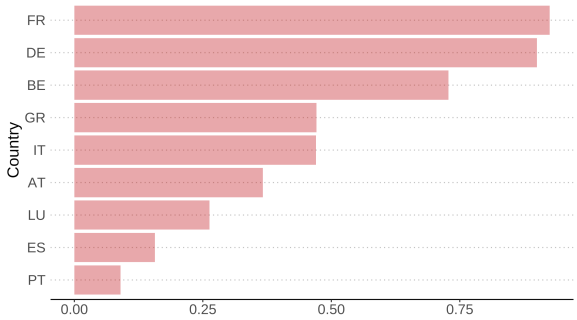


Figure 1: Share of home-owners with a fixed-rate mortgage in Europe

The figure plots the share of households who hold fixed rate mortgages for each country, given that they are home-owners and have a mortgage on their main residence. Shares are weighted to be representative of the population. Source: Eurosystem Household Finance and Consumer Survey. Data includes information on households who were interviewed in either Wave 1, Wave 2 or Wave 3 of HFCS. Figures for each wave individually exhibit similar heterogeneity.

In this paper, we show that personal experiences of high-inflation periods prior to joining the eurozone are an important determinant of households financing choices, which in turn contribute to the observed heterogeneity in FRM shares. More specifically, higher past experienced inflation reduces households likelihood of holding an FRM: using representative household-level data from 9 countries[1], we find that a one log-point increase in experienced inflation predicts a 71% decrease in the odds of holding a fixed-rate mortgage. The effect is significant both statistically and economically, after accounting for a battery of controls. Furthermore, our results have the opposite sign compared to Botsch and Malmendier (2023), who argue that the long shadow of the Great Inflation of the 1970s can explain the dominance of FRM in the US.

Our research connects two concepts to explain this seemingly surprising result. First, the idea from the seminal paper of Campbell and Cocco (2003) that mortgage choice is a risk management exercise for households. Real payments on an ARM tend to be stable, as interest rate movements compensate for changes in the rate of inflation. However, while an FRM can protect households from inflationary periods through lower real interest rates (i.e., it serves as an *inflation hedge*), the real value of payments can vary if inflation is volatile (i.e., it poses an *inflation risk*). To balance these two channels, we argue that when choosing between an ARM and FRM, households need to form expectations about the future path of real payments and, consequently, the future mean and volatility of inflation. The second concept of our research hypothesis thus concerns expectation formation and attitudes towards risk. We build on the idea proposed by a burgeoning literature on experience effects in macroeconomics and financial decisions, as reviewed by Malmendier (2021). It has been established that 1.) people use their personal experiences to form expectations about the future and 2.) they tend to overweight more recent experiences.

Households who have experienced higher inflation tend to expect both higher inflation and higher nominal interest rates in the future (Malmendier and Nagel, 2016). Thus, FRMs can serve as an *inflation hedge* against future increases. On the other hand, if those households also experienced (and thus expect) high inflation volatility, real payments from an FRM might be perceived as too volatile, creating an *inflation risk*. Thus, there are two opposite channels that households need to consider when choosing between an ARM and an FRM. In the US, households can refinance mortgages relatively easily, therefore the inflation hedge channel dominates[2]. The existence of prepayment penalties in our countries of study (Badarinza et al., 2018) significantly increases the cost of refinancing an FRM, making the analysis particularly interesting, since both channels are at work. Indeed, when looking at the raw aggregate data among our countries of study, those with the lowest shares of FRM (and highest shares of ARM) are characterised by higher historical inflation and volatility of inflation[3], suggesting that the dynamics might be different from that of the US.

[1] Austria, Belgium, France, Germany, Greece, Italy, Luxembourg, Portugal and Spain.

[2] We discuss US institutional setup and its effects in more detail in Appendix F.

[3] Figure A.1 and A.2 in the Appendix plot average mean and rolling volatility of historical inflation inflation for the first and fourth quartile of FRM shares in our countries of study.

To test whether the *inflation hedge* or *inflation risk* channel dominates on the household level, we use rich micro-data from the three currently available waves of the ECB's Household Finance and Consumer Survey (HFCS), narrowing our attention to mortgages taken after 2002, when all 9 countries in our sample had joined the euro zone. The final sample contains over 16,000 observations. We focus on households who own their main residence and have a mortgage on it. The survey contains detailed description on households balance sheet and, importantly, on mortgage contracts. We run household-level logit regressions where the key dependent variable is a binary variable that takes value one if the household holds a fixed-rate mortgage and zero otherwise. Our key independent variable is a measure of experienced inflation that we construct following Malmendier and Wellsjo (2023). For each household, we calculate the weighted sum of their experienced inflation since the year they are born until the origination year of the mortgage (or refinancing year, if they have done so), using linearly decreasing weights going into the past. Our identification strategy comes from cross-sectional variation in inflation experiences (across countries and age) and the evolution of these differences over time.

At the household level, we first test our hypothesis exploiting variation across countries, while also controlling for country-specific macro conditions (i.e. GDP growth, unemployment, inflation) and a variety of supply factors such as credit standards and the spread between ARM and FRM interest rates at the country-year level[4]. Despite our efforts to control for country specific factors, it is reasonable to suspect that household decisions might be partly driven by historical institutional and cultural dependencies. To investigate this, we add country fixed effects. We also add origination-year fixed effects to rule out any time trends that might affect the likelihood of an FRM at a given year. And, finally, in our most restrictive specification, we control for country-time fixed effects which allows us to compare households that take a mortgage in the same year within a country. The estimated coefficient remains fairly similar across all specifications and it is always significant. We find that a 1 log-point increase in experienced inflation predicts a 71% decrease in the odds of holding a fixed-rate mortgage. This effect is not only statistically significant but also economically relevant. To illustrate this, consider the average share of FRM in our sample: 62.5%. Then, for a household with 62.5% probability of choosing an FRM, a 1 log-point increase in experienced inflation predicts a decrease to 32.1%. Our analysis thus suggests that households who experienced higher inflation throughout their lives are less likely to have an FRM relative to those with lower experienced inflation.

This suggests that in the eurozone, the *inflation risk* channel dominates households decisions. Could it then be that our measure of experienced mean inflation is capturing the effects of high inflation volatility? To shed some light on this question, we construct a measure of households' experienced volatility of inflation. The two measures, experienced inflation and experienced volatility,

[4]The spread between rates has been shown to be a key driver of households' mortgage choice. Although data on the spread offered by banks to individual households is not available, multiple studies have shown that its variation is overwhelmingly driven by macro factors such as the slope of the yield curve (see Allen et al. (1999); Moench et al. (2010); Badarinza et al. (2014))

have an average correlation of 0.7 in our sample. This makes it hard to isolate each channel separately as, on average, European households who have experienced high inflation and might prefer FRMs are also households who have experienced high volatility and might thus prefer ARMs. With this in mind, we re-run our regressions with experienced inflation volatility as the key explanatory variable and we find that the estimated coefficient on experienced inflation volatility is negative and significant, after including the relevant controls. For a household with 62.5% probability of choosing a FRM, a 1 log-point increase in experienced inflation volatility predicts a decrease in the probability of choosing a fixed-rate mortgage to 55%. Thus, our main finding remains robust to a vast array of controls and measures of inflation: experiencing higher inflation (either levels or volatility) predicts a lower likelihood of holding an FRM for European households. In other words, households with high and volatile past experiences of inflation might perceive FRMs as too risky.

What is thus the mechanism linking experiences and behaviour? We investigate whether experiencing higher and volatile inflation affects households risk attitudes, and thus, how they evaluate the risks inherent in both financial instruments. In particular, if the inflation risk channel is indeed an important driver of the negative relation between households experienced inflation and FRM choice, then we expect to see that those who experienced higher inflation (level and volatility) also report less willingness to take financial risk. We provide evidence that this is the case in our sample which, combined with our previous results, supports the idea that the inflation risk channel dominates.

We observe the outcome of households' mortgage choice, which is an equilibrium object determined by various supply and demand factors. However, recently Albertazzi et al. (2020) found that 72% of the heterogeneity in eurozone mortgage choice is explained by demand factors. This is not entirely surprising, as the introduction of a common monetary policy implied the elimination of currency risk (Kalemli-Ozcan et al., 2010), deepening financial integration (Fornaro, 2022) and the convergence of inflation rates, thus removing most of the obstacles from supplying FRMs in eurozone countries (Badarinza et al., 2016). Therefore, in our analysis we focus on understanding the demand side: households' mortgage choice. Notwithstanding, we add a battery of controls to hold supply fixed and we run various robustness checks to ensure that our results are not driven by supply constraints. Importantly, conditional on households facing similar interest rates, we still find that higher experienced inflation is associated with lower likelihood of holding an FRM.

Our paper contributes to three strands of the literature. First, to the extensive research on households' mortgage choice. The workhorse theoretical model is Campbell and Cocco (2003), where households' choice between ARM and FRM is a risk management exercise in an environment with uncertain inflation, income risk and borrowing constraints. Optimal mortgage choice depends on income volatility, risk aversion and mobility. Later empirical studies find that demographic characteristics such as age and income play a role (Coulibaly and Li, 2009; Bergstresser and Beshears, 2010). For a survey, see Campbell (2013) and Gomes et al. (2021). In our empirical specifications, we control for all socio-economic characteristics that have been found relevant in the

literature. We apply the risk management hypothesis on eurozone households' mortgage choice and argue that besides demographics, measures of personal past experiences are key to understand the heterogeneity. By showing this, we also relate to the literature discussing deviations from rational choice in households financial decisions, such as Koijen et al. (2009), Keys et al. (2016), Bailey et al. (2018) and Bailey et al. (2019).

Second, our paper contributes to the literature on the European mortgage market. Given the recently increased awareness of the strong correlation between house prices, household leverage and consumption with the business cycle [see e.g. Mian and Sufi (2011), Mian et al. (2013), Verner and Gyöngyösi (2020)], European policymakers such as Cœuré (2019) or Lane (2019) and researchers are recognising the need to deepen our understanding of the drivers of the heterogeneous European mortgage market. An important concern is whether the heterogeneity across European countries can be explained by heterogeneous household preferences or by supply conditions which constrain households choices. In this respect, Albertazzi et al. (2020) study the determinants of the prevalent type of mortgage across countries and over time using bank level data on lending activity in the euro area, which allows them to disentangle demand and supply factors. By analysing the lending patterns for the same cross-border banking group in different economies and the lending patterns across different cross-border banking groups operating in the same economy, they conclude that country demand factors explain close to 72% of the variation in the share of FRM while bank supply factors explain 19% of it. Related to our point of study, they find a negative correlation between the demand component of the ratio of FRM to total mortgages and historically high inflation volatility.

In a nine country panel setup, Badarinza et al. (2018) use instrumental variables to investigate whether households choose the form of their mortgage financing in response to current interest rates or also in anticipation of future ones. They find that households are concerned with current interest costs but also with lifetime cost minimisation: they are forward looking over short horizons, but not over longer ones. Also, by investigating the persistent cross-country variation, the authors find a negative correlation between historical volatility of inflation and the share of FRM. We argue that these correlations are a result of households' choices being influenced by their own past inflation experiences.

Ehrmann and Ziegelmeyer (2017) also uses the HFCS micro-data to conduct a cross-country study of the determinants of household demand for mortgage types. They classify the main determinants of households financing choice in three groups: household characteristics, mortgage characteristics (pricing, length, whether it refinances an earlier mortgage) and macro conditions/market environment (captured by country fixed effects). Their results are in line with the risk management hypothesis of Campbell and Cocco (2003): higher income volatility reduces the propensity to take out ARMs. We extend their analysis to all three waves of the HFCS while also testing for the importance of experience effects above the previously described determinants. Overall, we contribute to the study of mortgage market choices by analysing the demographic, macroeconomic and pricing drivers of mortgage decisions of European households in a novel framework. Introduc-

ing households' personal experiences of inflation allows us to test for the prevalence of the inflation risk of FRM as highlighted by Campbell and Cocco (2003), a theoretical prediction that has not been tested before.

Third, we relate to the literature that studies how personal experiences of macroeconomic phenomena shapes economic decisions. Households are frequently making inter-temporal decisions, for which they need to form beliefs about future economic variables. Several papers have shown that personal experiences of macro-finance outcomes have a lasting impact on individual beliefs and attitudes (Malmendier and Nagel, 2011, 2016; Ampudia and Ehrmann, 2017; Kuchler and Zafar, 2019; Malmendier et al., 2020). There are two contemporaneous papers from this literature that are closely related to our analysis. On the one hand, Botsch and Malmendier (2023) highlight the puzzling dominance of FRMs in the U.S, arguing that it is a result of the "long shadow" of the Great Inflation. The authors find that higher lifetime inflation experiences are related to higher FRM share, the opposite to what we find when studying European households data. The US mortgage market has some particularities that make FRMs broadly free of inflation risk (see Appendix F for details). In such an environment, higher experienced inflation, which translates into higher expected inflation in the future, induces a preference for FRM as households perceive an inflation hedge only, i.e., lower future real payments. Our results thus highlight the importance of considering the institutional environment and the risks implied by it when studying the effect of households experiences on their financial decisions.

On the other hand, Malmendier and Wellsjo (2023) also use the HFCS database and find that past inflation experiences strongly predict home-ownership (as opposed to renting) within and across countries. Intuitively, if house prices move with inflation, investment in real estate protects households against inflation. This real-asset motive suggests housing can be viewed as an inflation hedge for those who expect higher inflation due to past experiences. While this channel exists for all households, irrespective of mortgage choice, the way of financing a home introduces new risks that households have to consider: besides the inflation hedge, fixed rate mortgages contain an inflation risk, as real payments would vary if inflation is volatile. Adjustable rate borrowing can provide insurance against this risk (Campbell and Cocco, 2003). We focus on understanding how households choose to finance the purchase of such house by testing for the presence of the inflation hedge vs inflation risk. We thus see our paper as complementary to Malmendier and Wellsjo (2023).

The rest of the paper is structured as follows. The data are explained in Section 2. We report our empirical strategy and results on the determinants of mortgage choice in European markets and its potential mechanism in Section 3. Section 5 concludes the analysis.

2 Data and Methodology

2.1 Data

Our sample consists of approximately 16,000 households from 9 European countries (Austria, Belgium, France, Germany, Greece, Italy, Luxembourg, Portugal, Spain) all of whom share a common currency. We will focus on households who took their mortgages between 2002 and 2017.

ECB Household Finance and Consumer Survey (HFCS). Our main data source is a recently collected household level micro-data from the Eurosystem Household Finance and Consumption Survey (HFCS). The survey has been conducted by the European Central Bank in three different waves. The field work was done between 2008-2010 for the first wave, in 2014 for the second wave and in 2017 for the third wave. The goal of the HFCS is to collect harmonised data across the euro area which is representative at an aggregate level but also at the country level. An important feature of this survey is that missing observations are multiply imputed. There are five data sets ("implicates"), which we will take into account when assessing the results. All the analysis will consider the weights provided in the survey, which compensate for the unequal probability of the household being selected into the sample.

We merge the three waves, carefully accounting for panel elements[5] in some countries (ECB, 2013, 2016, 2020). Since we are interested in the mortgage financing, we need to restrict our sample to those who are homeowners and have a mortgage. Table A.1 shows that from almost 210,000 households in our total sample, 74 percent are homeowners (154,000 households) of which 30 percent have a mortgage. This restriction leaves us with a smaller sample of 46,349 households, which represents 22 percent of the total sample. Moreover, when processing the data, we have to exclude some observations but also some countries due to the quality of the data.[6]. Our final sample consists of 9 countries and more than 15,000 households, as shown in Table A.2.

The HFCS contains rich micro-data on household characteristics, consumption and balance sheet information. Importantly for our analysis, it offers detailed information on real estate participation and mortgage contracts. Despite the availability of only three waves, we can trace back each mortgage to its origination year. Thus, our dependent variable is a binary variable that takes value 1 if household i in country j holds a FRM in year t. We also use the HFCS data for our controls. In particular, we obtain age, gender, marital status and education of the household head. These variables relate to what is defined as the "reference person". We calculate the age at the time of taking the loan, as this allows us to control for variation related to life cycle patters. We also control for quintile of income and wealth by country, to capture the affordability aspect of

[5]When merging the three waves, we avoid using overlapping windows as this would lead to double counting.

[6]For Finland, one of the countries with the highest respondent rates, we do not know the type of the mortgage. In the case of Ireland, age of the borrower is not provided. We also drop The Netherlands because the definition of ARM does not perfectly overlap with the one used in the other countries in our sample.

each type of financing.[7] We will also control for mortgage characteristics such as the length, the relative size and whether it refinances a previous mortgage.

We will model the household decision at the time of mortgage take-out, not at the time of the survey. This represents some challenges, as most household characteristics are recorded at the time of the survey, instead of the time of taking a loan, which might weaken their explanatory power as they might change throughout time. For this, we limit the sample to recently taken mortgages (mortgages taken at most ten years before each survey) and we use *quintiles* of income and wealth, as it makes these variables less prone to movements over time: there is high persistence in the income and wealth distributions in Europe (Franzini and Raitano, 2009). We also corroborate our results by restricting the sample to even more recent mortgages (last five years, and last year) and apply other robustness checks that assure that households characteristics are not driving our results.

In order to isolate the effects of experienced inflation on mortgage financing choices, we will also control for other risks that might affect the household choice. We do so by adding a set of controls for households' income volatility which might influence their ability to meet their monthly repayments. Standard measures include income quintiles, wealth quintiles, level of education and employment status. We expect employed, more educated households, with higher income/wealth to be less exposed to the payment risk inherent in an ARM. Moreover, employed households also report whether they are under a temporary or permanent contract. We control for such status, as employed households with temporary contracts might be more exposed to income volatility and, thus, payment risk. Households also answer whether they believe their income has increased, decreased or stayed the same during the last year. We use this to construct a measure for perceived income growth. Finally, we also include a control for households future income expectations. In particular, they are asked whether they expect their income to 1) rise more than prices, 2) less than prices or 3) about the same as prices. We consider households who answered 1) or 3) to expect stable or growing income. If this is the case, households might be in a better position to deal with payment risks. As robustness, we will also control for the size of the loan, debt-to-value ratio and loan-to-income ratios.

The HFCS also contains information on the interest rate households are currently paying on their mortgage. We use this measure to run additional robustness by limiting our sample to mortgages taken within the last year.

Macroeconomic Data. The macroeconomic environment and the market conditions are crucial in determining the prevalence of FRM vs ARM. To account for this, we collect the time series of a set of country-specific macroeconomic variables. From OECD, we collect data for country-specific unemployment rates and GDP growth at the time of mortgage take-out. We expect ARMs to

[7] It is not clear whether higher income would predict higher probability of FRM or ARM. Higher income earners can afford expensive FRM but they can also more easily bear the payment risk in ARMs (Ehrmann and Ziegelmeyer, 2017).

become less attractive in a context of high unemployment, as the latter should affect the stability of income expectations. Similarly, high GDP growth could incentivise ARMs.

The historical inflation data is taken mostly from Reinhart and Rogoff (2009), who provide historical time series of consumer price indices until 2010. We use data from FRED to extend the time series until 2017, which is the year of the last HFCS survey. We use this to construct our measure of household experienced inflation but also, to control for the level of inflation that all households of a specific country are experiencing at the specific year when they took the loan.

From the Statistical Data Warehouse of the European Central Bank (ECB), we obtain interest rates on loans from monetary financial institutions (MFIs) to households for house purchase with a maturity of up to one year and over 10 years. These measures are indicators of the cost of borrowing and are designed *"to accurately assess borrowing costs for non-financial corporations and households, enhancing cross-country comparability"*. We use these two interest rates to construct the spread between ARM (maturity up to one year) and FRM (maturity over 10 years) at the time of mortgage takeout in each country. While this measure does not depend on household characteristics, it is a proxy of individual spreads and can be observed by all households.

To control for different credit standards across countries and time, we resort to the Bank Lending Survey conducted by ECB. We make use of an indicator for credit standards that measures the time series variation of the internal guidelines and loan approval criteria of a bank for each country in our sample. This measure *"may change owing to changes in the bank's cost of funds and balance sheet situation, changes in competition, changes in the bank's risk perception, changes in the bank's risk tolerance or regulatory changes, for instance"*. We believe this to be an important variable that controls for heterogenous supply among countries and time which might affect the actual share of FRM that banks are willing to provide[8].

2.2 Measuring Experiences

To test our hypothesis we follow Malmendier and Wellsjo (2023) and construct a measure of experienced inflation over each household head's lifetime by calculating a weighted average of experienced annual inflation, measured in year-on-year percentage changes in headline CPI. We will construct a weighted average of annual inflation from year of birth to the year when each household took the mortgage.

Then, the experienced inflation for household i, in country j and year t is

$$\pi_{i,j,t}(\lambda) = \frac{\sum_{k=1}^{age_{i,t-1}} w_{i,t}(k,\lambda)\pi_{j,t-k}}{\sum_{k=1}^{age_{i,t-1}} w_{i,t}(k,\lambda)} \tag{1}$$

[8]An increase in bank's cost of funding might lead to tighter credit standards and lower ability to supply FRM (Albertazzi et al., 2020). It is important to highlight that credit standards are established prior to the actual loan negotiation on the terms and conditions and that this measure is not correlated with the cost of borrowing which is given by the spread.

where the weights are defined as

$$w_{it}(k,\lambda) = \Big(\frac{\text{age}_{it} - k}{\text{age}_{it}}\Big)^{\lambda} \tag{2}$$

with λ controlling the shape of the weighting function. As an example, we plot the dynamics of the weighting function for different values of the weighting parameter λ for a household who took the mortgage at 45 years old. The green line depicts the case of constant weights or $\lambda = 0$: all experiences receive the same weight. The red line refers to the linear declining weights case, i.e. $\lambda = 1$. As can be observed, the highest weight is assigned to experiences on the recent past and the weights decline linearly until the year when the household was born. The blue line depicts the case for $\lambda = 2$: decreasing and convex weighting function. Similarly, recent experiences receive a higher weight than those in the distant past but now the discount of the past is stronger.

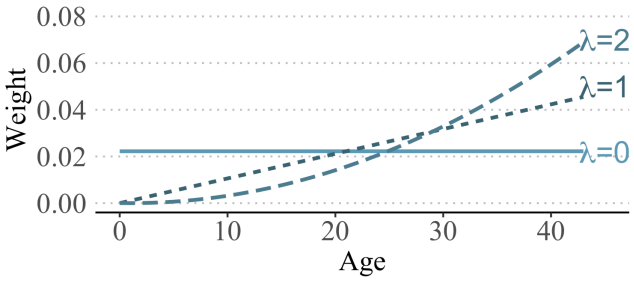


Figure 2: Weights for different values of λ for a 45 year old mortgage taker

The plot shows weights' dynamics for different values of the weighting parameter λ for a household aged 45. The x-axis start at 0 and ends at the current age of the mortgage taker, i.e. 45. The y-axis refer to the weights (scaled by the sum of weights) assigned to each yearly experience.

The heterogeneity in our measure of experienced inflation (Equation 1) emerges from differences in inflation experiences across time, countries and also across age groups within countries. We now fix two of these dimensions - country and year of mortgage take out - to illustrate the effect of changing the weighting parameter λ on experiences for different age cohorts. Similarly to Kuchler and Zafar (2019), we focus on three countries with different historical inflation rates. Figure 3 shows historical inflation rates for Germany, Greece and Spain until 2010. Germany experienced relatively lower inflation rates compared to the other two countries. Spain had a spike around 1980 and Greece had a more recent episode of high inflation around 1990. The plot also highlights the amount of data used to construct the life-time experienced inflation measure (Equation 1) for different cohorts who took a mortgage at the same point in time, i.e. 2010. For example, 30-year old households would apply the weighting function 2 to the last 30 years of inflation experiences.

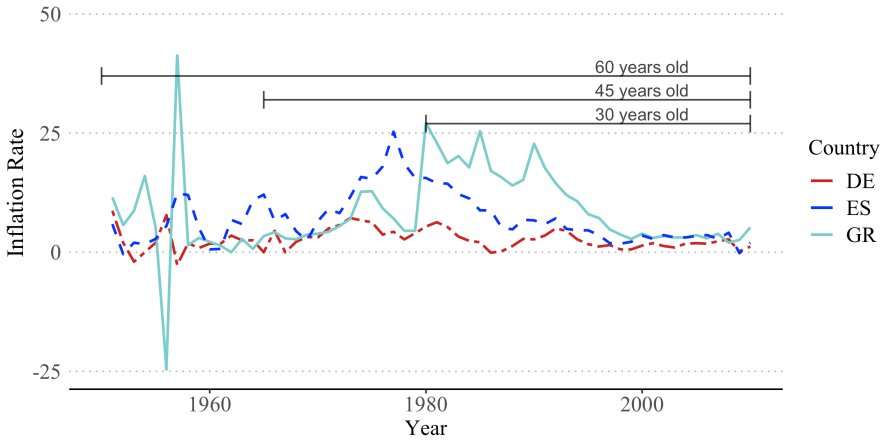
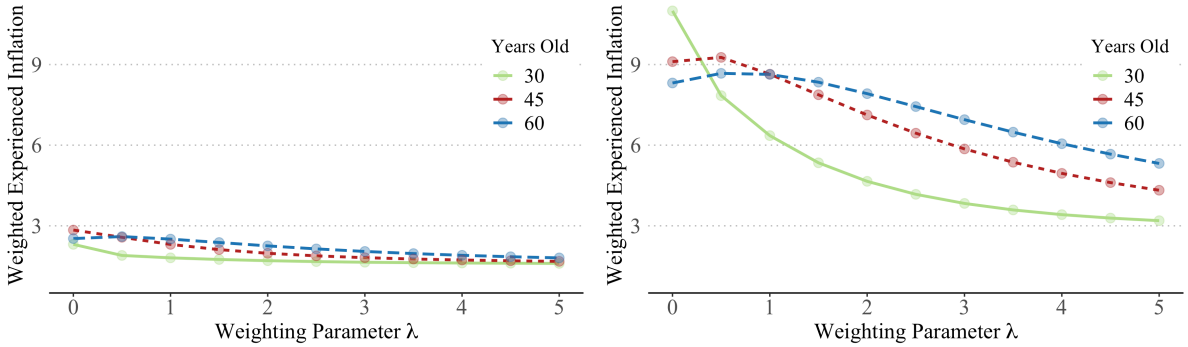


Figure 3: Historical Inflation rates for Germany, Spain and Greece

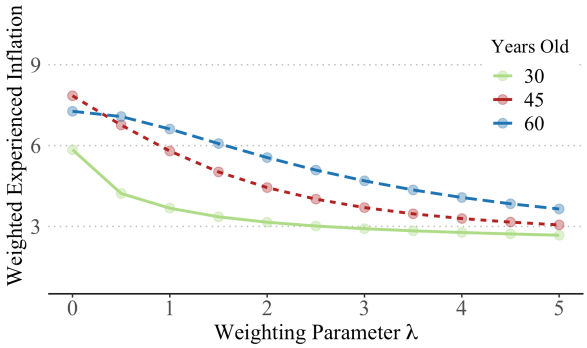
The figure plots time series of historical inflation rates until 2010 for Germany, Spain and Greece. The grey lines highlight the amount of information that is used to calculate the experienced-inflation measure in Equation 1 of a 30 year old, 45 year old and 60 year old.

Thus, we combine this historical inflation rates and the weighting function to construct a measure of experienced inflation for each household in each country and year. Figure 4 shows the dynamics of the weighted experienced inflation measure for a household who took a mortgage in 2010 in (a) Germany, (b) Spain, (c) Greece for each age group within country and different values of the weighting parameter λ. As expected, there are no big differences among German households of different cohorts, neither across different values of λ. For the three panels we can observe that as λ increases, our measure of weighted experiences goes down for all groups (within and across countries). This is driven by the decline and convergence of inflation rates among European countries in recent decades. A further implication that can be observed from theses figures is that higher values of λ are associated with less heterogeneity in weighted experienced inflation across countries and across age groups within the same country, as recent homogeneous experiences receive higher weight.



(a) $\pi_{ijt}(\lambda)$ for a mortgage taker in Germany 2010

(b) $\pi_{ijt}(\lambda)$ for a mortgage taker in Greece 2010



(c) $\pi_{ijt}(\lambda)$ for a mortgage taker in Spain 2010

Figure 4: Weighted Experienced Inflation for mortgage takers in 2010, for different λ values

The figures show the resulting inflation experienced measure (in y-axis) for different countries (in each panel), age (in each color) and weighting parameter (in x-axis).

Throughout the main analysis we will set $\lambda = 1$, making the weighting function linear and decreasing. This is consistent with previous work on experience effects (Malmendier and Nagel, 2011), but we also investigate the effect of changing λ on our results. More specifically, we estimate Equation 3 introduced in the next section on a range of $\lambda \in [0, 5]$ in intervals of 0.5 and we compare the fit of each model. Table B.13 on Appendix B reports the results of such analysis. In sum, values of λ close to 1 do not alter the results, while as λ increases, standard errors increase and coefficients become statistically insignificant.

We also implement an alternative measure of experienced inflation. Instead of focusing on the level, we look at experienced inflation volatility. We use the previous formula presented in Equation 1 to calculate a weighted average of experienced inflation volatility from year of birth until the year of origination of the mortgage. We calculate this measure in two ways. First, for each year, we calculate each head of household's standard deviation of inflation since they were born, and replace the level in equation 1 for this standard deviation. This gives us a weighted experienced volatility of inflation equivalent to the weighted experienced level of inflation. Alternatively, we calculate households experienced volatility of inflation as the standard deviation of inflation that

each household lived through out their lives (since they were born) until the year before taking the mortgage.

2.3 Descriptive Statistics

Table 1 offers a closer look into the heterogeneity of household finances across countries. In particular, it shows a summary of real estate participation measures and mortgage financing for our final sample. The table is organised by shares of FRM in a decreasing order. Column (2) shows these shares of fixed-rate mortgages by country. Importantly, there is considerable variation as regards the year of mortgage take-out. By pooling all origination years together, one could end up ignoring time-series variation that might be relevant for mortgage choice (such as the relative cost between the two products).

The last five columns of Table 1 show the share of fixed-rate mortgages taken within each year quintile for each country, highlighting not only cross-country but also time-series variation. These considerations will be addressed in our regressions: we will control for origination-year fixed effects allowing us to compare households choice within a given year.

				FRM by year quintile (share)				
Code	Country	Home-ownership Rate (share)	Fixed-rate mortgages (share)	1	2	3	4	5
FR	France	0.57	0.93	0.85	0.86	0.94	0.95	0.99
DE	Germany	0.44	0.9	0.98	0.92	0.94	0.84	0.83
BE	Belgium	0.7	0.73	0.56	0.8	0.69	0.71	0.88
GR	Greece	0.72	0.47	0.43	0.49	0.6	0.47	0.34
IT	Italy	0.68	0.47	0.46	0.39	0.5	0.46	0.52
AT	Austria	0.47	0.37	0.23	0.34	0.42	0.36	0.42
LU	Luxembourg	0.68	0.26	0.06	0.18	0.22	0.37	0.41
ES	Spain	0.8	0.16	0.13	0.09	0.15	0.13	0.23
PT	Portugal	0.75	0.09	0.1	0.06	0.08	0.1	0.12

Table 1: Summary of real estate participation and mortgage type

HFCS sample summary statistics of real state participation and financing rates, weighted to be representative of the population. The table is sorted by fixed-rate mortgage shares. Last 5 columns show FRM shares in each origination-year quintile: $(2002, 2004]$, $(2004, 2006]$, $(2006, 2009]$, $(2009, 2013]$, $(2013, 2018]$

Table 2 illustrates the mean of experienced inflation constructed for households in each country of our dataset using Equation 1 with $\lambda = 1$. The first column summarises actual historical inflation for each country, from 1925 until 2017. The second column is the average of our measure of experienced inflation for each country. Since experienced inflation is calculated using the year of mortgage take out, for a better comparison with historical inflation, the last five columns report the average experienced inflation of those households who took the mortgage in each of

the origination-year quintile. Comparing the first and last column, we can see a clear difference between mean historical inflation until 2017 and mean experienced inflation of those who took the mortgage around 2017. For example, households in Italy have a mean experienced inflation of around 5 while the mean historical inflation is above 7 percent.

Country	Past Inflation (%)	Experienced Inflation (%)	Exp. Infl. by year quintile (%)				
			1	2	3	4	5
AT	5.42	2.5	2.88	2.68	2.49	2.28	2.29
BE	4.41	2.62	3.01	2.77	2.66	2.55	2.23
DE	2.27	2.15	2.36	2.28	2.17	2.09	1.97
ES	6.35	5.55	6.43	6.35	5.81	5.35	4.43
FR	7.61	2.88	3.87	3.38	3.03	2.54	2.11
GR	9.92	9.16	10.37	9.76	9.09	8.8	7.94
IT	7.2	5.02	6.5	5.62	5.16	4.56	3.83
LU	3.83	2.73	3.22	2.92	2.76	2.59	2.39
PT	5.33	6.74	8.49	7.44	6.89	6.14	5.33

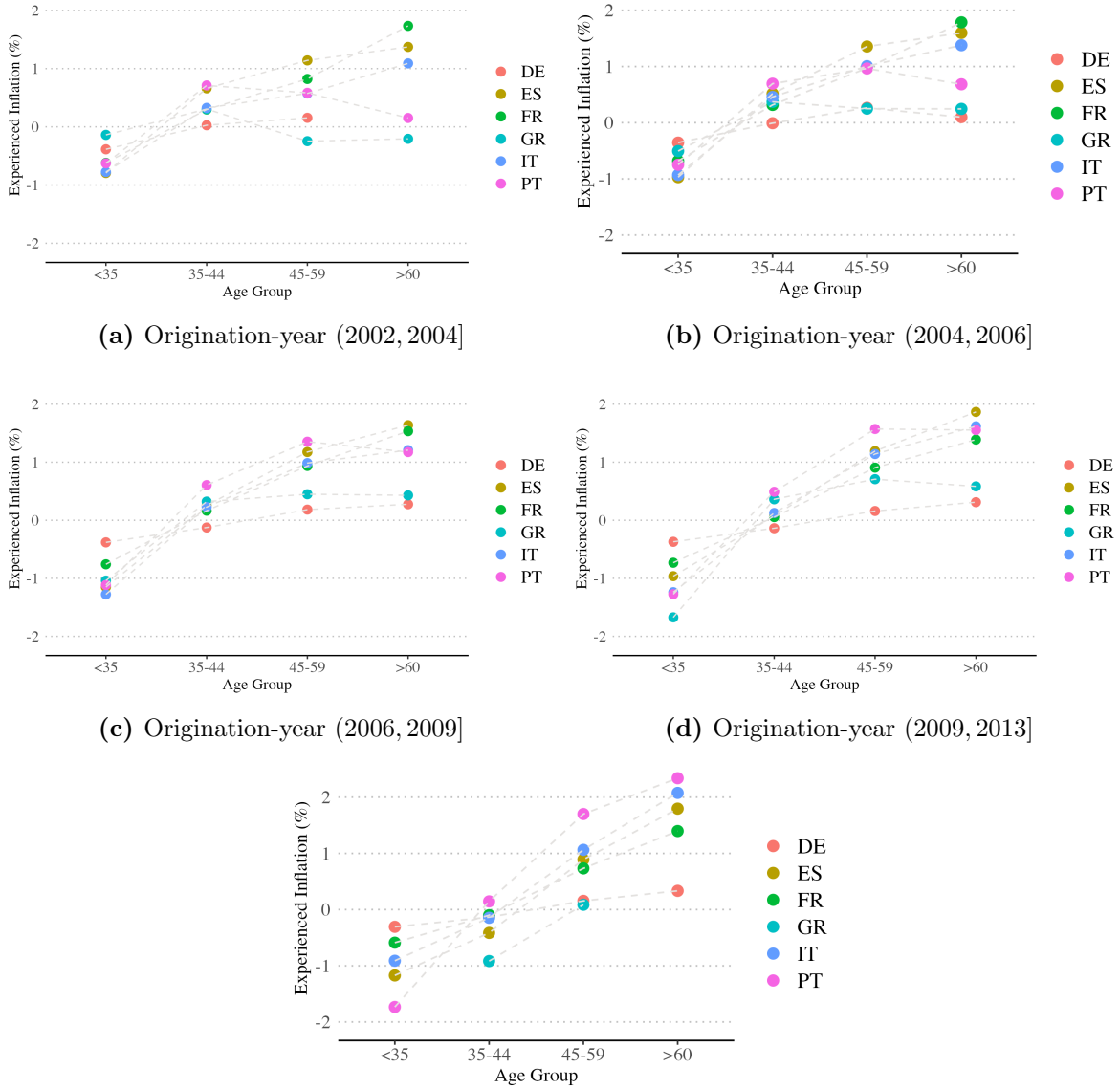
Table 2: Summary of experienced and average historical inflation

The table shows mean of past historical inflation and mean of past experienced inflation by country. Historical inflation data is an average from 1925 until 2017. Experienced inflation is calculated for each household in our sample and aggregated at country level using weights provided by HFCS. Last 5 columns show experienced inflation of households who took a mortgage in each origination-year quintile.

Figure 5 plots the experienced inflation by country and age group, as deviations from country mean, for each origination-year quintile. Appendix Figure A.3 plots the same graph for all countries in our sample. While previous figures highlighted heterogeneity across countries, the current ones show the substantial within-country variation, as can be seen by the grey dashed lines connecting different age groups within the same country. Moreover, these cross sectional differences within country also change over time. For example, in Panel (a), we can observe young and middle-aged households in Greece who have a higher measure of experienced inflation than older ones. Greece has gone through an inflationary period in the 90's, which is over-weighted by young agents, as it accounts for a larger share of their lives. As we move through the panels, we see that this pattern is reversed when we approach the last years in our sample, with older mortgage-takers having experienced more inflation than young ones. These figures stress that even after controlling for country fixed effects and origination year, there is substantial variation in experiences.[9] This is what will allow us to identify experience effects within countries, separately from other determinants such as age and origination-year. In our identification strategy, we are

[9]Figures show variation within year-quintile for expositional clarity but the same pattern holds when done for each year.

going to exploit the variation stemming from experiences that is left after controlling for country fixed effects, origination year fixed effects and demographic controls.



(a) Origination-year $(2002, 2004]$ **(b)** Origination-year $(2004, 2006]$

(c) Origination-year $(2006, 2009]$ **(d)** Origination-year $(2009, 2013]$

(e) Origination-year $(2013, 2018]$

Figure 5: Experienced Inflation by country, age group and origination-year for selected countries

Within each origination-year quintile, we group households according to their age when they took the loan. We then calculate the experienced inflation of each group, as deviation from country mean experienced inflation (within that quintile). Throughout, HFCS survey weights are used.

In Table A.3 of Appendix A we present summary statistics for the final data set of homeowners and mortgage holders. There are around 15,000 households in this sample, with an average age of 44 years old. 73% of household heads are males and 48% have at least one child. Almost 70% of

households heads are married, 20% are single, 3% are widowed and 10% are divorced. As regards education, 37% has completed high school education, 45% above high school and the rest has an education below high school. 88% of households heads were employed at the time of the survey, 3.5% unemployed and 6% retired. We calculate the age of the households when they took the loan using the age at survey and the year when they took the mortgage. We find that the average age to take a mortgage is 40, the average length of the loan is 20 years and the average share of fixed-rate mortgages across countries in our sample is 62.5%.

3 The Effect of Experiences on Mortgage Choice

We next study how European households' inflation experiences affect their mortgage financing choice. In particular, our research question is whether differences in past inflation experiences help predict household choice of ARM vs. FRM, beyond the influence of other known determinants. We carry out our investigation through two sets of analyses. Aggregating the data to the country level, we run an OLS regression of the share of FRM on average experienced inflation in each country at the time of taking the loan. Then we carry out a parallel analysis on the household-level, using a logit-regression to predict household mortgage choice using experienced inflation (level and volatility), along with several controls that had been typically accounted for in the literature.

3.1 Country-level Analysis

As a first exercise we aggregate our data on the country-level. We construct the country average of experienced inflation at the time of taking a loan and the share of FRM in that same year for each country every year in our sample using the provided survey weights representative of the population. In our analyses, we weight countries by the average population across survey years (obtained from the World Bank). We add the interest rate spread as control, as it has been the most emphasised factor in previous studies.

The results are shown graphically on Figure 6, with average experienced inflation (in log points) measured on the x-axis and the average share of FRM mortgages on the y-axis. The red line represents the best fit in all countries and shows a negative relationship between mean experienced inflation and the share of fixed-rate mortgages. By looking at the graph, however, the relationship seems to be at least partly driven by heterogeneity in country-level institutions: for example, we can observe large heterogeneity in Western European countries' FRM share with relatively similar experienced inflation levels.

We show the results formally in Table B.6 in Appendix. We find a negative and significant relationship between a country's average experienced inflation (in levels and volatility) and the share of fixed rate mortgages, which holds in the cross section (when adding time fixed effects)

but also in the time series (when adding country fixed effects).

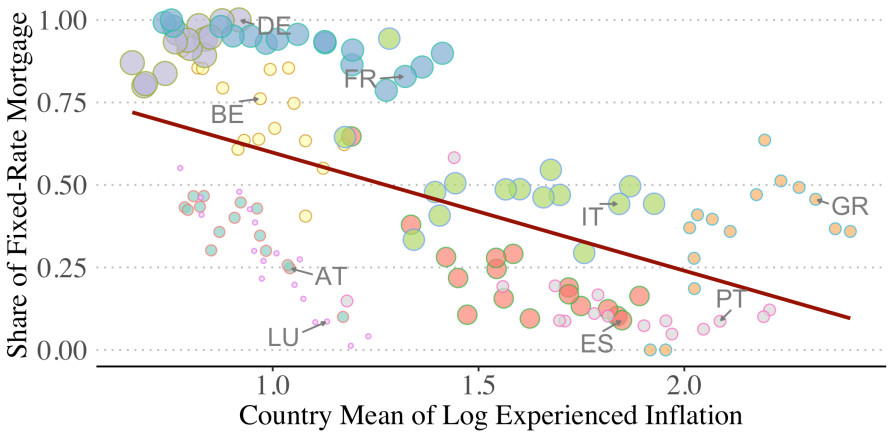


Figure 6: Relation between FRM share and experienced inflation, OLS regression at country level

The figure plots the share of fixed-rate mortgages on the y-axis and the country mean of log experienced inflation in the x-axis. Each dot represents a country and a time, while colours differentiate among countries. The size of the dots refers to the size of the country, as measure by the average population obtained from the World Bank. The fitted regression line of equation $ShareFRM_{jt} = \alpha_0 + \beta_0 AvgExperience_{jt} + e_{jt}$ is plotted in red (j refers to country and t time).

3.2 Household-level Analysis

Rich household-level micro-data of the HFCS allows us to go one level deeper, and test whether individual differences in inflation experiences can predict the likelihood of individual mortgage choice. In the following analysis, we aim to exploit the variation in experiences across individuals in various European countries as well as the variation of experiences of different age cohorts within countries.

We run logit regressions on household-level data where our key dependent variable is a binary variable indicating whether a household has chosen FRM to finance her home purchase. Our regressions will have the following form

$$Prob(FRM_{ijt}|X) = \Lambda(\alpha + \beta \log \pi_{ijt}(\lambda) + X_i'\gamma + \psi_t + Z_{jt}'\theta + \delta_j) \tag{3}$$

where Λ is the cumulative logistic function and FRM_{ijt} takes value 1 if household i in country j takes a fixed-rate mortgage in year t. $\pi_{ijt}(\lambda)$ is our key independent variable (with $\lambda = 1$) which measures household experienced inflation (level or volatility) until the year of taking the loan, and it is calculated using the household head's age when taking the loan, country, and origination-year as described in Section 2. X_i' are length of the mortgage and household characteristics that are standard in the literature: age (when taking the loan), gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income (the latter two within

country and wave). We also add to this set of variables some proxies for income volatility: type of contract and expectation of income growth. At a more aggregate level, we include country-specific macro conditions at the time of taking the loan Z'_{jt} which might potentially affect the choice between FRM and ARM (inflation rate, unemployment rate, GDP growth, spread between ARM and FRM, credit standards). We add country fixed effects to account for any persistent heterogeneity among countries δ_j. To ensure that we are not capturing time trends that might affect the availability or preferences of households for one or the other alternative, we include time fixed effects ψ_t such that we can compare households taking the loan at the same point in time. Moreover, they account for potential changes on the supply side of mortgages through time, above the ones included in Z'_{jt}. For example, by adopting the euro, banks might have better access to long-term funding (ECB, 2011).

Finally, we add country-year fixed effects to compare households who took a mortgage in the same country, at the same year but who have different experiences. Our sources of variation in experienced inflation come from differences across households from different countries but also across individuals within a country, by age and origination-year.

We use the HFCS multiple imputation data, which allows us to use the full sample despite missing data for some households[10]. Standard errors account for the multiply imputed nature of the data, following techniques by Rubin (2004)[11]. In all analyses, we use the HFCS household weights that are representative of each country and the EU population (inverse probability of being sampled and non-response). Results are robust to using probit or linear probability models.

We report coefficients and standard errors as well as odds ratios for our main analysis in Table 3. Column (1) presents results for the baseline case, where we regress the log of experienced inflation on our dependent variable while only controlling for demographic characteristics and mortgage characteristics (only the length of loan for now). In Column (2) we add country specific macro conditions at the time of taking the mortgage that might affect the supply of each ARM vs FRM, as it was described in Section 2.

Despite our efforts to control for country specific factors, it is reasonable to suspect that household decisions might be partly driven by historical institutional and cultural dependencies. To investigate this, we add country fixed effects, which control for all factors that vary across countries but not over time. Such specification eliminates the average difference in experienced inflation across countries and only tests the predictive power of experienced inflation on mortgage financing

[10]For details on imputation methodology, see e.g. the HFCS User Guide (ECB, 2020). Most missing variables are income and wealth

[11]We follow the User Guide provided by ECB on how to generate best point estimates and best estimates of variances for parameters of interest, which is based on methodology developed by Rubin (2004). We first analyse each of the five data sets separately and then we combine the results across implicates. Point estimates are calculated as the average across the five implicates: $\bar{y} = \frac{1}{5}\sum_{i=1}^{5}\hat{y}_i$. The total variance associated with this estimate is $T = W + (1 + \frac{1}{5})B$, where $W = \frac{1}{5}\sum_{i=1}^{5}\hat{V}_i$ is the within imputation sampling variance (which is the average of the five complete-data variance estimates, $\hat{V}_i$) and $B = \frac{1}{4}\sum_{i=1}^{5}(\hat{y}_i - \bar{y})^2$ is the variance between implicates (which reflects variability due to imputation uncertainty).

within country. Column (3) shows these results. In Column (4) we add origination-year fixed effects to rule out any time trends that might affect the likelihood of a FRM at a given year. Finally, in Column (5) we present our most restrictive specification where we add country-year fixed effects.

The estimated coefficient remains fairly similar across the first four specifications and it is significant at the one percent level. Column (5) controls for confounding factors but also eliminates some relevant variation in the measure of experienced inflation. The fact that we still find a significant effect highlights the important role of this measure as a determinant of mortgage financing choices. Our analysis thus suggests that households who experienced higher inflation throughout their lives are less likely to have an FRM relative to those with lower experienced inflation. We find that a 1 log-point increase in experienced inflation predicts a 71.6% decrease in the odds of holding a fixed-rate mortgage (since $0.284 - 1 = -0.716$). This effect is not only statistically significant but also economically relevant. To illustrate this, consider the average share of FRM in our sample: 62.5%. Then, for a household with 62.5% probability of choosing an FRM, a 1 log-point increase in experienced inflation predicts a decrease in the odds ratio to $0.284 \times \frac{0.625}{1-0.625} = 0.473$ which corresponds to a 32.1% $(= 0.473/(1 + 0.473))$ probability of choosing a fixed-rate mortgage.

Dep. Var: FRM (dummy)	(1)	(2)	(3)	(4)	(5)
(Intercept)	3.538^{***}	4.584^{***}	1.241^{**}	0.290	-5.224
	(0.554)	(0.614)	(0.632)	(0.774)	(8.010)
Experienced Inflation (log)	-2.790^{***}	-2.070^{***}	-2.117^{***}	-1.959^{***}	-1.259^{**}
	(0.118)	(0.125)	(0.278)	(0.519)	(0.499)
Odds ratio	0.06	0.126	0.120	0.141	0.284
Demographic and Mortgage Controls	Yes	Yes	Yes	Yes	Yes
Country Macro Conditions at t	No	Yes	Yes	Yes	No
Country FE	No	No	Yes	Yes	No
Time FE	No	No	No	Yes	No
Country-Time FE	No	No	No	No	Yes
Pseudo R^2	0.357	0.321	0.490	0.487	0.470
Observations	15220	13218	13218	13218	15220

Table 3: Inflation Experiences and Household Mortgage Decisions

The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Each column refers to a different specification where controls are added sequentially. Demographic Controls include age when taking the loan, gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income and Mortgage Controls refers to length of the mortgage. Country-specific conditions at the time of the loan include inflation rate, unemployment rate, GDP growth, the spread between FRM and ARM and credit standards. Multiple imputation techniques and survey weights are used throughout. Number of observations is the maximum N across the 5 imputations. Pseudo R^2 is the average across the 5 imputations.

Thus, we estimate a strong significant effect of personal experienced inflation on households

likelihood of holding a fixed-rate mortgage. This effect holds even after controlling for a rich set of individual and macro controls such as the relative price between FRM and ARM, credit standards set by banks in each country at each year and, importantly, current inflation level when taking the loan. Experienced inflation might also be confounded with other cross-country determinants of mortgage financing, particularly on the supply side. For example, banks in countries with lower inflation might have a better ability to provide FRM. The estimates with country fixed effects aim to help alleviate such concern. Aggregate time trends (such as a greater financial development) might again affect the availability of a certain type of mortgage. Origination-year fixed effects remove these unobservable time-variations. In summary, the robustness of our estimates position experienced inflation as an important determinant of households' mortgage financing.

Overall, we do find strong evidence in favour of experience effects. However, quantitatively, our results are in contrast with the empirical findings on a US sample by Botsch and Malmendier (2023), where authors find that higher experiences of inflation translate into higher likelihood of choosing FRM. As emphasised in Appendix F, FRM holders in the US are barely exposed to any risk while they can benefit if inflation increases (due to the particularities of the US mortgage market). In Europe, fixed rate mortgages not only have an inflation hedge but they also posses an inflation risk, which is particularly important in environments of high inflation volatility. We therefore want to investigate whether our results could be understood from these lenses: on average, European households who have experienced higher inflation also experienced higher inflation volatility leading them to prefer an ARM over an FRM (after controlling for pricing and the rich set of controls described before). For this, we calculate households experienced *volatility* at the time of taking the mortgage and we repeat the previous analysis. We calculate this measure in two different ways. For our main measure which is used in the regressions, we go back to Equation 1 in Section 2.2 and replace the level of inflation by its standard deviation. This measure has an average correlation of 0.685 with our measure of experienced inflation. Alternatively, we also calculate experienced inflation volatility as the standard deviation of inflation that each household has experienced since they were born until the year before taking the mortgage. This measure has a correlation of 0.77 with the measure of experienced inflation. This suggests that, on average, households who experienced higher inflation also experienced higher inflation volatility in our sample. Table 4 presents coefficients, odds ratios and standard errors for the analysis using the first measure, but results are robust to the second one. As before, we gradually add controls.

Table 4: Inflation Volatility Experiences and Household Mortgage Decisions

Dep. Var: FRM (dummy)	(1)	(2)	(3)	(4)	(5)
(Intercept)	3.123***	5.189***	0.923	−0.634	−5.434
	(0.525)	(0.622)	(0.629)	(0.752)	(8.039)
Experienced Volatility (log)	−1.413***	−0.543***	−0.551***	−0.367**	−0.322*
	(0.112)	(0.109)	(0.175)	(0.182)	(0.186)
Odds Ratio	0.243	0.581	0.576	0.693	0.725
Demographic and Mortgage Controls	Yes	Yes	Yes	Yes	Yes
Country Macro Conditions at t	No	Yes	Yes	Yes	No
Country FE	No	No	Yes	Yes	No
Time FE	No	No	No	Yes	No
Country-Time FE	No	No	No	No	Yes
Pseudo R^2	0.272	0.281	0.487	0.488	0.471
Observations	15220	13218	13218	13218	15220

Notes: The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Each column refers to a different specification where controls are added sequentially. Demographic Controls include age when taking the loan, gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income and Mortgage Controls refers to length of the mortgage. Country-specific conditions at the time of the loan include inflation rate, unemployment rate, GDP growth, the spread between FRM and ARM and credit standards. Multiple imputation techniques and survey weights are used throughout. Number of observations is the maximum N across the 5 imputations. Pseudo R^2 is the average across the 5 imputations.

Coefficients remain negative and significant, suggesting that households who have experienced higher volatility of inflation have a lower likelihood of holding an FRM. More specifically, a 1 log-point increase in experienced volatility of inflation predicts a decrease on the probability of holding an FRM from 62.5% (the average in our sample) to 55%, considering our most restrictive results in Column (5). Even though the effect of experienced volatility is quantitatively milder than the effect of experienced inflation on mortgage financing choices, our main finding remains robust to a vast array of controls and measures of inflation: experiencing higher inflation (either levels or volatility) predicts a lower likelihood of holding a FRM for European households.

Counterfactual Exercise and Size of the Effect. To gain a better understanding of the magnitude of the effects, we conduct a counterfactual exercise in the spirit of Malmendier and Wellsjo (2023): what would be the fixed rate mortgage in a given country if their average experienced inflation would have been different? To do this, we rely on estimates from Table 3 Column (4) and keep demographics and country specific macro conditions at their average value in both actual and counterfactuals. First, we take Germany and Italy. Germany has a relatively low average experienced inflation and an associated FRM rate of 86%. Italy, on the other hand, has higher average experienced inflation and their predicted FRM rate under their actual average experienced inflation is 46%. If Germany were to experience Italy's average experienced inflation, their predicted FRM rate would drop to 49%, while if Italy were to experience German's average experienced inflation their predicted FRM rate would jump to 88%. In case of such a hypothetical

scenario, the cross-country heterogeneity of mortgage choice would change significantly.

In the second example we look at Belgium - with a predicted FRM share of 78% under their actual experienced inflation - and Portugal - with a predicted FRM share of 11% under their actual experienced inflation. If Belgium were to experience Portugal's average experienced inflation, their FRM share would drop by 52 pp, while if Portugal were to experience Belgium's average experienced inflation their FRM share would increase by 44 pp. This hypothetical change would lead to a stronger prevalence of FRM in Portugal than in Belgium, and it would decrease the existing cross-country differences.

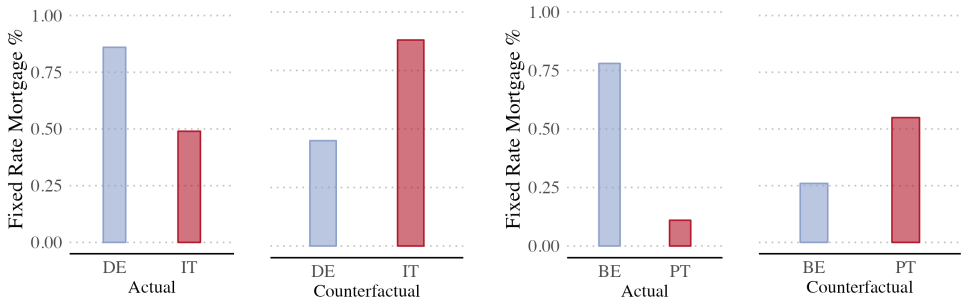


Figure 7: Actual FRM Rates and Counterfactual with Alternative Inflation Experiences

The figure shows predicted fixed rate mortgage rates using true average experienced inflation in each country and counterfactuals using alternative average experienced inflation. Estimates are based on the results from Table 3 Column (4). Demographics and country specific macro conditions are kept at their average value in both actual and counterfactuals.

Further Determinants. Many of the variables we control for in the baseline analysis predict mortgage choice, several of which we report in a detailed manner in Tables B.8 and B.9 in Appendix A. We find that age has a significant effect on the likelihood of choosing an FRM: older respondents are more likely to hold an FRM. Educational attainment, gender and marital status do not correspond to any statistically significant changes in mortgage choice across specifications. We find that the higher a household is on the wealth distribution, the less likely it is that she chooses a fixed-rate mortgage. This is consistent with earlier findings that show that financial literacy and wealth increases the willingness to take on ARM, suggesting that those households can more easily understand complex financial instruments such as ARMs and bear the payment risk inherent in them. The positive relation between wealth and financial literacy has been established by Van Rooij et al. (2012). Conditional on wealth, there is no clear relationship between mortgage choice and income. As regards labor, being self-employed or retired reduces the likelihood of holding an FRM. The interest rate term spread serves as a measure on the price differentials between FRM and ARM in each country and at each point in time. As expected, the higher the spread the lower the likelihood of choosing an FRM, as it becomes more expensive compared to an ARM. Likewise, the price of an FRM is also increasing in the length of the mortgage, as for longer mortgages, the insurance aspect of FRM may become too expensive and households can end up

with a decision favouring ARMs. In fact, we find that higher loan length reduces the probability of taking an FRM. We can also observe that when credit standards are tightened, the probability of holding an FRM is reduced.

3.3 Robustness

3.3.1 Supply vs Demand Side Concerns

We add several robustness checks to guarantee that these results are not driven by mortgage characteristics or supply-constrained households. In particular, we proceed by adding a battery of controls with respect to the mortgage characteristics: an indicator variable that takes value 1 if the household has more than one mortgage on the main residence and an indicator variable that takes value 1 if the current loan refinances a previous one and the initial amount of debt.[12] We do this while also controlling for the previously mentioned variables: household characteristics, length of loan, macro conditions, origination year fixed effects and country fixed effects. We find that having more than one mortgage on the main residence does not have a significant effect on the probability of holding an FRM. As regards refinancing, the coefficient is also not statistically significant. As expected, relatively larger loans reduce the likelihood of taking an FRM, as they are generally subject to higher interest margin, making fixed-rates mortgages more expensive. The coefficient on experienced inflation remains significant and close to the one presented above.

Debt-to-Income. Throughout the main analysis, we have controlled by country-specific conditions and origination-year fixed effects. The first controls for any variation among countries that might be influencing the prevalence of one of the two mortgage types at each point in time. The latter controls for any time trend that may have favoured ARMs over FRMs or vice-versa. We also add country fixed effects, which control for any time-invariant differences among countries such as culture. Given this, we have assumed that households are free to choose between the two types of financing. This might not necessarily be the case for households with high debt-to-income ratios and/or high loan-to-value ratios. To account for this, we run our regressions again but this time controlling for quintiles of mortgage debt-to-income ratio (DTI) and also quintiles of loan-to-value (LTV). We find that results are robust, corroborating that neither mortgage characteristics nor supply-side factors are driving our results.[13] Table B.10 in Appendix reports coefficients and standard errors for such analyses.[14]

Loan-to-Value. Alternatively, we split the sample into quartiles of LTV. The aim is to understand whether experiences of inflation influence the likelihood of holding FRM equally across

[12] We use quintiles of initial amount borrowed to account for the effect of the relative size of debt.

[13] The coefficients on DTI and LTV ratios are insignificant, suggesting that the households (income, wealth quintiles) and mortgage (length, amount) controls already account for the variation in these new variables.

[14] Even though the robustness test is conducted using experienced inflation, we also check the robustness of our findings with respect to experienced volatility and we find that results are unchanged.

groups with different loan-to-values, as those in higher quartiles might be less free to choose their financing instrument. Table 5 presents the regression results.[15]

Dep. Var.: FRM (dummy)	LTV Q1	LTV Q2	LTV Q3	LTV Q4
(Intercept)	14.719	4.623**	5.884***	−2.249
	(7.549)	(1.438)	(1.019)	(7.047)
Experienced Inflation (log)	−2.017***	−2.240***	−2.134***	−2.083***
	(0.300)	(0.251)	(0.258)	(0.368)
Odds Ratio	0.13	0.11	0.12	0.12
Controls	Y	Y	Y	Y
Country Conditions at t	Y	Y	Y	Y
Pseudo R^2	0.283	0.318	0.333	0.308
Observations	2287	3296	3147	1748
Mean Dep. Var.	0.66	0.62	0.64	0.59
Quartiles Values	$(0, 0.281]$	$(0.281, 0.5]$	$(0.5, 0.739]$	$(0.739, 5.59]$

Table 5: Inflation Experiences and Household Mortgage Decision across LTV quintiles

Notes: The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Each column refers to a different LTV quintile. Controls include age when taking the loan, gender, marital status, employment status, educational attainment, quintile of net wealth and quintile of household gross-income, length of the mortgage and country-specific conditions at the time of the loan - including inflation rate, unemployment rate, GDP growth, the spread between FRM and ARM and credit standards. Multiple imputation techniques and survey weights are used throughout. Number of observations is the maximum N across the 5 imputations. Pseudo R^2 is the average across the 5 imputations.

Among those in the highest LTV quartile, the average share of FRM is 7pp lower compared to those with in the lowest LTV quartile. Nevertheless, the effect of past experiences of inflation is relatively constant across quartiles and always negative and significant. For example, a 1 log point increase in experienced inflation predicts a decrease in the odds of holding an FRM of 86.7% among households in the first quartile of LTV and a decrease of 87.5% among households in the fourth quintile of LTV. Thus, among people who have a similar loan-to-value and across different quartiles of loan-to-value, those that experienced higher inflation are less likely to hold an FRM.

Recent Mortgages and Individual Level Interest Rates. Although we have controlled for the national spread between FRM and ARM at the time of mortgage take out, this might mask some important heterogeneity since individuals could be offered different interest rates when first contracting the mortgage. Although the HFCS does not contain this information, it does ask individuals what is the current interest rate they pay on their mortgages. We then limit our sample to individuals who took their mortgage at most one year before they are surveyed, and work under the assumption that the interest rate they pay today is the same they were offered when they first took the mortgage a year ago. We believe this is a reasonable assumption for FRM

[15]The regression exploits heterogeneity across countries, while controlling for country specific conditions at the time of taking the mortgage. Results are robust when country fixed-effects are added.

but also for ARM who generally adjust after one year. Table 6 repeats the analysis but now on the sample of recently taken mortgages and controlling for the interest rate each household pays on the mortgage. The coefficient on experienced inflation is still negative and significant, with a magnitude similar to the one estimated in previous exercises. Higher interest rates are associated with higher likelihood of holding an FRM, in line with previous literature that emphasised the bigger costs of FRM in terms of interest rates.

Dep. Var.: FRM (dummy)	(1)
(Intercept)	-1.651
	(2.170)
Experienced Inflation (log)	-2.764^{**}
	(1.216)
Interest Rate on Mortgage	0.376^{***}
	(0.087)
Controls	Y
Country Macro Conditions at t	Y
Country FE	Y
Time FE	Y
R^2	0.493
Observations	3042

Table 6: Inflation Experiences and Household Mortgage Decision - Recent Mortgages

Notes: The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Controls include age when taking the loan, gender, marital status, employment status, educational attainment, quintile of net wealth and quintile of household gross-income, length of the mortgage, interest rate on the mortgage and country-specific conditions at the time of the loan - including inflation rate, unemployment rate, GDP growth, the spread between FRM and ARM and credit standards. Multiple imputation techniques and survey weights are used throughout. Number of observations is the maximum N across the 5 imputations. Pseudo R^2 is the average across the 5 imputations.

We then divide our sample of recently taken mortgages into four, according to the interest rate quintiles, and we test the role of heterogenous experiences of inflation among households who pay similar interest rates. Table 7 shows the results.[16] The average FRM for recently taken mortgages is 78%, which is considerably higher than when considering the whole sample (i.e. 62.5%), and the estimated coefficient on experienced inflation is also higher but remains negative and statistically significant across all interest rate quintiles.

[16]The regression exploits heterogeneity across countries, while controlling for country specific conditions at the time of taking the mortgage. Results are robust when country fixed-effects are added.

Dep. Var.: FRM (dummy)	IntRate Q1	IntRate Q2	IntRate Q3	IntRate Q4
(Intercept)	3.667	0.513	1.721	7.387***
	(2.788)	(1.748)	(1.760)	(1.544)
Experienced Inflation (log)	−5.740**	−2.568**	−5.841***	−1.554**
	(2.230)	(1.225)	(1.673)	(0.743)
Controls	Y	Y	Y	Y
Country Conditions at t	Y	Y	Y	Y
Pseudo R^2	0.506	0.430	0.268	0.208
Observations	1006	814	637	606
Mean Dep. Var.	0.79	0.83	0.75	0.77
Quintile Values	$(0, 1.8]$	$(1.8, 2.55]$	$(2.55, 3.6]$	$(3.6, 19]$

Table 7: Inflation Experiences and Household Mortgage across Interest Rate Quintiles - Recent Mortgages

Notes: The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Each column refers to a different quintile of interest rate on households' mortgage. Controls include age when taking the loan, gender, marital status, employment status, educational attainment, quintile of net wealth and quintile of household gross-income, length of the mortgage, and country-specific conditions at the time of the loan - including inflation rate, unemployment rate, GDP growth, the spread between FRM and ARM and credit standards. Multiple imputation techniques and survey weights are used throughout. Number of observations is the maximum N across the 5 imputations. Pseudo R^2 is the average across the 5 imputations.

Although average shares of FRM are relatively constant across interest rate quintiles, experienced inflation plays a much stronger role among households who face lower interest rates. Importantly, conditional on households facing similar interest rates, we still find that higher experienced inflation is associated with lower likelihood of holding an FRM.

3.3.2 Heterogeneity by Country

Given the common monetary policy in the euro area, the focus of this paper is to uncover the across-country behaviour of households. The empirical investigation suggests that, on average, the inflation risk inherent in an FRM prevails and thus higher experienced inflation makes FRM less attractive. Notwithstanding, country-by-country dynamics can be of interest to ensure that it is not the institutional characteristics of certain countries that drive the results. Moreover, european countries have been through different experiences that might also shape how inflation impact households choices. We investigate two hypothesis.

First, people who live in countries that underwent periods of hyperinflation might be more concern about the dangers and risks of rising inflation, as opposed to its volatility. In our sample, Germany and Greece experienced hyperinflation during the 1920s and 1940s respectively. Thus we hypothesised that the inflation hedge prevails in those countries: higher experienced inflation in levels should lead to higher likelihood of holding an FRM.

Second, we have argued that FRM are less attractive for people who experienced higher inflation because of their inflation risk, while ARMs can serve as an insurance against such concern. Importantly, the attractiveness of such insurance depends on how the short term interest rate

correlates with the business cycle. Similarly to previous studies, we take as a proxy for that the correlation between the short term interest rate and the unemployment rate (Albertazzi et al., 2020). If the correlation is negative, short term interest rates are low when unemployment is high, and ARMs can provide higher protection as they benefit borrowers in bad times. With this in mind, we hypothesised that ARMs are most attractive when experienced volatility of inflation is high and the correlation between short term interest rates and unemployment is negative.

We test such hypothesis by re-running our analysis on a country-by-country basis. For hypothesis 1, we rely on households experienced of inflation in levels which are normally associated with the prevalence of an inflation hedge. Figure 8 summarises the results. We observe that higher experienced inflation is generally associated with lower likelihood of holding an FRM in most countries, except for Greece and Germany, where higher experiences of inflation predict a higher likelihood of holding an FRM.

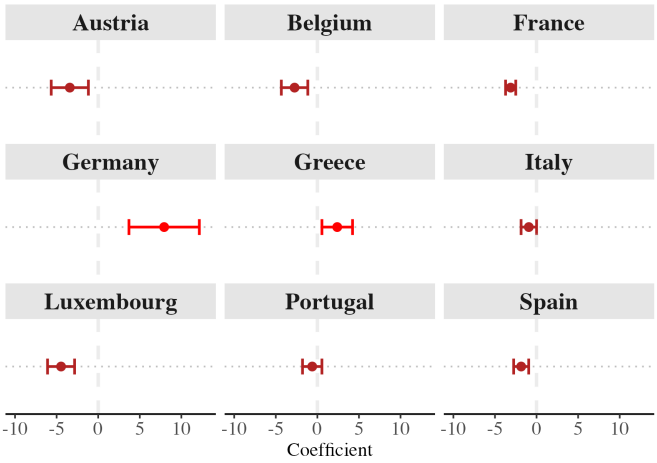


Figure 8: Effect of Experienced Inflation for each country in the sample

The figure plots logit coefficients and confidence intervals for regressions of FRM share on experienced inflation for each country, controlling for household characteristics, length of mortgage and interest rate spread at the time of the mortgage.

To test hypothesis 2 we rely on households experiences of volatile inflation and the correlation between short term interest rates and unemployment in their countries. The following table shows the average correlation, and the average experienced inflation in levels and volatility for each country in our sample. German households have not only experienced a relatively low volatility of inflation but also a very high and positive correlation between short term interest rates and unemployment (≈ 0.7).

	AT	BE	DE	FR	GR	IT	ES	LU	PT
Experienced Inflation Volatility	3.02	2.88	2.14	3.96	8.38	6.4	5.33	2.72	7.12
Experienced Mean Inflation	2.51	2.74	2.21	2.96	9.18	5.39	5.92	2.75	6.82
corr(short int, unemp)	-0.74	-0.48	**0.68**	-0.8	-0.58	-0.59	-0.66	-0.76	-0.71

Table 8: Average Correlation between Short Term Interest Rate and Unemployment Rate

Figure 9 shows the logit coefficients estimated on households' experienced volatility for each country. It can be observed that higher experienced volatility predicts lower likelihood of holding an FRM in almost all countries except Germany, where indeed ARMs do not represent a good insurance against inflation risk because of the higher and positive correlation between unemployment rates and short term interest rates

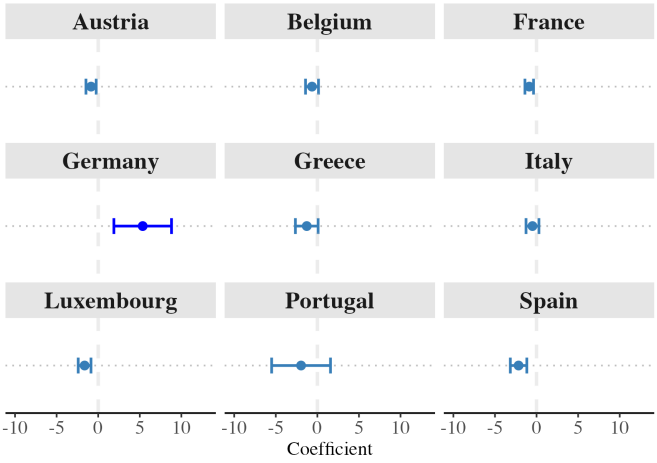


Figure 9: Effect of Experienced Inflation for each country in the sample

The figure plots logit coefficients and confidence intervals for regressions of FRM share on experienced inflation volatility for each country, controlling for household characteristics, length of mortgage and interest rate spread at the time of the mortgage.

Overall, the main result holds across countries with some interesting country specific effects. We see this as highlighting the importance of investigating experience effects in conjunction with other experiences and country-specific developments.

4 Discussion and Mechanism

The presented evidence suggests that households' past experiences of inflation are important determinants of their financial decisions, in our case their mortgage choice. In this subsection, we propose an explanation for that.

Beliefs and Risks. The main channel from experiences to behaviour proposed in the experienced-based learning literature is beliefs: past personal experiences have a long lasting effect on beliefs

which translate into heterogeneous behaviour. For example, Malmendier and Nagel (2016) have shown how different experiences of inflation can lead to different expectations of inflation and, therefore, different financial behaviour. Botsch and Malmendier (2023) have further shown that higher experiences of inflation are correlated with higher expectations of future interest rates, inducing a current preference for FRM. These studies are based on US households, who make their mortgage financing decisions on a particular housing market where both borrowers and lenders face a significantly lower amount of risk due to easy refinancing of mortgages, the presence of government-sponsored enterprises (GSEs), and securitisation.[17] In contrast, European markets exhibit none of these. Importantly, in each of our countries there are varying but significant degrees of prepayment penalties, which make refinancing costly (Badarinza et al., 2018).

More specifically, in the US, due to the lack of prepayment penalties, holding an FRM is an *inflation hedge*. If inflation goes up, the real value of the payments declines and the borrower benefits while the lender suffers. If inflation decelerates, borrowers can refinance their FRMs at a lower rate, avoiding the consequences of declining inflation. Then, FRMs function as a one-sided bet that protect households against high inflation in the future without any risk if inflation declines. On the other hand, if there are prepayment penalties, as is generally the case in Europe, borrowers will have to make higher real payments as inflation declines. This is what has been defined as the *inflation risk* of an FRM. In case of an ARM, real payments tend to be stable (Campbell, 2013). We interpret households' mortgage choice as a problem of risk management (Campbell and Cocco, 2003), balancing the inflation hedge and inflation risk channels. We argue that in Europe, it is the latter that dominates. In Appendix E, using a simple simulation exercise, we demonstrate how different expectations (based on different experiences) on the path of inflation might alter households' assessment about the financing of their mortgage.

Ideally, we would like to have European household level data on expectations of inflation to test the channel from experiences to beliefs. Unfortunately, no such cross-country micro-data on beliefs is available at the moment. Notwithstanding, we can test for another complementary mechanism: past personal experiences might have a long lasting effect on beliefs and *investment/risk attitudes* which translate into heterogeneous behaviour. More specifically, personal experiences of inflation might not only affect inflation expectations but also the willingness to take financial risk.

Inflation Risk Channel. If the inflation risk channel is an important driver of the negative relation between households' experienced inflation and their mortgage financial decisions, then we expect to see that those who experienced higher inflation (level and volatility) are also less willing to take financial risk. Households who experienced higher inflation and higher volatility might be more worried about future volatile inflation, as it could translate into volatile real payments on their biggest liability. In such a context, ARM provides an insurance against such inflation risk, while an FRM does not.

[17] We provide more detail on institutional characteristics in Appendix F.

To asses this hypothesis we will analyse the effect of experienced inflation on a measure of reported willingness to take financial risk. Households in the survey are asked the following question:

Which of the following statements comes closest to describing the amount of financial risk that you (and your husband/wife/partner) are willing to take when you save or make investments?

1. *Take substantial financial risks expecting to earn substantial returns*
2. *Take above average financial risks expecting to earn above average returns*
3. *Take average financial risks expecting to earn average returns*
4. *Not willing to take any financial risk*

In our sample, almost 800 households answer that they take above average risk (answer 1 or 2), approximately 3500 answer that they take average risk and almost 9600 households say they are not willing to take any risk. We construct a binary variable that takes value one if households are willing to take average or above average risk (answers 1, 2 and 3) and zero if they are not willing to take any financial risk. Figure 10 plots the average experienced inflation of households on the left and the average experienced volatility on the right for those who report taking above or average risk (in green) and no risk at all (in red). For this we use the experienced inflation measure previously constructed, which calculates experienced inflation until the time of taking the mortgage. Since the reported investment attitude is measured at the time of the survey, we also conduct a robustness test with an alternative experienced inflation until the time of the survey.

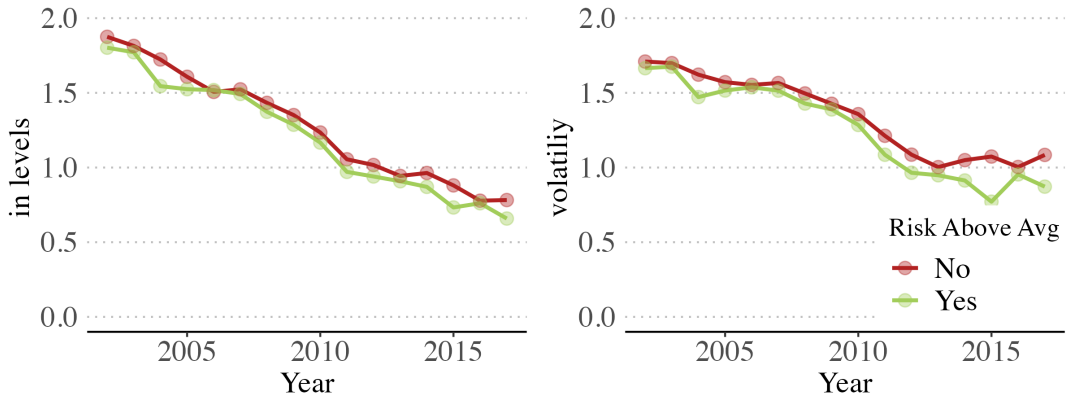
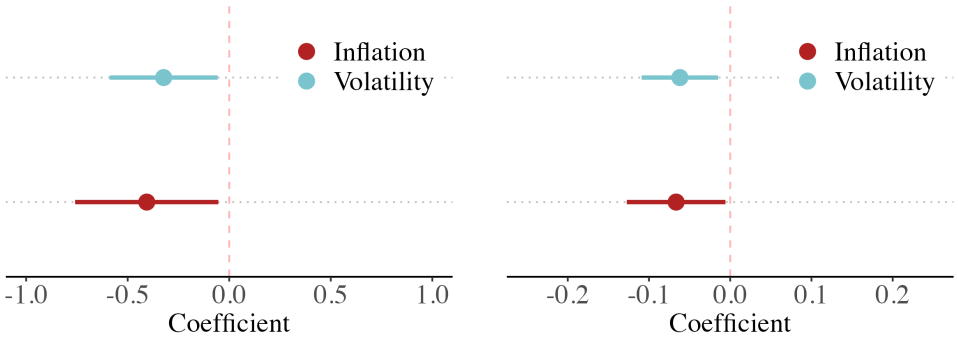


Figure 10: Average Experienced Inflation by level of Risk Attitude

The figure on the left-hand side plots average experienced inflation for households who took a mortgage in each year in our sample. The figure on the right-hand side plots average experienced volatility of inflation for households who took a mortgage in each year in our sample.

The x-axis refers to the year when households took a mortgage. For example, all households that took mortgages around 2005 have a higher experienced inflation than households who took a mortgage in 2015. Moreover, a clear pattern can be observed from the raw data when looking at risk attitudes: on average, households who are not willing to take any financial risk experienced higher

inflation (in levels and volatility) than households who take average or above average risk. Figure 11 shows that this pattern also holds when we exploit our household level data. The figure reports estimates of the effect of experienced inflation on the risk attitude measure, while controlling for demographic characteristics, time fixed effects and country fixed effects. The negative relation between experienced inflation, both in levels and volatility, and risk taking holds when estimated both in OLS regressions and logit regressions.



(a) Logit Estimated Coefficients **(b)** OLS Estimated Coefficients

Figure 11: Effect of Experienced Inflation on Risk Attitudes

Estimates for logit and OLS regressions of households risk attitudes on their 1) experience of inflation (in red) and 2) experience of inflation volatility (in blue), controlling for demographics and country fixed effects. All coefficients are negative and significant.

Considering the logit estimates, we find that a 1 log-point increase in experienced inflation (volatility) predicts a 34% (27.7%) decrease in the odds of taking risk. Table C.14 in the Appendix shows the estimates and standard errors in detail. Overall, we do find evidence that households who experienced higher inflation are less willing to take financial risk[18], which might induce a preference for ARM as it serves as an insurance against the inflation risk inherent to an FRM.

The above exercise does not aim to capture a unique causal path from experiences to risk attitudes and then choices, but rather present suggestive evidence that this could be one of the mechanisms. We also acknowledge that, besides affecting risk attitudes, experiences are likely affecting expectations of the level and volatility of inflation. The currently available data only allows us to provide evidence of the importance of the former.

5 Conclusion

[18]In line with this result, we also find that households who have experienced higher inflation also hold lower shares of mutual funds over total financial assets, and lower shares of stocks over total financial assets.

Campbell (2013) shows that the current share of ARM is positively correlated with historical volatility of inflation before the introduction of the euro, concluding that this leaves the reader with an interesting open question: *"why are mortgage markets in Europe still ARM-dominated long after the introduction of the euro?"*. Our findings can help us understand this initially puzzling fact: past inflation experiences exert a long lasting effect on households' financial behaviour.

In this paper, we present evidence that on European mortgage markets, inflation experiences are correlated with households' mortgage choice. However, our results are not entirely in line with similar investigations carried out in the US. While results based on US data support the hypothesis that households with higher lifetime inflation experiences tend to prefer FRM over ARM, we find that households who have experienced higher inflation (and higher volatility) have a lower probability of holding an FRM. Using rich micro-data, we show that these correlations are only partially explained by a number of household and mortgage characteristics, macroeconomic conditions and supply factors. We argue that these discrepancies between our results and previous research rely on important differences between the US and European mortgage market. While fixed rate mortgages can be seen as an inflation hedge for US households, they also carry an inflation risk for European households that face prepayment penalties. This risk is particularly relevant in volatile environments or for households who have experienced high inflation volatility. We see our results as evidence on the importance of studying the effect of behavioural biases on beliefs, attitudes and behaviour in different environments and societies.

Our evidence suggests that the channel might not only be going through beliefs but also through risk attitudes. Households who experienced higher inflation in levels and volatility are less likely to take financial risk. A comprehensive analysis of the mechanism behind our results and the differences between US and European households behaviour would require more detailed data on beliefs. We hope that in the future, data availability on European households' beliefs would allow researchers to advance our understanding of this question.

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Appendix

A Figures and Descriptive Statistics

Figure A.1 and A.2 plot average historical inflation and rolling volatility of inflation for the first and fourth quartile of FRM shares among countries in our final sample. For Figure A.2 we first consider windows of eight years for the inflation rate of each country and compute, for those years, the standard deviation of the inflation rate. Then we take an average for each year across the countries in each quartile..

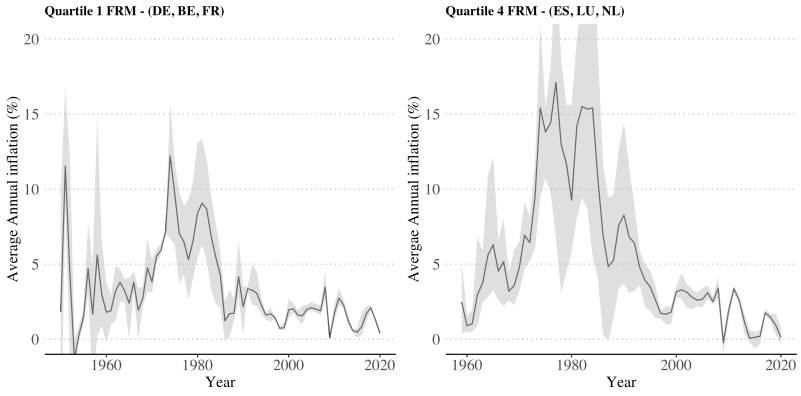


Figure A.1: Average Inflation, by quartile of fixed-rate mortgage

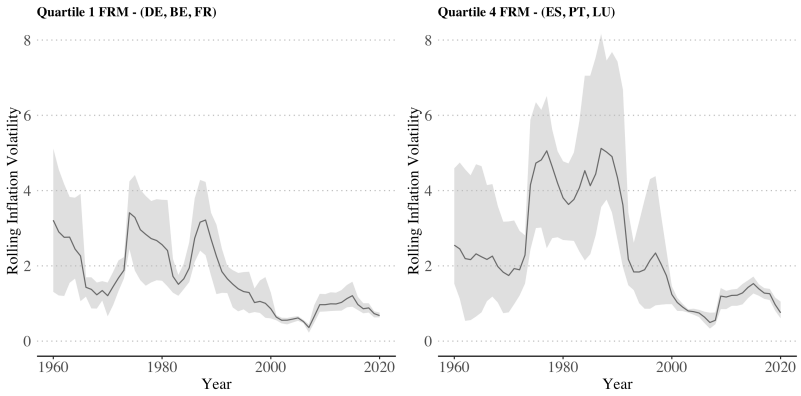
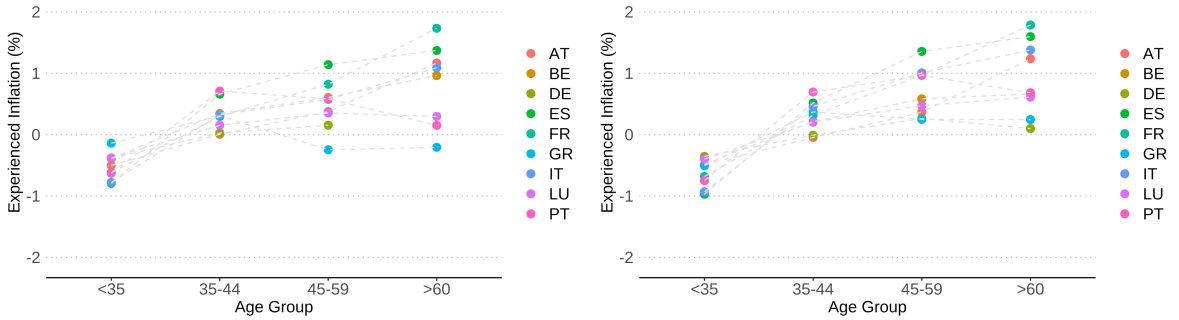


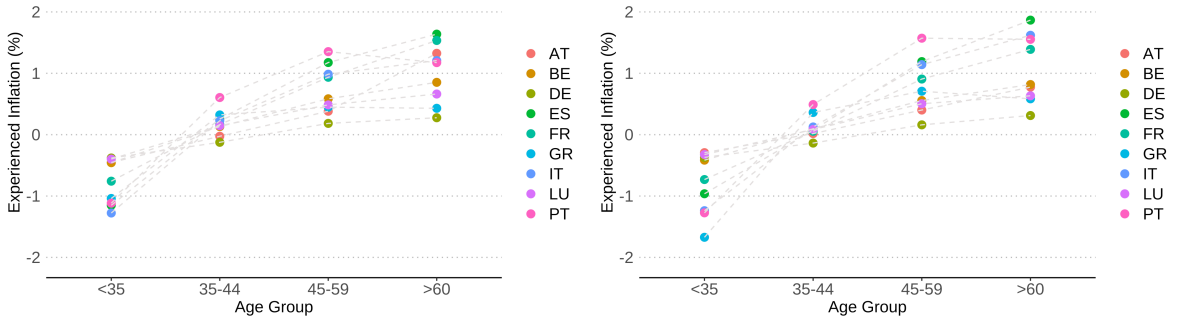
Figure A.2: Rolling Inflation Volatility, by quartile of fixed-rate mortgage

Quartile 1 includes countries with the highest share of fixed-rate mortgages (or lowest share of adjustable-rate mortgages) and quartile 4, the lowest. The above figures plot the mean and range of historical inflation across countries belonging to each quartile, while the ones below plot the average rolling volatility.



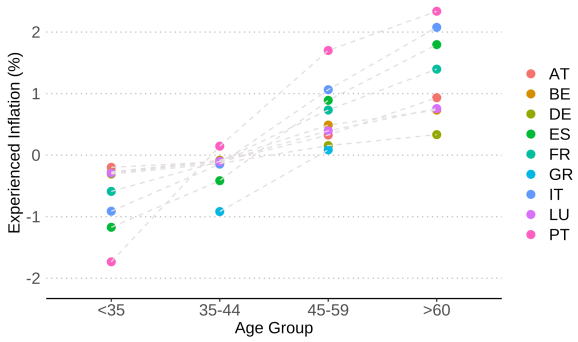
(a) Origination-year $(2002, 2004]$

(b) Origination-year $(2004, 2006]$



(c) Origination-year $(2006, 2009]$

(d) Origination-year $(2009, 2013]$



(e) Origination-year $(2013, 2018]$

Figure A.3: Experienced Inflation by country, age group and origination-year for all countries in sample

Within each origination-year quintile, we group households according to their age when they took the loan. We then calculate the experienced inflation of each group, as deviation from country mean experienced inflation (within that quintile). Throughout, HFCS survey weights are used.

Code	Country	Actual Population (M)	Observations		
			Households in sample	Homeowners	Homeowners and Mortgage Holders
AT	Austria	8.8	8449	3612	1162
BE	Belgium	11.4	4433	2980	1140
CY	Cyprus	1.2	1739	1304	645
DE	Germany	82.7	7244	4065	1539
EE	Estonia	1.3	3177	2533	687
ES	Spain	46.6	19789	16830	3890
FI	Finland	5.5	30042	23297	11396
FR	France	66.9	36288	24842	7339
GR	Greece	10.8	8981	6015	954
HR	Croatia	4.1	1357	1199	122
HU	Hungary	9.8	12175	10484	2013
IE	Ireland	4.8	10212	7419	3101
IT	Italy	60.5	18968	13491	1340
LT	Lithuania	2.8	1664	1540	169
LU	Luxemburg	0.6	4167	3047	1414
LV	Latvia	1.9	1783	1408	258
MT	Malta	0.5	1438	1127	166
NL	Netherlands	17.1	3545	2391	1850
PL	Poland	38	7096	5507	799
PT	Portugal	10.3	16535	12976	5230
SI	Slovenia	2.1	4910	3842	426
SK	Slovakia	5.4	5665	4713	709
Total			209657	154622	46349
Percentage (out of Total)				74%	22%
Percentage (out of Homeowners)					30%

Table A.1: Number of observations in HFCS sample

Column 3 shows the number of households in sample by country, column 4 restricts the sample to those who are homeowners and column 5 to those that are homeowners and also have a mortgage. Data for actual population in 2017 is from the World Bank.

Code	Country	Observations
AT	Austria	517
BE	Belgium	880
DE	Germany	1202
ES	Spain	2055
FR	France	5937
GR	Greece	436
IT	Italy	892
LU	Luxembourg	920
PT	Portugal	2363
Total		15203

Table A.2: Observations in final sample

Table shows final number of observations per country and the total number of observations used in the main analysis.

Variable	Mean	Median	SD
Age (years)	44.17	43	10.12
Male	0.726	1	0.45
Has child	0.482	0	0.5
Marital Status			
Single/never married	0.197		
Married or legal union	0.669		
Widowed	0.03		
Divorced	0.103		
Education Level			
Below high school	0.182		
High school	0.369		
Above high school	0.448		
Employment Status			
Employed	0.76		
Self-employed	0.124		
Unemployed	0.035		
Retired	0.06		
Other	0.012		
Age at origination-year (years)	40.19	38	10.1
Length of Loan (years)	20	20	8.61
Share of FRM	0.625	1	0.484

Table A.3: Summary of HFCS mortgage holders characteristics

HFCS sample summary statistics weighted to be representative of the population. Mean and median are the averages across imputations. Standard deviation is the square root of the average weighted variance of each imputation.

Country	Mean	ARM	FRM
AT	21.88	22.38	21.02
BE	19.6	21.66	18.83
DE	12.92	16.29	12.55
ES	25.41	25.98	22.33
FR	18.82	20.12	18.72
GR	21.45	21.4	21.51
IT	21.4	22.49	20.18
LU	22.1	22.5	20.97
PT	30.66	31.26	24.61

Table A.4: Average Mortgage Length (in years) by country and type of financing

Table A.5: Table shows average mortgage length in years for each country and type or mortgage financing. All averages are calculated using survey weights to ensure they are representative of the population and they are themselves averages across imputations.

B Regression Results

Dep. Var: FRM share	(1)	(2)	(3)
(Intercept)	1.364^{***}	1.642^{***}	0.601^{***}
	(0.051)	(0.106)	(0.066)
Experienced Inflation (log)	-0.579^{***}	-0.663^{***}	-0.262^{***}
	(0.039)	(0.043)	(0.047)
Country FE	No	No	Yes
Time FE	No	Yes	No
R^2	0.613	0.670	0.906
Adj. R^2	0.611	0.625	0.900
Observations	142	142	142

Table B.6: Inflation Experiences and Country-Level Share of Fixed Rate Mortgages

Table presents results OLS regressions of country-level shares of FRM on country-level averages of experienced inflation. Averages account for survey weights. Column (1) includes no controls, Column (2) adds time FE and exploits heterogeneity across countries in a given year, while Column (3) controls for country FE and exploits heterogeneity across time for a given country. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Dep. Var: FRM share	(1)	(2)	(3)
(Intercept)	1.282^{***}	1.316^{***}	0.618^{***}
	(0.064)	(0.128)	(0.103)
Experienced Volatility (log)	-0.470^{***}	-0.476^{***}	-0.245^{***}
	(0.045)	(0.049)	(0.083)
Country FE	No	No	Yes
Time FE	No	Yes	No
R^2	0.440	0.461	0.891
Adj. R^2	0.436	0.387	0.884
Num. obs.	142	142	142

Table B.7: Inflation Experiences (volatility) and Country-Level Share of Fixed Rate Mortgages

Table presents results OLS regressions of country-level shares of FRM on country-level averages of experienced inflation volatility. Averages account for survey weights. Column (1) includes no controls, Column (2) adds time FE and exploits heterogeneity across countries in a given year, while Column (3) controls for country FE and exploits heterogeneity across time for a given country. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	4.093***	3.538***	4.584***	1.241**	0.290	−5.224
	(0.145)	(0.554)	(0.614)	(0.632)	(0.774)	(8.010)
Experienced Infl (log)	−2.792***	−2.790***	−2.070***	−2.117***	−1.959***	−1.259**
	(0.100)	(0.118)	(0.125)	(0.278)	(0.519)	(0.499)
Age at loan		0.051***	0.041***	0.048***	0.044***	0.030**
		(0.006)	(0.006)	(0.008)	(0.013)	(0.012)
Length of loan		−0.076***	−0.070***	−0.049***	−0.050***	−0.049***
		(0.006)	(0.007)	(0.007)	(0.007)	(0.007)
Employed, temporary		−0.497*	−0.466	−0.308	−0.322	−0.299
		(0.295)	(0.306)	(0.336)	(0.332)	(0.292)
Employed, other		0.043	0.271	0.816	0.623	0.539
		(0.638)	(0.621)	(0.614)	(0.628)	(0.653)
Employed, no info		−0.442***	−0.450***	−0.032	−0.039	0.053
		(0.135)	(0.140)	(0.160)	(0.163)	(0.158)
Retired		−0.283*	−0.231	−0.383*	−0.385*	−0.258
		(0.166)	(0.181)	(0.204)	(0.229)	(0.221)
Self-employed		−0.203*	−0.233*	−0.199	−0.207	−0.210
		(0.111)	(0.121)	(0.136)	(0.136)	(0.132)
Unemployed		−0.166	−0.283	0.025	0.047	0.179
		(0.201)	(0.206)	(0.267)	(0.272)	(0.256)
Educ - below high-school		−0.003	−0.018	0.049	0.050	0.048
		(0.103)	(0.111)	(0.134)	(0.136)	(0.130)
Educ - high-school		0.141	0.011	−0.067	−0.066	−0.039
		(0.094)	(0.100)	(0.110)	(0.110)	(0.108)
Divorced		0.212	0.100	0.099	0.048	0.098
		(0.151)	(0.163)	(0.187)	(0.185)	(0.182)
Single		0.278***	0.270**	0.106	0.089	0.075
		(0.097)	(0.107)	(0.124)	(0.125)	(0.120)
Widowed		0.100	0.076	0.348	0.335	0.361
		(0.279)	(0.291)	(0.339)	(0.333)	(0.296)
Child = 1		0.231***	0.218**	0.085	0.074	0.042
		(0.083)	(0.089)	(0.100)	(0.100)	(0.098)
Female = 1		0.085	0.071	−0.020	−0.018	−0.006
		(0.085)	(0.092)	(0.106)	(0.108)	(0.102)
Demographic and Mortgage	No	Yes	Yes	Yes	Yes	Yes
Country Macro Conditions at t	No	No	Yes	Yes	Yes	No
Country FE	No	No	No	Yes	Yes	No
Year FE	No	No	No	No	Yes	No
Country-Year FE	No	No	No	No	No	Yes
R2	0.257	0.357	0.321	0.490	0.487	0.470
Observations	15225	15220	13218	13218	13218	15220

Table B.8: Inflation Experiences and HH Mortgage Choice in detail - logit coefficients

Note: The table reports coefficients and standard errors for households and mortgage characteristics of variables that are significant (education, marital status and income quintiles are not reported as they are never significant). Reference for employment status is "Employed, permanent". Each Column corresponds to the respective Column in Table 3. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Income q2		0.071	−0.041	0.143	0.154	0.176
		(0.240)	(0.274)	(0.308)	(0.312)	(0.292)
Income q3		0.030	−0.072	0.125	0.116	0.173
		(0.222)	(0.257)	(0.286)	(0.288)	(0.268)
Income q4		0.027	−0.071	0.046	0.036	0.080
		(0.227)	(0.262)	(0.295)	(0.296)	(0.273)
Income q5		0.143	0.089	0.227	0.235	0.255
		(0.237)	(0.272)	(0.304)	(0.306)	(0.282)
Wealth q2		−0.182	−0.073	−0.392	−0.454	−0.634
		(0.432)	(0.440)	(0.436)	(0.444)	(0.411)
Wealth q3		0.057	0.009	−0.710	−0.750*	−0.864**
		(0.432)	(0.435)	(0.441)	(0.448)	(0.417)
Wealth q4		0.026	−0.070	−0.751*	−0.812*	−0.912**
		(0.429)	(0.435)	(0.441)	(0.448)	(0.413)
Wealth q5		−0.105	−0.237	−0.872*	−0.916**	−1.018**
		(0.436)	(0.443)	(0.446)	(0.453)	(0.418)
E(income), less		0.021	−0.122	−0.156	−0.148	−0.104
		(0.111)	(0.121)	(0.127)	(0.125)	(0.126)
Past Inc. Growth, equal/higher		−0.198**	−0.260**	0.007	0.021	0.017
		(0.099)	(0.105)	(0.119)	(0.121)	(0.121)
Int. Rate Spread (FRM-ARM)			−0.599***	−0.193**	−0.091	
			(0.086)	(0.097)	(0.162)	
Inflation Rate			−0.017	0.100*	0.272***	
			(0.055)	(0.056)	(0.098)	
Unemployment Rate			−0.056***	0.010	0.055*	
			(0.013)	(0.022)	(0.030)	
GDP Growth			−0.163***	−0.029	0.101*	
			(0.025)	(0.028)	(0.052)	
Credit Standards			−0.021***	−0.006	−0.009**	
			(0.003)	(0.004)	(0.004)	
Demographic and Mortgage	Yes	Yes	Yes	Yes	Yes	
Country Macro Conditions at t	No	No	Yes	Yes	Yes	No
Country FE	No	No	No	Yes	Yes	No
Year FE	No	No	No	No	Yes	No
Country-Year FE	No	No	No	No	No	Yes
Pseudo R^2	0.257	0.357	0.321	0.490	0.487	0.470
Observations	15225	15220	13218	13218	13218	15220

Table B.9: Inflation Experiences and HH Mortgage Choice in detail - continued - logit coefficients

Note: The table reports coefficients and standard errors for the country specific macro conditions at the time of mortgage origination. Each Column corresponds to the respective Column in Table 3. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

	Model 1	Model 2
(Intercept)	−5.201	−4.792
	(7.987)	(7.987)
Experienced Inflation (log)	−1.230**	−1.429***
	(0.505)	(0.492)
Size of loan q2	−0.219*	−0.171
	(0.127)	(0.157)
Size of loan q3	−0.364**	−0.233
	(0.144)	(0.181)
Size of loan q4	−0.509***	−0.325
	(0.157)	(0.215)
Refinance? (Yes=1)	0.060	0.065
	(0.121)	(0.123)
>1 mortgage on HMR? (Yes=1)	−0.029	0.052
	(0.141)	(0.156)
LTV Ratio q2		−0.104
		(0.146)
LTV Ratio q3		0.152
		(0.172)
LTV Ratio q4		−0.247
		(0.228)
DTI Ratio q2		−0.056
		(0.142)
DTI Ratio q3		−0.139
		(0.182)
DTI Ratio q4		−0.188
		(0.232)
Demographic and Mortgage Controls	Yes	Yes
Country-Year FE	Yes	Yes
Pseudo R^2	0.472	0.476
Observations	14656	14122

Table B.10: Robustness: controls on mortgage type and borrowing constraints - logit coefficients

The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Demographic Controls include age when taking the loan, gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income and Mortgage Controls refers to length of the mortgage. Multiple imputation techniques and survey weights are used throughout.

	Model 1	Model 2
(Intercept)	−4.914	−5.180
	(8.019)	(8.046)
Experienced Inflation (log)	−1.531***	
	(0.514)	
Experienced Volatility (log)		−0.456**
		(0.191)
Mortgage DTI>=3? (Yes=1)	−0.903***	−0.712**
	(0.313)	(0.327)
Experienced Inflation(log):Mortgage DTI>=3? (Yes=1)	0.476**	
	(0.205)	
Experienced Volatility(log):Mortgage DTI>=3? (Yes=1)		0.319
		(0.205)
Demographic and Mortgage Controls	Yes	Yes
Country-Year FE	Yes	Yes
Pseudo R^2	0.471	0.472
Observations	15186	15186

Table B.11: Heterogeneity on the effect of experiences by DTI - logit coefficients

The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Model 1 uses as main explanatory variable the personal measure of experienced inflation while Model 2 uses the personal measure of experienced volatility. Demographic Controls include age when taking the loan, gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income and Mortgage Controls refers to length of the mortgage. Multiple imputation techniques and survey weights are used throughout.

	Model 1	Model 2
(Intercept)	−5.100	−5.283
	(7.987)	(7.995)
Experienced Inflation (log)	−1.414***	
	(0.508)	
Experienced Volatility (log)		−0.424**
		(0.189)
Mortgage LTV>=0.75? (Yes=1)	−0.863**	−0.835**
	(0.390)	(0.405)
Experienced Inflation(log):Mortgage LTV>=0.75? (Yes=1)	0.443*	
	(0.257)	
Experienced Volatility(log):Mortgage LTV>=0.75? (Yes=1)		0.409
		(0.253)
Demographic and Mortgage Controls	Yes	Yes
Country-Year FE	Yes	Yes
Pseudo R^2	0.470	0.470
Observations	15218	15218

Table B.12: Heterogeneity on the effect of experiences by LTV - logit coefficients

The table presents coefficients and odds ratios from logit regressions with robust standard errors, $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$. Model 1 uses as main explanatory variable the personal measure of experienced inflation while Model 2 uses the personal measure of experienced volatility. Demographic Controls include age when taking the loan, gender, marital status, educational attainment, quintile of net wealth and quintile of household gross-income and Mortgage Controls refers to length of the mortgage. Multiple imputation techniques and survey weights are used throughout.

B.1 Different weights for our experience measure

We estimate equation 3 on a range of $\lambda \in [0, 5]$ in intervals of 0.5. Note that this regression equation includes the full set of controls: demographic and mortgage controls and country-time fixed effects and is therefore equivalent to column (5) in Table 3. In the following table we report the best fit parameters for $\lambda \leq 2$, as higher values are associated with higher standard errors.

	Best Fit Parameters for Past Experience Measures							
	Weighted Experienced Inflation				Weighted Experienced Volatility			
	R^2	λ	Coefficient	Standard Error	R^2	λ	Coefficient	Standard Error
	0.4704	0	-0.2721	0.330	0.4708	0	-0.3396**	0.162
	0.4703	0.5	-0.8307**	0.374	0.4707	0.5	-0.3372*	0.177
	0.4703	1	-1.2592**	0.499	0.4707	1	-0.322*	0.185
	0.4704	1.5	-1.4603**	0.623	0.4706	1.5	-0.3081	0.191
	0.4704	2	-1.440**	0.681	0.4706	2	-0.297	0.194
Obs	15220							

Table B.13: Best Fit Parameters for different values of the weighting parameter λ

For a given value of λ, experienced measures are constructed and then used as explanatory variable to re run estimation in Column (5) of Table 3. The table reports the value of λ and the resulting coefficient of experienced inflation, its standard error and the R^2 of the regression. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

The weighted experienced inflation that best fit our data lies between $\lambda = 0.5$ and $\lambda = 1$, when considering the results of both experienced inflation in levels and volatility. For experienced volatility, coefficients are almost identical across different values of λ but become insignificant for $\lambda > 1$. Based on this investigation, we conduct our main analysis in Section 3 with $\lambda = 1$ but these findings suggest that our results wouldn't change considerably if we move to $\lambda \in \{0.5, 2\}$. Intuitively, these results suggest that past experiences still receive an important weight and thus, influence current decisions.

C Regression Results - Risk Attitudes

The following table reports logit coefficients of significant controls. Demographics include: age at loan, employment status, education level ("above high school" reference category), marital status ("divorced" as reference), binary for having children, gender ("male" as reference), income quintiles (q1 as reference), wealth quintiles (q1 as reference).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	−0.146	−0.125	−1.766***	−1.742***	−0.713	−0.799
	(0.099)	(0.108)	(0.652)	(0.649)	(0.663)	(0.662)
Exp. Inflation (log)	−0.582***		−0.336***		−0.406**	
	(0.071)		(0.082)		(0.180)	
Exp. Volatility (log)		−0.566***		−0.360***		−0.323**
		(0.074)		(0.082)		(0.136)
Age at loan			0.000	0.000	−0.003	−0.004
			(0.005)	(0.005)	(0.006)	(0.006)
Employed, other			−1.805***	−1.736**	−2.003**	−1.872**
			(0.684)	(0.688)	(0.831)	(0.804)
Employed, temporary			−0.264	−0.270	−0.184	−0.175
			(0.196)	(0.198)	(0.203)	(0.203)
Employed, no info			−0.391***	−0.410***	−0.313**	−0.316**
			(0.135)	(0.134)	(0.141)	(0.141)
Self-employed			0.182*	0.188*	0.191*	0.190*
			(0.104)	(0.104)	(0.109)	(0.109)
Unemployed			−0.567***	−0.576***	−0.340*	−0.348*
			(0.195)	(0.195)	(0.197)	(0.197)
Below high school			−0.380***	−0.379***	−0.398***	−0.414***
			(0.115)	(0.115)	(0.120)	(0.120)
High school			−0.074	−0.085	−0.247***	−0.257***
			(0.086)	(0.085)	(0.090)	(0.089)
Married = 1			−0.048	−0.067	−0.120	−0.133
			(0.088)	(0.089)	(0.093)	(0.093)
Child = 1			−0.124	−0.075	−0.069	−0.034
			(0.084)	(0.086)	(0.089)	(0.091)
Female = 1			−0.243***	−0.230***	−0.233***	−0.230***
			(0.085)	(0.086)	(0.088)	(0.088)
Income q5			0.422*	0.433**	0.375*	0.386*
			(0.219)	(0.219)	(0.220)	(0.222)
Wealth q2			1.163*	1.174*	0.933	0.920
			(0.610)	(0.607)	(0.615)	(0.611)
Wealth q3			1.136*	1.164*	0.935	0.924
			(0.600)	(0.596)	(0.604)	(0.600)
Wealth q4			1.307**	1.331**	1.081*	1.074*
			(0.601)	(0.597)	(0.605)	(0.602)
Wealth q5			1.951***	1.970***	1.730***	1.718***
			(0.602)	(0.598)	(0.608)	(0.604)
Country FE	No	No	No	No	Yes	Yes
Pseudo R^2	0.022	0.023	0.084	0.086	0.124	0.124
Observations	13885	13885	13880	13880	13880	13880

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table C.14: Correlation between experiences and risk attitude - logit coefficients

Experienced inflation, both in levels and volatility, predicts a lower likelihood of reporting willingness to take financial risk. The lower coefficients in columns 3 and 4 show that part of the big negative correlation found in columns 1 and 2 can be explained by demographic characteristics of these individuals, although the effect remains negative and highly significant. One might also argue that the correlation between risk attitudes and experiences might be explained by fixed heterogeneities across countries. Last columns alleviate such concern by adding country fixed effects. For robustness, we also construct new measures of experiences taking as reference year the survey one. We re run the regressions with such measures and we find similar results.

D Country-by-Country Regressions

In the main body of the paper we uncover a negative relation between past experiences of inflation and current holdings of FRM mortgages. In our sample of 15000 households from 9 different euro area countries we found that, on average, a 1 log point increase in experienced inflation predicts a decline in the odds of holding an FRM of 71.6%. This effect was identified exploiting heterogeneity within a year-country and controlling for several household and mortgage characteristics.

Even though a thorough exploration of country by country results exceeds the scope of this paper, we provide some evidence that this result generally holds for each country in our sample. In particular, we re-run our regressions for the nine countries separately. Figures in the main body summarise the results for such regressions and Tables D.16 and D.17 show the full set of logit coefficients and standard errors.

	AT	BE	DE	FR	GR	IT	ES	LU	PT
Experienced Inflation Volatility	3.02	2.88	2.14	3.96	8.38	6.4	5.33	2.72	7.12
Experienced Mean Inflation	2.51	2.74	2.21	2.96	9.18	5.39	5.92	2.75	6.82
corr(short int, unemp)	-0.74	-0.48	**0.68**	-0.8	-0.58	-0.59	-0.66	-0.76	-0.71

Table D.15: Average experiences and correlation for each country

Table presents average experiences, both in levels and volatility, for each country in the sample. The last row shows the correlation between the short term interest rate and the unemployment rate across time for each country.

Dep.Var.: FRM	AT	BE	DE	FR	GR	IT	ES	LU	PT
Exp. Infl. (log)	-3.873^{***}	-0.838	6.535^{***}	-3.305^{***}	1.792^{*}	-1.031^{**}	-2.628^{***}	-4.362^{***}	-1.095^{*}
	(1.265)	(1.312)	(2.152)	(0.334)	(1.028)	(0.475)	(0.554)	(0.936)	(0.575)
Age at loan	0.054^{**}	0.022	-0.038	0.077^{***}	-0.019	0.002	0.077^{***}	0.048^{**}	0.049^{*}
	(0.023)	(0.035)	(0.028)	(0.012)	(0.018)	(0.016)	(0.013)	(0.018)	(0.027)
Spread (FRM-ARM)	-0.156	-0.772^{***}	0.363	-0.388^{*}	-0.539^{**}	-0.173	-0.314	0.206	-0.061
	(0.141)	(0.205)	(0.347)	(0.236)	(0.261)	(0.163)	(0.191)	(0.202)	(0.150)
Num. obs.	532	705	1202	5939	417	892	1924	932	896

Table D.16: Inflation Experiences (in level) and Households' Mortgage Choice by Country

The table presents regression coefficients from individual-level logit regressions of FRM on experienced inflation. All regressions include household characteristics, mortgage length and interest rate spread at time of mortgage take out. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Dep. Var.: FRM	AT	BE	DE	FR	GR	IT	ES	LU	PT
Exp. Vol. (log)	-0.878^{***}	-0.153	4.795^{***}	-0.843^{***}	-1.606^{**}	-0.413	-2.056^{***}	-1.488^{***}	-0.955
	(0.322)	(0.509)	(1.662)	(0.271)	(0.741)	(0.399)	(0.571)	(0.407)	(1.842)
Age at loan	0.022	0.012	-0.047	0.030^{***}	0.013	-0.012	0.054^{***}	0.024	0.039
	(0.017)	(0.027)	(0.030)	(0.010)	(0.021)	(0.015)	(0.012)	(0.016)	(0.026)
Spread (FRM-ARM)	-0.045	-0.797^{***}	0.538	-0.868^{***}	-0.566^{**}	-0.132	-0.054	0.445^{**}	0.016
	(0.131)	(0.204)	(0.328)	(0.266)	(0.263)	(0.162)	(0.168)	(0.181)	(0.141)
Num. obs.	532	705	1202	5939	417	892	1924	932	896

Table D.17: Inflation Experiences (volatility) and Households' Mortgage Choice by Country

The table presents regression coefficients from individual-level logit regressions of FRM on experienced inflation volatility. All regressions include household characteristics, mortgage length and interest rate spread at time of mortgage take out. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

E FRM vs. ARM: a simulation exercise

To illustrate our research hypothesis, we conduct a simple simulation exercise. Our aim is to show how real payments would vary for different paths of inflation and how this can affect the valuation of a mortgage contract. First, we simulate $N = 1000$ price level paths for a 20 year horizon. We assume that monthly year-on-year inflation develops according to an $AR(1)$ process, where the error terms are randomly drawn from a normal distribution:

$$\pi_t = \mu_\pi(1-\rho) + \rho\pi_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim \mathcal{N}(0, \sigma_\varepsilon^2) \tag{4}$$

Next, using the simulated price level paths, we simulate ARM and FRM contracts and their monthly payments using the parameters in Table E.18. For an FRM contract, the simulation of

monthly payments is straightforward, using the standard formula:

$$M^{FRM} = L \times (i^{FRM}/12)\frac{[(1+i^{FRM}/12)^{T\times 12}}{[(1+i^{FRM}/12)^{T\times 12}-1]} \tag{5}$$

where M^{FRM} is the (nominal) monthly payment due throughout the length of the FRM contract, L is the size of the loan, i^{FRM} is the annual fixed rate, T is the length of the contract in years.

Loan value	112.500 euros
Length of mortgage (T)	20 years
FRM annual rate (i^{FRM})	6%
Real interest rate ($\bar{r}$)	2%
Risk premium (ψ)	1%
ARM adjustment period	1 year
AR-1 parameter ρ	0.98

Table E.18: Parameters used in the simulation exercise

ARM contracts, on the other hand, are less straightforward as we need to simulate interest rate adjustments as well. We follow Campbell and Cocco (2003) in assuming that lenders adjust the interest rate in the following way:

$$i_t^{ARM} = \bar{r} + \psi + \frac{1}{N}\sum_{n=1}^{N}\pi_{t-n} \tag{6}$$

where $\bar{r}$ is a (constant) real rate, ψ is a risk premium expected by the lender, and $\frac{1}{N}\sum_{n=1}^{N}\pi_{t+n}$ is the average inflation in the past N period (since the last interest rate adjustment). Then, we can calculate a corresponding path of nominal interest rates. Using this path of interest rates, we can calculate the nominal monthly payment for each period t as

$$M_t^{ARM} = L_t \times (i_t^{ARM}/12)\frac{[(1+i_t^{ARM}/12)^{TT\times 12}}{[(1+i_t^{ARM}/12)^{TT\times 12}-1]}$$

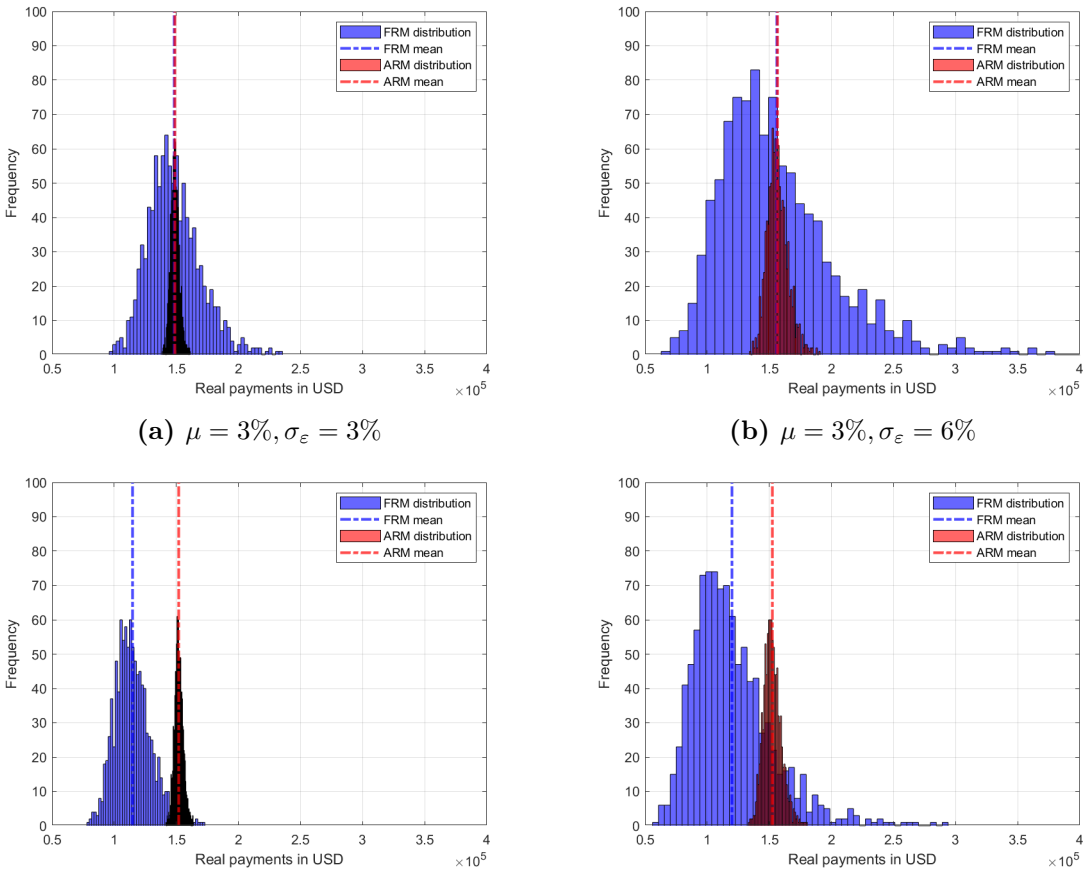
where M_t^{ARM} is the (nominal) monthly payment due throughout the length of the ARM contract, L_t is the outstanding amount of the loan at time t, i_t^{ARM} is the annual adjustable rate, TT is the remaining length of the contract at time t, in years. For both ARM and FRM, we assume that there is no possibility of early repayment[19].

As a last step, we divide the nominal payments of the simulated FRM and ARM contracts with the corresponding price level to obtain the real payments. The top figures of Figure E.4 plot the

[19] As previously described, the European mortgage market is generally characterized by the existence of some prepayment penalty. For simplicity, we rule out this possibility as a whole.

distribution of real payments for two inflation processes with the same mean but different variance (σ_ε^2 in equation 4), where Panel (a) has lower inflation variance than Panel (b). It can be seen that while the mean of the distribution of payments from an ARM is the same as for an FRM, real payments are significantly more dispersed for an FRM, with a right-skewed distribution, and the dispersion increases with the volatility of inflation (moving from Panel (a) to Panel (b)).

Since households are uncertain about the future path of inflation when deciding their type of mortgage financing, they need to form expectations about it. These expectations about mean inflation and volatility are crucial, as they directly influence their perceived future real payments (mean and variance)[20]. As Figure E.4 highlights, even if two households expect the same inflation mean, they might have a very different assessment of the distribution of real payments depending on what their perceived expected volatility is.



(a) $\mu = 3\%, \sigma_\varepsilon = 3\%$ **(b)** $\mu = 3\%, \sigma_\varepsilon = 6\%$

(c) $\mu = 6\%, \sigma_\varepsilon = 3\%$ **(d)** $\mu = 6\%, \sigma_\varepsilon = 6\%$

Figure E.4: Histogram of simulated real payments for ARM and FRM

[20] A household who expects inflation to behave as depicted in Panel (b) would expect the same mean of real payments from an FRM as a household who expects inflation to behave as depicted in Panel (a), but the former might see this FRM as much more riskier. These plots highlight the inflation risk inherent in an FRM.

According to our experienced-based hypothesis, a household who experienced high and volatile inflation would expect high and volatile inflation. From their lenses, an FRM could protect them against future higher inflation compared to an ARM but it would expose them to higher volatility. These two effects have opposing implications on their behavior. Therefore, we want to test whether:

1. Higher experienced inflation *increases* the likelihood of choosing an FRM (inflation hedge)
2. Higher experienced inflation *reduces* the likelihood of choosing an FRM (inflation risk)

Our setup provides an ideal laboratory to test which of the two channels prevail on average, as FRMs in Europe can be seen as both a hedging device but they also contain an inflation risk.

F Institutional Context

The share of FRMs in a country is an outcome of household choice albeit influenced by housing finance regulation (Badarinza et al., 2018). To study the determinants of household financial decisions we thus need to evaluate whether there are institutional hurdles in the supply of either ARM or FRM products that might constrain these household choices. In this subsection, we briefly introduce the characteristics of European mortgage markets, emphasising the key differences with the US.

Even though both type of of mortgages are accessible in EU domestic markets (Bouyon et al., 2017), there is a large heterogeneity across countries in their share of FRMs and ARMs. Some markets have on average been dominated by ARMs (e.g. Portugal, Spain, Austria), whereas others have placed further emphasis on FRMs (Belgium, Germany, France). The variation in the share of FRMs over total new loans also varies across countries, with little variation across time for Germany, France and Portugal as opposed to Greece and Italy (ECB (2009), Albertazzi et al. (2020)). These trends are also visible in our HFCS data (see Figure F.5).

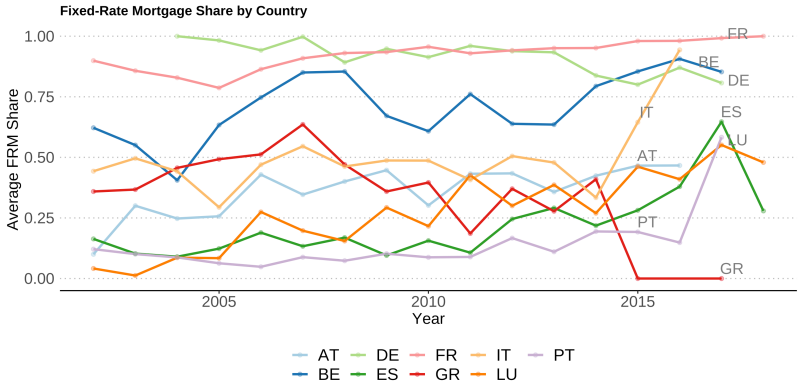


Figure F.5: Dynamics of FRM share amongst new mortgages in the HFCS database

This figure plots the share of fixed-rate mortgages among newly issued loans for each country and year in our HFCS sample.

A possible important determinant of the dynamics of the FRM share are the changes in the relative cost of FRMs vs ARMs. The literature has broadly found a negative co-movement between the spread between ARM and FRM rates and FRM market shares, suggesting that households might be accustomed to comparing FRM rates with ARM rates when seeking finance for their housing (Albertazzi et al. (2020), Bouyon et al. (2017)). Nevertheless, the degree of correlations is highly heterogeneous both amongst EU economies and across time, suggesting that the analysis should be extended to other factors such as other mortgage characteristics, households characteristics and macroeconomic elements.

Another consistent pattern found in the literature is a negative correlation between inflation variance in consumer prices and the FRM market share. Bouyon et al. (2017) argues that "*this can notably be explained by the prepayment fees scheme that prevails in each domestic market. If a fixed-rate mortgage cannot be prepaid without significant penalties, as is the case in Germany, then an FRM is risky to the extent that inflation is volatile and persistent*". This brings us to an important institutional feature of the European market: "*while partial or total early repayments are allowed in all euro area countries, fees are generally charged for the early repayment of fixed rate housing loans, whereas early repayment is free of charge in the case of variable rate housing loans in several euro area countries*" (ECB (2009), p19). While prepayment regulations are heterogeneous, in all countries in our sample the borrower bears most of the inflation risk for an FRM[21].

The existence of prepayment penalties is a key factor that differentiates European and US mortgage markets. The US housing market is largely dominated by a 30-year, fixed rate, prepayable mortgage. This type of mortgage financing has benefited consumers through payment stability and the right to prepay the mortgage without penalty (Lea and Sanders, 2011), but it relies on a very specific feature of the US market: the presence of government-sponsored enterprises (GSEs), originating from the era of the Great Depression, that acquired a central role following the savings and loan (S&L) crisis in the 1980s. GSEs such as Fannie Mae and Freddie Mac helped removing mortgages from the balance sheet of banks and S&L institutions, thus after selling a fixed-rate mortgage loan, it is GSEs that bear the risk of rising interest rates. Therefore, GSEs and ultimately the US government support the provision of mortgage credit in the United States, and specifically the supply of FRM that has been dominating the market. Moreover, the GSEs enjoyed lower funding costs compared with private banks due to an implicit government guarantee (that was made explicit during the Great Financial Crisis), thus reducing banks' funding costs. In contrast, euro area governments do not act in a comparable way to reduce banks' funding cost and interest rate risk. Furthermore, in some euro area countries accounting rules pose strict criteria for the removal of securitised loans from banks' balance sheets, thus mortgage loans (and the associated default risk) remain to a large extent on banks' balance sheets. Euro area banks, unlike their US peers, often need to bear the risk of financing long-term assets with short-term funds. In such

[21] For details, see the Online Institutional Appendix of Badarinza et al. (2018) and Badarinza et al. (2016) for a review on international comparative household finance.

a context, high volatility of inflation makes this long-term nominal contracts risky - lenders can insure themselves by setting high prices for FRM or, alternatively, imposing prepayment penalties.

In summary, it is important to take into consideration country-specific conditions that might affect the supply, such as banks' risk assessment and pricing when analyzing the composition of European mortgage market (which we will control for in our analysis), but also keep in mind the importance of the existence of prepayment fees, or the lack of them, as in the US.