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Financial Literacy, Present Bias and Alternative Mortgage Products

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Abstract

Choosing a mortgage is one of the most important financial decisions made by a household. Financial innovation has given rise to more complex mortgage products with back-loaded payments, known as 'Alternative Mortgage Products' (AMPs), or 'Interest-Only Mortgages'. Using a specially designed question module in a representative survey of UK mortgage holders, we investigate the effect of consumer financial sophistication on the decision to choose an AMP instead of a standard repayment mortgage. We show poor financial literacy and present bias raise the likelihood of choosing an AMP. Financially literate individuals are also more likely to choose an adjustable rate mortgage, suggesting they avoid paying the term premium of a fixed rate mortgage.

Keywords: mortgages, financial literacy, present bias, alternative mortgage products
JEL Codes: D10, D12, G21

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1 Introduction

Since the onset of the financial crisis much controversy has surrounded innovations in the mortgage market. The mortgage market is important for households – most households purchase a home during their lifetime and most purchases are funded by mortgage loans. For the typical household, a mortgage loan is the largest debt in the household's portfolio and is secured against the household's most valuable asset – the family home. The choice of type of mortgage used to finance a house purchase is a crucial decision for households which has attracted much interest from policymakers.

The increase in mortgage lending during the 2000s was associated with the emergence of new types of mortgages, known as 'Alternative Mortgage Products' (AMPs). These innovative mortgage products offered new opportunities for households to purchase a home via a mortgage with much lower up-front costs. The key feature of an AMP is that payments cover only the interest due, or in some cases for an initial period, payments are less than the value of the interest due. Hence, the principal on the mortgage does not decline (it is 'non-amortizing'), or may actually initially increase.

While a rational consumer can use an AMP to smooth non-housing consumption over time when faced with expected income growth, consumers lacking financial sophistication may choose an AMP by mistake or due to a bias towards higher initial lifetime consumption. It is widely accepted that mortgage market failure has played an important role in mortgage decisions in the sub-prime mortgage market in the US (Mayer et al., 2009; Bernanke, 2010; Einav et al., 2012; Gerardi et al., 2013; Ghent, 2015).

A commonly raised concern about AMPs is that consumers do not understand these mortgage products or may be choosing them inappropriately. Cocco (2013) uses UK data to show many consumers use AMPs in a manner consistent with consumption smoothing. However, he also speculates that the greater complexity of AMPs together with poor consumer financial sophistication may lead some consumers to "fail to recognize that the lower initial mortgage payments imply larger future loan balances outstanding", and that "the lower initial payments are particularly appealing to myopic borrowers who put relatively little weight of the future." (p. 1667).

In this paper, we investigate the role of consumer financial sophistication in the choice between an AMP and a standard repayment mortgage (SMP), and also the choice between a fixed and adjustable rate mortgage (FRM and ARM). We use individual level micro data of UK households and focus on two dimensions of consumer sophistication:

understanding of the financial components of mortgage products (commonly referred to as ‘financial literacy’) and time preferences for consumption now or in the future, i.e. whether consumers have high discount rates or show a ‘present bias’ for consumption due to an underlying self-control problem.

In the UK, the context of this study, AMPs have been an important type of mortgage product since the early 1990s. AMPs constitute around one third of the entire UK mortgage stock and are commonly held for the full value of the mortgage loan. At the same time, default rates are substantially higher for households with AMPs, and a sizeable proportion of current AMP holders may not be able to repay their mortgage principal at maturity (Financial Conduct Authority, 2013).

The environment for our research is an extensive individual level consumer survey conducted in 2013 into which we incorporate a series of bespoke questions to measure financial literacy and present bias. We configure the financial literacy questions to focus on mortgage choices in order to provide an objective measure of respondents’ understanding of core concepts related to mortgage vehicles: the accrual of interest over time, simple interest calculations, interest compounding and the absence of principal repayments in an AMP.

Our financial literacy questions do not require complex calculations, but do require a sound understanding of the core concepts embodied within each question, e.g. interest compounding. From these we discover that over two thirds of respondents understand that mortgages with longer maturities involve greater accrued interest and can make a simple interest calculation. But we also find that only half understand the concept of compound interest and less than 40% can correctly identify an AMP from a SMP.

We also insert a series of questions which have been developed in the recent applied behavioral economics literature to distinguish time preferences with respect to present bias and patience in survey settings. These traits may be important for understanding mortgage choices: both present-biased consumers as well as consumers with high discount rates may prefer AMPs because of the minimal up-front costs. Individuals with high discount rates put little weight on the future; they find the lower initial payments of AMPs appealing as they allow higher present consumption. But in the case of present bias the preference for AMPs arises because of underlying self-control issues and a consequent overweighting of present consumption (Laibson, 1997).

Another important factor is the potential interrelation between time preferences, and financial literacy on mortgage choices. A more impatient individual will be less willing

to invest to the acquisition of financial literacy (Meier & Sprenger, 2013). They are also more likely to face binding liquidity constraints as they desire higher consumption early in life. As Cocco (2013) acknowledges, agency problems similar to those modelled in Inderst & Ottaviani (2012) may also play a role and AMPs may be sold predominantly to less sophisticated, myopic consumers who have lower financial literacy. Hence, in this example, failing to control for time preference, the underlying determinant of both financial literacy and the choice of an AMP, will bias estimates of the relationship between financial literacy and mortgage choice.

Our results show that financial literacy and consumer behavioral characteristics are important determinants of mortgage choices. In our data, poor financial literacy raises the likelihood of choosing an AMP. An increase in financial literacy of one-point on our five point scale lowers the likelihood of an individual holding an AMP by around 50%. We show that this result does not arise due to reverse causality or simultaneity by using an instrumental variable based on early life performance in mathematics at school (Jappelli & Padula, 2013). Our results also show that present bias is strongly related to AMP holding, even when controlling for impatience. This suggests that the preference for an AMP due to present-bias may arise because of an underlying self-control issue. This is evidence for the contention of Cocco (2013) that myopic consumers are more likely to choose AMPs.

Our results also show that financial literacy increases the likelihood of choosing an adjustable rate mortgage compared to a fixed rate mortgage. A one-unit increase in literacy increases the likelihood of holding an ARM by around 25%. We find no relationship between present bias, discount rates and the choice between ARM and FRM. We interpret our finding that financial literacy predicts choosing an ARM as suggestive that financially literate consumers realize the added cost of paying the term premium of a fixed rate mortgage.

We know of no prior US or UK work on the interplay between financial literacy, present bias and choices over mortgage repayment type and interest rate type. For Dutch households, two recent studies have examined financial literacy and mortgage choices (van Ooijen & van Rooij, 2014; Cox et al., 2015). In the Dutch context, the characteristics of alternative mortgage products and mortgage holders are very different to the US or UK setting. AMPs in the Dutch mortgage market bring tax relief, hence households may gain a tax advantage from holding an interest only mortgage – there are no corresponding tax benefits from holding AMPs in the US or the UK mortgage market. As Cox et al. (2015)

show, households holding AMPs are typically more likely to be educated, have higher average incomes and higher average wealth. Both studies find individuals with better financial literacy are more likely to choose an AMP. Using US data, other studies related to our work show individuals with poor understanding of portfolio risk are more likely to withdraw housing equity (Duca & Kumar, 2014). Gerardi et al. (2013) find poor numerical ability in math tests predicts the likelihood of mortgage default.

Our findings contribute to the literature on the determinants of mortgage choice, in particular the choice between AMPs and SMPs (LaCour-Little & Yang, 2010; Piskorski & Tchistyi, 2010), but also the choice between ARMs and FRMs (Stanton & Wallace, 1999; Campbell & Cocco, 2003; Koijen et al., 2009). We also contribute to the literature on financial literacy by developing a new set of questions that measure literacy with respect to understanding central features of mortgage contracts. Our results are consistent with the broader financial literacy literature which shows the effects of poor financial literacy on a broad range of financial choices, including retirement savings, stock market participation and use of consumer credit (Guiso & Jappelli, 2005; Lusardi & Mitchell, 2007a, 2007b; van Rooij et al., 2011a, 2011b; Disney & Gathergood, 2013; Lusardi & Mitchell, 2014).

Our results are also important for the broader literature on present bias and self-control issues, which has shown that these are important factors for individual choice, both theoretically (Strotz, 1955; Thaler & Shefrin, 1981; Laibson, 1997; Gul & Pesendorfer, 2001) and empirically, for example for choices in retirement savings and in the labor market (DellaVigna & Malmendier, 2004; Ameriks et al., 2007; Busse et al., 2013). We also contribute to the expanding literature on investigating behavioral characteristics in representative surveys (Ameriks et al., 2007; Dohmen et al., 2010, 2011; Burks et al., 2012), as well as the potential interaction between time preferences and financial literacy (Meier & Sprenger, 2013).

The remainder of this paper proceeds as follows. In Section 2, we describe the evolution of AMPs in the UK mortgage market and in Section 3 the motivation behind our survey design plus the survey instruments that we use. Section 4 describes initial results on characteristics of individuals by mortgage type. Following that, Section 5 presents econometric results from a variety of econometric models which reveal the impact of financial literacy and present bias on mortgage choice. We discuss our results and conclude in Section 6.

2 The UK Mortgage Market

The focus of attention around AMPs has centered upon the US mortgage market, but the UK mortgage market includes a significant share of AMP products with several unique characteristics that make the UK market particularly interesting for the study of consumer mortgage choice[3]. AMPs have been common in the UK since the early 1990s and were widely chosen by consumers (in our data 22% of mortgage holders have an AMP). In the UK market, where AMPs are used, they are typically used to finance the entire mortgage balance over the term of the mortgage (this implies that, compared to the US, in the UK market AMPs are typically held at higher loan-to-value (LTV) limits).

There are no conforming loan limits that dictate loan size, loan characteristics or a relation between the two in the UK mortgage market. That means that AMPs are typically available under similar conditions as SMPs, e.g. with the same minimum deposits or leverage ratios. A review of AMPs in the UK can be found in Cocco (2013), who examines the use of AMPs by individual mortgage holders in a sample of UK consumers beginning in 1993.

Historically, AMPs were commonly sold alongside stock-market linked investment vehicles designed to accrue the principal payable at maturity. The mortgage holder would make monthly contributions to the vehicle alongside their AMP payment. These were known as 'endowment mortgages'. Similar products continue to exist in other nations. For example, in the Netherlands tax-deductible interest-only mortgages are sold alongside 'endowment' investment products with the investment provider underwriting the repayment of the principal at maturity (i.e. taking on liability for underperformance of the investment). This is a key difference from the UK market in which any investment shortfall is borne by the mortgagee.

Alleged mis-selling of endowment mortgages on the basis of unrealistic returns resulted in the regulator demanding endowment mortgage providers to provide compensation to holders of endowment-linked mortgages in the early 2000s (see Severn, 2008 for a detailed review). The regulator imposed compensation payments to make up for projected shortfalls in the value of accrued endowments. One impact of the mis-selling

[3] Within the US, AMPs developed during the early 2000s as add-on products for conforming mortgages and incorporated limited or no amortization. In some cases they incorporated negative amortization up to specific loan-to-value (LTV) limits, i.e. initial mortgage payments did not cover interest charges for some period. Some AMPs were coupled with a 'teaser' interest rate, implicitly assuming house price growth would exceed negative amortization ahead of the next mortgage refinancing point. The wide variety of AMP products offered in the US market is reviewed in Mayer et. al (2009).

episode has been that mortgage providers no longer recommend endowment products and instead sell interest-only mortgages with no associated investment vehicles. In our dataset, two thirds of AMP holders report they have no linked investment product or other investment which they intend to use to repay the outstanding principal due at maturity.

There is some existing evidence that many holders of AMPs do not understand the key features of their products in the UK. The 'Miles Report' (Miles, 2004) chronicles the innovation and features of the UK market, but also raises the issue of consumer misunderstanding of mortgage products. In particular, Miles (2004) argues that many consumers base their mortgage choice on initial payments only and not the longer-term horizon[4]. The report also shows that consumers tend to focus on initial costs, but not on expectations of future interest movements, although the report argues that forward-looking consumers should factor in the likely future cost of different mortgage product types when making their borrowing decision.

3 Survey Design

To investigate the role of financial literacy and present bias in mortgage choice, we commissioned a special module in a survey of UK consumers. Our survey is the YouGov Debt Tracker, a cross-sectional survey of UK households, conducted quarterly by the market research company YouGov. We use the August 2013 wave which surveys a representative sample of 2,000 UK households drawn from YouGov's panel of 350,000 households. The survey is conducted via the internet and special provisions for non-internet users are made in order to achieve a representative sample (we later show that average levels of income, assets, debt and mortgage types in our data are very close to official data). The core Debt Tracker survey comprises approximately 80 questions that cover demographics, finances, labor market situation, education, financial product use and housing. The survey provides information on housing tenure and value plus details of the mortgages held. In addition, YouGov provided us with the opportunity to add specific questions on financial literacy and behavioral traits to the survey. We now describe these questions in more detail.

[4] Miles (2004), p. 27: "[S]tudies highlight that the information that consumers say they need is predominantly focused on the immediate monthly mortgage costs in order to assess initial affordability, and that they do not have longer-term horizons."

3.1 Mortgage Financial Literacy Questions

We first describe the design of our survey questions which measure financial literacy. We have designed a specific set of questions relating to mortgage products. In our view, in the analysis of a relationship between financial literacy and a financial choice, it is essential that the measure of financial literacy used by the researcher is relevant for the financial choices modelled. For example, financial literacy questions framed within the context of retirement saving decisions (for example focusing on the concepts of real vs nominal returns and annuity returns) are not appropriate for analyzing decisions relating to, for example, consumer credit and debt for which those concepts are not integral. Some concepts, such as interest compounding, are common to understanding of a wide variety of products, but should be incorporated into questions which focus on the particular domain of interest, in our case mortgage choice, to avoid framing bias. It is also essential that the measure of financial literacy allows the researcher to judge better and worse levels of financial understanding in an objective way.

In designing these questions we seek to achieve two objectives. First, to construct an objective measure of the extent to which an individual understands the key concepts in finance relevant for mortgage choice, and second, to do so in a design which is not mathematically complex and can be incorporated in a survey setting. The literature has documented that basic or 'core' financial literacy varies in the population and that variation in correct responses to relatively simple questions about finance can explain significant heterogeneity in observed choices related to consumer credit and debt (Lusardi & Tufano, 2009; Disney & Gathergood, 2013), retirement savings (Lusardi & Mitchell, 2007a, 2007b; van Rooij et al., 2011a) and stock market participation (Guiso & Jappelli, 2005; van Rooij et al., 2011b). These studies typically use question-based measures to measure individual understanding of, for example, compound interest or minimum payments on a credit product. Multiple-choice questions with relatively low mathematical requirements are used to avoid the financial literacy questions resembling a math test or requiring infeasible calculations within the context of a consumer survey.

We adopt the same approach of question-based measures for the design of our financial literacy questions. We include four questions to the survey that aim to measure respondents' ability to make informed decisions specifically with regards to mortgage choice, which we brand 'mortgage financial literacy'. Each question was framed in the context of a particular dimension of typical mortgage contracts and constructed using a

multiple-choice format. In the online survey respondents could view answers to each question on screen with the option of choosing one.

The four questions are:

1. Suppose a 15 year mortgage and a 30 year mortgage have the same Annual Percentage Rate and the same amount borrowed. The total amount repaid will be:
    a. Higher for the 15 year mortgage
    b. Higher for the 30 year mortgage
    c. The total amount repaid on both mortgages will be the same
    d. Don't know
2. Suppose you owe £50,000 on a mortgage at an Annual Percentage Rate of 6%. If you didn't make any payments on this mortgage how much would you owe in total after one year?
    a. Less than £50,000
    b. £50,000 - £54,999
    c. £55,000 - £59,999
    d. £60,000 - £64,999
    e. More than £65,000
    f. Don't know
3. Suppose you owe £100,000 on a mortgage at an Annual Percentage Rate of 5%. If you didn't make any payments on this mortgage how much would you owe in total after five years?
    a. Less than £120,000
    b. Between £120,000 and £125,000
    c. More than £125,000
    d. Don't know
4. Suppose you owe £200,000 on a mortgage with at an Annual Percentage Rate of 5%. If you made annual payments of £10,000 per year how long would it take to repay the whole mortgage?
    a. Less than 20 years
    b. Between 20 and 30 years
    c. Between 30 and 40 years
    d. The mortgage would never be repaid
    e. Don't know

The questions are (arguably) increasing in difficulty. The first two questions are designed to measure fundamental understanding of interest rates crucial for making borrowing choices: an understanding that, *ceteris paribus*, interest costs increase with the length of the loan and an ability to make a very simple interest calculation. Failure to grasp these concepts would demonstrate a significant misunderstanding of the terms of a mortgage product. They are designed to establish whether a sub-sample of respondents do not have an even fundamental understanding of the operation of a mortgage.

The third and fourth questions examine more advanced concepts in finance. The third question uncovers whether the individual understands compound interest. The question itself does not require a specific compound interest calculation, but instead requires the respondent to know that interest compounds, not multiplies, so the accrued interest on a £100,000 mortgage at 5% APR over five years with no payments would be more than £25,000. The fourth question focuses on whether the individual can recognize a non-amortizing mortgage using an example. The question describes a scenario in which mortgage payments only cover the interest cost – the essence of an AMP– and requires the respondent to realize that in this example the principal will never be repaid.

We analyze responses to these questions in two ways. First, we create a series of 1/0 dummy variables for which a value of one denotes a correct answer and zero otherwise. Second, we sum the number of questions answered correctly to create a five-point mortgage financial literacy score ranging from zero to four. We show results from econometric models in which the financial literacy variables enter in index form and as individual dummy variables denoting correct responses to each question.

In our econometric analysis, we subsequently relate an individual's performance on these questions to their mortgage choices. However, an individual's financial literacy score may be endogenous to mortgage choices or confounded by other factors related to mortgage choices. Financial literacy may be correlated with individual characteristics we do not observe directly (such as human capital) and other elements of an individuals' financial situation (such as asset holding). Also, reverse causality may be at play whereby an individual's mortgage choice affects their subsequent mortgage financial literacy. The causality may run from mortgage holding to financial literacy if mortgage choices affect subsequent learning and information acquisition of the mortgagee. This mechanism may be at play in our data. For example, the choice of taking a SMP as opposed to an AMP may lead to consumers acquiring information on mortgage amortization through their mortgage statements, information which they would not receive had they taken an AMP,

and so improve their performance on our financial literacy questions.

Christiansen et al. (2008), Lusardi & Mitchell (2007a, 2007b) and Behrman et al. (2012) show that models that do not control for correlated errors typically underestimate the effect of financial literacy on wealth accumulation. Following these studies, we address the potential endogeneity problem by adopting an Instrumental Variable (IV) approach. The candidate instrumental variable should be correlated with the instrumented variable (the financial literacy score), but be exogenous to mortgage choice and unrelated to the unobservable characteristics which may be related to mortgage choice.

Our strategy exploits a source of variation in financial literacy at the individual level which pre-dates mortgage market exposure, and hence self-selection, and also pre-dates the acquisition of labor market and financial market experience. The instrument that we use has been suggested by Jappelli & Padula (2013), who demonstrate that pre-labor market entry financial literacy endowment is a valid instrument in estimations of financial literacy. Based on this, we include their suggested question in the survey. The question measures the self-assessed level of mathematics whilst in primary school:

- When you were at primary school aged 10 how did you perform in maths compared to other children in your class?
    - Much better than average
    - Better than average
    - About the same as average
    - Worse than average
    - Much worse than average

In the UK education system, 10 is the age before high school entry and hence before students are able to self-select into subjects of interest e.g. economics and finance. From answers to this question we create a primary-school math level score ranging from one (‘much worse’) to five (‘much better’). We use this as our instrument in IV estimates.

3.2 Measures of Behavioral Characteristics

In addition to the financial literacy questions, we include survey instruments to proxy a variety of behavioral characteristics. We focus on present bias and patience. Researchers seeking to measure behavioral characteristics typically use incentivized laboratory experiments involving choices for money. However, a laboratory setting necessarily limits the available subject pool. Consequently, recent research has seen the development

of a series of survey instruments. These have been shown to correlate very closely with those obtained in laboratory studies (Ameriks et al., 2007; Dohmen et al., 2010, 2011; Burks et al., 2012; Vischer et al., 2013).

First, we elicit present bias using Likert scale responses by which respondents associate or disassociate themselves with a short statement describing 'impulsive' consumption behavior on a five point scale from 'agree strongly' to 'disagree strongly'. The statement is:

- "I am impulsive and tend to buy things even when I can't really afford them."

This question proxies self-control issues in the sense of 'present bias', which we also use in Gathergood (2012) and Gathergood & Weber (2014). Respondents are asked by how much they can see themselves preferring instantaneous gratification even when it is suboptimal, conceptually similar to the self-control measure developed by Ameriks et al. (2007). We create a binary variable that we label 'Present biased', taking the value of one if the respondent answers 'tend to agree' or 'agree strongly' and zero. We show below that our measure of present bias predicts credit card and other high cost debt holding as well as low holdings of liquid savings. The literature has shown that these financial behaviors are associated with present bias.

Second, we elicit patience. A measure of patience is particularly important for our analysis, because it allows to distinguish self-control issues in the form of present bias from high discount rates. The two concepts are theoretically distinct in β-δ models of quasi-hyperbolic discounting to distinguish between linear (time-consistent) discounting (the δ part) and present bias (the β part), such as in Laibson (1997). This distinction may be important empirically: mortgage choices might be explained by high discount rates, implying that consumers make time consistent choices over time but simply prefer the higher current consumption offered by an AMP. However, if mortgage choices are explained by impulsive behavior, there may be potential for consumers to make choices that may be considered sub-optimal. We do not assume that individuals in our data have preferences which are best represented by quasi-hyperbolic discounting, but suggest measuring these two distinct elements of time preference is revealing in understanding choice behavior. We also show in our results below that answers to the questions on patience and present bias are uncorrelated (the correlation coefficient between these two variables is -0.06), implying the two instruments capture distinctly different components of time preference.

We adopt a widely used short proxy for patience as described in Dohmen et al. (2010). The authors insert this measure of patience into the German Socio-Economic Panel to investigate the relation between risk aversion, patience and cognitive ability. The question is:

- "How do you see yourself: are you generally an impatient person, or someone who always shows great patience? Answers are coded on an 11-point scale, with 0 referring to 'very impatient' and 10 to 'very patient'."

In a follow-up study the authors conduct incentivized time preference experiments on the survey subject pool and find that answers to the survey proxy provide very similar estimates as more complex elicitation procedures, such as multiple price lists (Vischer et al., 2013). They also show that answers to this survey question predict impatience even when controlling for impulsiveness.

We also control for risk attitude in our analysis. Campbell & Cocco (2003) show that more risk averse households may prefer fixed rate mortgages. Individuals with greater risk aversion may also shy away from AMPs due to the underlying uncertainty of repaying the principal. Alternatively, risk averse households may exhibit a preference for AMPs if they are concerned with future income streams and the higher present repayments of SMPs. Our measure of risk attitude is again based on a question developed by Dohmen et al. (2010):

- "How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means: 'unwilling to take risks' and the value 10 means: 'fully prepared to take risk'."

4 Sample Characteristics

Summary statistics for the survey sample are presented in Table 1. In total there are 1,974 households in our sample, of which 32% are mortgage holders, 32% are outright homeowners and 36% are renters[5]. This distribution is representative of the UK population as found in panel data sets such as 'Understanding Society' (the largest UK household survey) and the 'Wealth and Assets Survey' (WAS; the largest UK survey of household finances).

[5] 'Renter' in our sample comprise 'private renting' individuals in privately rented dwellings and 'social renting' individuals in state subsidized public housing.

Mortgage holders are typically in midlife, better educated and more likely to be in work. Mortgage holders report, on average, the highest mean and median incomes of all subgroups. Renters are typically younger than mortgage holders and outright owners are typically older (79% of outright owners are aged over 55). Compared with whole sample characteristics, mortgage holders are more likely to be married (77% compared to 64% in the sample), have dependent children (36% compared to 20%) and to be in employment (85% compared to 59%)[6].

We focus on the 632 mortgage holders in the sample and divide this group by mortgage repayment type and interest rate type. Summary data by mortgage type are shown in Table 2. 78% of mortgage holding households hold a SMP and 22% hold an AMP. 53% hold an ARM and 47% hold a FRM. There are some demographic differences between holders of AMPs and SMPs. Compared with households who hold a SMP, holders of AMPs are typically less likely to have a household head in employment and have lower income (average income among AMP holders is approximately 10% lower than among SMP holders). The differences in the average mortgage size of the two groups are small: AMP and SMP holders have similar average property values and outstanding mortgage amounts. The average loan-to-income ratio (LTI) among holders of AMPs is also very similar compared to holders of SMPs (4.4% difference), consistent with the UK data sample used by Cocco (2013)[7]. By way of contrast there are no notable differences in characteristics between the FRM and ARM groups.

Summary data for answers to our mortgage financial literacy questions are shown in Table 3. We show a complete breakdown of answers by repayment type and interest rate type groups. The pattern in correct answers across questions confirms our prior that the later questions are more difficult. Overall, among all mortgage holders, 81% answer the first question on loan duration correctly, 66% answer the second question on simple interest rates correctly, 51% answer the third question on compound interest question correctly and only 37% answer the final 'never repay' question correctly. Only 7% of respondents chose 'don't know' as the answer to the first question, suggesting only very few respondents might have chosen to ignore our question module on financial literacy.

[6] These sample summary values closely match those of the 'Understanding Society' survey, from which equivalent statistics are: to be married 65%; have dependent children 22%; be in employment 61%, average household income £33,200.

[7] Summary values for mortgage types and values also closely match the WAS, from which equivalent statistics (for homeowners) are average property value £211,600; average mortgage value £86,400; proportion of households with ARM 55%; loan to income ratio 2.50; loan to value ratio 0.51 (authors' calculations using the WAS 2012 wave).

We later show that our results are not sensitive to how we treat 'don't know' answers.

The summary data shows holders of AMPs do much worse on the financial literacy questions compared to holders of SMPs. On average, respondents answered 2.35 questions correctly. AMP holders answer only 1.56 questions correctly compared with 2.57 correct answers among holders of SMPs. Indeed, holders of AMPs do worse than renters who, on average, answer 1.64 questions correctly (not shown in Table 3).

On which questions do AMP holders perform worse? They do so on all questions, but especially on the two harder questions for which only 29% (Question 3) and 26% (Question 4) of AMP holders chose the correct answer compared with 58% and 41% of SMP holders. It is also striking that AMP holders performed worst on the final 'never repay' question as this question describes a non-amortizing mortgage product and requires the respondent to identify that under the interest-only payments the mortgage would never be repaid. Most AMP holders answer that the mortgage would be repaid in under 40 years. By contrast, summary data for financial literacy of holders of FRM and ARM mortgages show very similar levels of financial literacy across the two groups. ARM holders exhibit slightly higher average financial literacy (2.45 compared to 2.23 of FRM holders), mainly because they do better at answering the final question correctly.

Summary data for behavioral characteristics of respondents as measured by our survey instruments are described in Table 4. The average numerical value for patience among all mortgage holders on the 0-10 scale is 5.56 with a standard deviation of 2.55. The average level (and standard deviation) of patience is very similar across mortgage repayment type and interest rate type. AMP holders are on average slightly more patient than SMP holders and FRM holders are more patient than those with ARMs. But the differences between group averages are very small when compared with the standard deviation of the sample. There is more notable variation across mortgage type groups in the degree of present bias. The table shows a breakdown of each answer to the present bias question by mortgage type and a constructed dummy variable ('Present biased = 1) which takes a value of 1 if the respondent answers 'tend to agree' or 'agree strongly' and 0 otherwise. In the sample of all mortgage holders, 13% of respondents are in the present biased category. A breakdown by repayment type shows that holders of AMPs are twice as likely to be present biased than SMP holders (21% compared with 10%).

Is there evidence to validate that responses to this question elicit present bias, or might it capture some other individual behavioral trait? The existing literature shows, both theoretically and empirically, that present bias induces higher levels of credit card

debt and lower savings (Laibson, 1997; Laibson et al., 2003; Meier & Sprenger, 2010; Heidhues & Kőszegi, 2010). To explore this, we relate our measure of present bias to occurrences of high cost credit and savings. We estimate a series of regression models that relate our behavioral measures to the likelihood and levels of consumer debt and liquid savings.

In Columns 1 and 3 of Appendix Table A.1 we estimate probit models where the dependent variables are indicator variables for whether the individual holds high cost credit and savings, respectively[8]. Among those who hold a balance on at least one consumer credit product and have savings, respectively, we estimate the linear relationship between the log of the respective balances and our behavioral measures (Columns 2 and 4). In each model, the coefficient on the present biased dummy variable is statistically significant at the 1% level. Present bias raises the likelihood of holding high cost credit by 42% (average marginal effect of 0.196 divided by baseline probability 0.472) and decreases the likelihood of holding savings by 41% (0.206/0.506). We also include the patience variable in each model and find, in each case, the coefficient on this variable is not statistically significant. This evidence is in line with the prior literature and suggestive (without proving) that our survey measure captures present bias in individual time preferences.

A detailed breakdown of individual characteristics by mortgage literacy score is provided in Table 5. The table shows that mortgage financial literacy strongly correlates with choice of repayment type. Among the 138 individuals with a score of 4/4, only 12% hold an AMP compared with 67% among the 63 individuals with a score of 0/4. The unconditioned correlation between mortgage literacy score and the likelihood of holding an AMP is -0.88. As might be expected, individuals with better mortgage literacy scores typically have a higher education leaving age, higher household income and higher property values. There is no clear relationship between mortgage financial literacy score and mortgage interest rate, LTI or LTV.

Overall, these summary data suggest that individual financial literacy and behavioral characteristics are related to the choice of an AMP versus a SMP, but appear unrelated to the choice of ARMs versus FRMs. There is a strong contrast in the mortgage financial literacy scores of AMP holders compared to SMP holders. Other behavioral measures

[8] 'High cost credit' is defined as holding two credit/store cards or more, and/or holding a payday loan, pawn broker loan or home collected credit. 'Savings' are liquid savings in excess of £250.

show AMP holders are also more likely to be present biased. However, a comparison of summary data does not imply a causal relationship between these characteristics and choice of an AMP. AMP and SMP holders differ in other characteristics related to consumer financial sophistication, including age, income, employment and education level. We address the causal relationship in our econometric analysis below.

5 Econometric Analysis

We now present results of econometric analyses of the relationship between individual characteristics and mortgage choices. Our econometric analysis proceeds in three stages. Firstly, we show baseline econometric estimates from multivariate models. These estimates show that poor mortgage financial literacy and present bias strongly predict the choice of an AMP, and that higher literacy predicts holding an ARM. However, financial literacy in particular may be endogenous to mortgage choice. Therefore, secondly, we show IV estimates which exploit pre-market mathematical ability as an instrument for contemporaneous financial literacy. Thirdly, we show that our results are not sensitive to definitions of the dependent variable and how we treat 'don't know' responses to the financial literacy questions. We also show that results are not sensitive to the inclusion of variables to control for underlying mortgage market trends.

5.1 Results for Repayment Type

We start by presenting our baseline estimates for the relationship between behavioral characteristics and mortgage repayment type. We model the choice of AMP vs SMP using probit models. The estimated equation is given as:

$$\Pr(\text{AMP} = 1) = \Phi(\alpha_0 + \alpha_1 fl + \alpha_2 pb + \alpha_3 p + \mathbf{X}'\beta) \qquad (1)$$

where Φ is the cumulative normal distribution. We report average marginal effects throughout the paper.

The dependent variable is a dummy variable which takes a value of 1 if the mortgage is an AMP and 0 if the mortgage is a SMP. Independent variables include the financial literacy score (fl), ranging from zero to four, a dummy variable for present bias (pb) and the continuous measure of patience on a 0-10 scale (p). Both probit models also include a number of control variables, captured by the vector $\mathbf{X}$, for financial-, demographic- and housing covariates as well as a control for risk attitude. In the results tables we show coefficient estimates for age-range dummies and mortgage characteristics. Additional

controls for which coefficients are not shown in the table are: household income, education leaving age, a 1/0 dummy for (spouse) employment status, gender, marital status, a 1/0 dummy for whether the mortgage holder has dependent children and the ratio of household income to monthly mortgage payments. We enter the age variable as a series of four dummy variables for the age band of the individual respondent: 18–34, 35–44, 45–54 and 55 or over, which is omitted from the regression as the baseline group. Household income is also included in bands. We do so to allow for a high degree of non-linearity in the model fit between age, household income and the dependent variable outcomes.

Results for Equation 1 are shown in Table 6, Column 1. The coefficients on financial literacy and present bias are statistically significant at the 1% level of significance. The coefficient on the literacy score is negative, and the average marginal effect on the coefficient returns a value of -0.107, implying that a 1 unit increase in the financial literacy score is associated with a 10.7 percentage point (pp) decrease in the likelihood of holding an AMP. The baseline predicted probability from the probit model is 22%. Hence, the 10.7 pp decrease is a 49% decrease on the baseline predicted probability. The positive coefficient and average marginal effect of the present biased dummy implies an individual who is present biased is 15 pp more likely to hold an AMP, a 67% increase on the baseline predicted probability. The coefficient on the patience variable is negative but is not statistically significant.

Our baseline probit estimates suggest a strong role for financial literacy and present bias in the choice of the repayment type of a mortgage. However, these baseline estimates should be interpreted with caution: an individual's financial literacy score may be endogenous to mortgage choices or confounded by other factors related to mortgage choices. To address this endogeneity problem we use an Instrumental Variable (IV) probit model. As discussed above, our choice of instrument is an individual's self-reported mathematical ability aged 10, as suggested by Jappelli & Padula (2013), which pre-dates self-selection into the mortgage market and the acquisition of financial experience.

The linear equation that estimates mathematical ability as instrument for financial literacy is given as:

$$fl = \alpha_0 + \alpha_1 math + \alpha_2 pb + \alpha_3 p + \mathbf{X}'\beta + u \qquad (2)$$

The IV probit approach jointly estimates Equation 2 together with Equation 1 using a maximum likelihood estimator. Estimates from these models are shown in Columns 2

and 3 of Table 6.

The first-stage regression (Column 3 of Table 6) shows results of Equation 2. The dependent variable is the financial literacy score and the set of independent variables is identical to that used in the baseline regression plus the inclusion of the instrument. Estimates return a positive coefficient on the math level in school index which is statistically significant at the 1% level. The coefficient value of 0.444 implies a 1 unit increase in mathematical ability at school leads to a 0.44 unit increase in the financial literacy score. The average financial literacy score among mortgage holders in the sample is 2.35; hence a 1 unit increase in self-assessed mathematical ability causes a 19% increase in the financial literacy score.

Estimates from the second stage of the IV Probit model are shown in Column 2. Overall, the results of the IV specification are very similar to the baseline specification. The coefficients on the literacy score and present biased dummy are significant at the 1% level and the estimated marginal effects return very similar magnitudes to those from the non-IV regressions. The coefficient on the financial literacy score of -0.558 is statistically significant at the 1% level, a little larger in magnitude to the coefficient estimate of -0.477 in the non-IV model. The marginal effect implies a one unit increase in the instrumented financial literacy score lowers the probability of the individual holding an AMP by 12 pp, or a 54% decrease in the likelihood evaluated against the baseline probability – very similar to the 49% decrease in likelihood from the equivalent calculation for the baseline model.

Coefficients on the other behavioral characteristics variables are also very similar to before. The coefficient on the present bias dummy is statistically significant at the 1% level. This implies that a present biased individual is 14 pp (61%) more likely to hold an AMP. These results are virtually unchanged in the IV model, suggesting endogeneity does not affect our baseline results. The Wald test of exogeneity confirms this as the test fails to reject the null hypothesis of no endogeneity ($p = 0.567$).

5.2 Results for Interest Rate Type

Our empirical model of mortgage interest rate type resembles Equations 1 and 2 above, but replaces the dependent variable with a 1/0 dummy variable where a value of 1 is coded if an individual holds an ARM and a value of 0 for holding an FRM. The estimation sample is the same as before, and the estimated equation is then given as:

$$\Pr(\text{ARM} = 1) = \Phi(\alpha_0 + \alpha_1 fl + \alpha_2 pb + \alpha_3 p + \mathbf{X}'\beta) \qquad (3)$$

Results are shown in Table 7. Column 1 shows estimates of the baseline Equation 3. Financial literacy increases the likelihood of an individual choosing an ARM. The coefficient on the financial literacy score is positive and statistically significant at the 5% level. The marginal effect on the financial literacy variable is 3.3 pp. This implies that a 1-unit increase in the financial literacy score raises the likelihood of an individual choosing an ARM by 7% (evaluated against the baseline probability of 0.536). Results also show other behavioral characteristics are unrelated to the choice between ARM and FRM. The coefficients on the present bias or patience variables are not statistically significant.

Columns 2 and 3 of Table 7 show IV probit estimates for the interest rate type model using the same instrument for financial literacy as in previous estimates (see Equation 2). Results show that in the IV specification the coefficient on the literacy score is positive and statistically significant at the 1% level. The non-IV specification causes a downward bias in the coefficient estimate (as we might expect through a learning effect of holding a mortgage), and the coefficient and marginal effect are larger compared with the non-IV specification. In this IV specification, the marginal effect of 0.141 implies a 1 unit increase in financial literacy raises the likelihood of choosing an ARM by 27%. Other behavioral characteristics remain statistically non-significant in the IV model.

5.3 Sensitivity to Financial Literacy Dummy Variables

In the models for mortgage repayment type and interest rate type shown in Tables 6 and 7 the financial literacy variable enters as the sum of correct answers to the four questions. But are some of these questions more important than others for the decision to hold an AMP or ARM? To investigate this, in Table A.2 we re-estimate the probit models from Equations 1 and 3, but include separate 1/0 dummy variables denoting correct/incorrect answers to each of the four questions. Answering zero answers correctly is the baseline group.

Coefficient estimates for the AMP model in Column 1 reveal that each of the first three questions return statistically significant and negative coefficients with similar coefficient and average marginal effect magnitudes. The coefficient on the Question 4 dummy variable is statistically not significant at the 10% level. This is perhaps unsurprising as answers to the preceding questions are correlated and the addition of the

fourth question dummy may be collinear with the earlier questions. However, these estimates show that no one single concept captured by our financial literacy questions alone explains the choice between an AMP and SMP. Instead, a range of concepts tested by the questions are relevant to the mortgage choice decision.

Column 2 shows the equivalent specification for the interest rate type model. Results show that the relationship between financial literacy and choice of mortgage interest type is explained only by responses to the first financial literacy question (which is a simple interest rate calculation). This suggests the choice of an FRM may be related to the inability of a subset of mortgage holders to understand even the basic elements of an interest rate calculation.

5.4 Robustness Tests for Repayment Type -and Interest Rate Type Models

In this section we examine the robustness of our IV probit results for mortgage repayment type to the definition of 'AMP' and the treatment of 'don't know' answers. First, we consider the definition of an AMP classification. As described above, some AMP mortgages were historically sold with linked equity investment vehicles. Importantly, the endowment provider does not guarantee any shortfall in the value of these equity investments at the maturity of the mortgage, so unlike other European institutional settings, an endowment-linked AMP does not guarantee principal repayment.

However, an endowment-linked AMP could be considered to be a partial repayment mortgage. Therefore, to examine the robustness of our estimates to possible mis-classification of these mortgages, we re-estimate the IV probit model excluding individuals with endowment-linked AMPs. This removes 34 observations from our estimation sample (24% of those previously defined as AMPs). Results are shown in Table A.3 in Column 1. Our estimates are very similar to before. Financial literacy remains negative and statistically significant at the 1% level and the marginal effect on the literacy score increases in absolute value a little (-0.132, before -0.107). The implied effects of a one unit increase in literacy on the likelihood of holding an AMP is a 64% decrease, very similar to the decrease in our earlier estimates. The dummy variable for present biased individuals is significant at the 1% level and the marginal effect decreases in magnitude (0.109, before 0.147).

Second, we consider treatment of 'don't know' answers to our mortgage financial literacy questions. One potential problem with responses to our questions is that some individuals might answer 'don't know' simply to avoid the (cognitive) effort involved in

answering the questions. Hence 'don't' know' responses will comprise some genuine answers on the part of the respondents plus some answers stated simply to avoid exerting effort in attempting an answer. Therefore, in Column 2 of Table A.3 we exclude individuals who might be of the latter type from the estimation sample. We remove observations with 'don't' know' responses to the first financial literacy question (which is the easiest question). We also remove observations with three or more 'don't know' answers. This excludes 68 individuals from our sample. When we do so, model estimates are again very similar to before, with very similar coefficient and marginal effect magnitudes for financial literacy and behavioral characteristics.

Third, in Column 3, we estimate a model which excludes individuals who are excluded by the sample selections in Columns 1 and 2 (100 observations). Again, the coefficient estimates and marginal effects are very similar to before.

Table A.4 reports results from robustness checks for the interest rate type model, where we exclude 'don't know' responses with the same criteria as before. Our results are nearly unchanged by the omission, and financial literacy remains positive and statistically significant at the 1% level.

5.5 Does 'Extrapolation Bias' explain Mortgage Choices?

In this final section we explore whether mortgage choices are driven by another channel: extrapolation bias over house price trends at the point of choosing the mortgage. Extrapolation bias is the tendency to overweigh recent trends when making decisions about the future. This bias may be important for mortgage choices. In particular, mortgagees might extrapolate past house price growth into the future and on that basis choose an AMP, anticipating that a lower loan-to-value ratio will be achieved through house price growth instead of principal repayments.

Our survey data includes details of the time at which the individual chose their current mortgage (in 2-3 year bands). The dataset also provides the four-digit postcode for the location of the survey respondent. There are 3,114 four-digit districts in the UK and we match house prices using official sales data (in the UK, all prices for which houses and real estate are sold are recorded by the 'Land Registry'). We calculate the 3-year and 5-year growth rate of median house prices in the postcode district of the individual survey respondent in the period before the mortgage was taken out. We then include this as an additional covariate in our IV probit model. If the house price growth variable is positive and significant in the model for mortgage repayment type, this would suggest mortgagees

extrapolated past growth in the decision to choose an AMP over a SMP. We also include year dummies for the year brackets in which the mortgage was taken to control for macroeconomic factors which might correlate with house price growth.

Results are shown in Table A.5. House price sales data is only available for England and Wales, so the estimated sample excludes 190 households from Scotland and Northern Ireland. Column 1 reports estimates for the mortgage repayment type model. The coefficient on the 3-year growth of median house prices is negative and not statistically significant at the 10% level. Most of the coefficients on the year dummies are not statistically significant. We also replace the 3-year growth rate with the 5-year growth rate and the coefficient remains statistically not significant (estimates not shown).

In Column 2 we show estimates from the interest rate type model. The coefficient on the 3-year growth rate is also not statistically significant. The coefficients on the year dummies show the likelihood of choosing an ARM decreases after 2009 (base year: before 2003). This is consistent with individuals reacting to the increased monetary policy uncertainty during the recent recession by choosing FRMs.

Importantly, the signs, magnitudes and significance of the financial literacy measure remain unchanged in both specifications when including these extra controls. In the AMP model, present biased dummy variable remains significant at the 1% level.

6 Discussion & Conclusion

This paper estimates the impact of financial literacy and behavioral traits on mortgage choice. The study of mortgage choice, in particular the use of alternative mortgage products has become of much interest in light of the US sub-prime crisis which proceeded the recent severe economic recession, and in the UK where default rates among alternative mortgages are high.

We use household survey data in which we measure financial literacy through a set of questions focused on measuring understanding of central features of mortgage contracts. We analyze the impact of financial literacy on the choice between standard and alternative mortgage products plus the choice between adjustable and fixed rate mortgages. Our results are obtained using an IV strategy which addresses the potential endogeneity of financial literacy to mortgage market experience by exploiting a source of early life variation in financial literacy which arises before experience of the mortgage market.

The analysis highlights several key results: first, we show that financial literacy, but not present bias or patience, is related to the choice of the type of interest rate of a mortgage. Summary statistics reveal little heterogeneity between holders of adjustable rate mortgages and fixed rate mortgages with respect to financial literacy, but econometric estimates reveal the importance of financial literacy. Results show that a unit increase in literacy increases the likelihood of holding an ARM by around 25%. This suggests that consumers with higher financial literacy are more likely to appreciate the term premium cost of a fixed rate mortgage. Results also reveal that there is no evidence that present bias or patience are important for the interest rate type decision.

Second, we show financial literacy is poor among those holding alternative mortgage products. We find that holders of AMPs do worse at financial literacy questions than renters. In the whole sample, comprising mortgage holders and non-mortgage holders, individuals answer on average two of the four multiple-choice financial literacy questions correctly. Among mortgagees, holders of SMPs answer 2.5 questions correctly, but holders of AMPs answer only 1.5 questions correctly. Econometric results show that these differences in financial literacy among mortgagees give rise to large and statistically significant effects on the choice of AMP vs SMP in multivariate regression models. Results show a one point increase in financial literacy lowers the likelihood of an individual holding an AMP by around 50%. Our results are in contrast to studies using Dutch mortgage data, who find a positive relation between financial literacy and AMP holding (van Ooijen & van Rooij, 2014; Cox et al., 2015). But, as we discussed before, the Dutch mortgage market is very different to the UK's: AMPs in the Netherlands bring tax relief, and it may require financial sophistication to realize this potential advantage. This mechanism does not exist in the UK, hence it is unsurprising that our results are contrasting.

Third, we show that present bias is an important predictor for the choice of an AMP. Holders of AMPs are much more likely to be present biased (20% among AMP holders compared with 10% among SMP holders). Our econometric estimates show that this difference gives rise to large and statistically significant effects on the choice of AMP vs SMP, but not in the choice of ARM vs. FRM. Being present biased increases the likelihood of an individual holding an AMP by around 50%. At the same time, patience is not significantly related to the choice of holding an AMP.

How should we interpret our results for the relationship between financial literacy, present bias and mortgage choice? We interpret this as evidence that behavioral

characteristics are important for mortgage choice, and suggestive that individuals might make poor mortgage choices due to behavioral biases. Even when controlling for patience, present bias and associated self-control issues are still an important predictor of choosing an AMP. AMP holding is not only explained by a preference for higher future consumption, but also by an underlying self-control issue for disproportionate present consumption.

These results are suggestive of the notion that for some consumers the choice of an AMP may be the result of misunderstanding features of the mortgage product. They also suggest that myopic consumers who put little weight on the future are more prone to choosing an AMP. Although our data does not allow judgment whether a mortgage choice was ex-ante optimal for a household, results show AMP mortgages attract some customers who lack financial sophistication and may as a results make mistakes in their mortgage choices.

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Table 1: Sample Characteristics

	(1) Sample	(2) Mortgage Holder	(3) Outright Homeowner	(4) Renter
Age				
18–34	0.23	0.22	0.02	0.43
35–44	0.18	0.30	0.05	0.19
45–54	0.18	0.27	0.13	0.15
55+	0.41	0.21	0.79	0.23
Demographics				
Male (= 1)	0.50	0.53	0.53	0.46
Married/living as married (= 1)	0.64	0.77	0.78	0.40
Dependent children (= 1)	0.20	0.36	0.05	0.19
Education leaving age	18.44	18.95	17.74	18.63
Math level in school (1–5)	3.59	3.69	3.54	3.53
Employment				
Employed (= 1)	0.59	0.85	0.31	0.60
Unemployed (= 1)	0.02	0.01	0.01	0.05
Retired/Student/Housewife/Disabled	0.39	0.14	0.69	0.35
Spouse employed (= 1)	0.37	0.62	0.26	0.24
Household Finances				
Household income (£)	32900 (28000)	43600 (39000)	29400 (24400)	26400 (23000)
Observations	1974	632	634	708

Note: Table shows summary statistics for all individuals in the survey (Column 1), plus for all individuals divided into three mutually exclusive and exhaustive groups: those owning a home via a mortgage (Column 2), those who are outright home owners i.e. with no mortgage (Column 3), and those renting (Column 4). The variable 'education leaving age' is the age at which the individual finished full-time education. The variable 'math level in school' is the individual's self-reported mathematical ability at school on a scale from 1 to 5. Mean values reported, medians in parentheses for financial variables.

Table 2: Demographic and Housing Characteristics of Mortgage Holders

	(1)	(2) Repayment Type		(3) Interest Rate Type	
	All Mortgage Holders	Standard Mortgage (SMP)	Alternative Mortgage (AMP)	Fixed Rate (FRM)	Adjustable Rate (ARM)
Age					
18–34	0.22	0.25	0.11	0.27	0.17
35–44	0.30	0.31	0.26	0.28	0.32
45–54	0.27	0.28	0.24	0.28	0.26
55+	0.21	0.16	0.39	0.17	0.25
Demographics					
Male (= 1)	0.53	0.54	0.46	0.48	0.57
Married/living as married (= 1)	0.77	0.77	0.76	0.73	0.80
Dependent children (= 1)	0.36	0.38	0.30	0.33	0.39
Education leaving age	18.95	19.13	18.32	19.19	18.74
Math level in school (1–5)	3.69	3.76	3.46	3.60	3.77
Employment					
Employed (= 1)	0.85	0.88	0.74	0.88	0.83
Unemployed (= 1)	0.01	0.01	0.01	0.00	0.01
Retired/Student/Housewife/Disabled	0.14	0.11	0.24	0.12	0.16
Spouse employed (= 1)	0.62	0.63	0.56	0.64	0.59
Household Finances					
Household income (£)	43600 (39000)	44500 (40000)	40400 (34100)	44000 (40000)	43200 (38000)
Housing					
Property value (£)	204800 (170000)	202400 (165000)	213300 (183100)	204000 (172500)	205500 (165000)
Mortgage outstanding amount (£)	91800 (80000)	93200 (80500)	87300 (75200)	95900 (81500)	88300 (77000)
Adjustable rate mortgage (ARM)	0.53	0.51	0.61	0.00	1.00
Mortgage interest rate	3.54	3.61	3.31	4.00	3.14
Loan-to-income ratio	2.41	2.39	2.50	2.49	2.34
Loan-to-value ratio	0.55	0.57	0.47	0.53	0.57
Observations	632	492	140	294	338

Note: Column 1 shows summary statistics for the 632 mortgage holders in the sample. Column 2 divides the sample by mortgage repayment type, Column 3 divides the sample by mortgage interest rate type. A 'Standard Mortgage' (SMP) is a capital repayment mortgage in which mortgage payments include payment of the principal which declines to zero over the term of the mortgage. An 'Alternative Mortgage' (AMP) is a mortgage in which mortgage payments meet the interest on the principal. A 'Fixed Rate Mortgage' (FRM) is a mortgage in which the nominal interest rate is fixed for some or all of the mortgage term. An 'Adjustable Rate Mortgage' (ARM) is a mortgage for which the interest rate varies over the mortgage term, in the majority of cases the interest rate is linked to the Bank of England repo rate.

Mean values reported, medians in parentheses for financial variables.

Table 3: Mortgage Financial Literacy Performance

	(1)	(2) Repayment Type		(3) Interest Rate Type	
	All Mortgage Holders	Standard Mortgage (SMP)	Alternative Mortgage (AMP)	Fixed Rate (FRM)	Adjustable Rate (ARM)
1. Suppose a 15 year mortgage and a 30 year mortgage have the same Annual Percentage Rate and the same amount borrowed. The total amount repaid will be:					
Higher for the 15 year mortgage	0.05	0.03	0.13	0.06	0.04
Higher for the 30 year mortgage	0.81	0.88	0.56	0.78	0.83
The total amount repaid will be the same	0.08	0.05	0.19	0.08	0.07
Don't know	0.07	0.05	0.13	0.08	0.06
2. Suppose you owe £50,000 on a mortgage at an Annual Percentage Rate of 6%. If you didn't make any payments on this mortgage how much would you owe in total after one year?					
Less than £50,000	0.03	0.02	0.06	0.02	0.04
£50,000 – £54,999	0.66	0.71	0.46	0.64	0.67
£55,000 – £59,999	0.14	0.13	0.18	0.14	0.14
£60,000 – £64,999	0.03	0.01	0.06	0.03	0.02
More than £65,000	0.05	0.04	0.09	0.06	0.05
Don't know	0.10	0.09	0.14	0.12	0.09
3. Suppose you owe £100,000 on a mortgage at an Annual Percentage Rate of 5%. If you didn't make any payments on this mortgage how much would you owe in total after five years?					
Less than £120,000	0.15	0.14	0.18	0.13	0.16
Between £120,000 and £125,000	0.24	0.20	0.38	0.26	0.22
More than £125,000	0.51	0.58	0.29	0.49	0.53
Don't know	0.10	0.09	0.16	0.12	0.09
4. Suppose you owe £200,000 on a mortgage with at an Annual Percentage Rate of 5%. If you made annual payments of £10,000 per year how long would it take to repay the whole mortgage?					
Less than 20 years	0.03	0.01	0.08	0.03	0.02
Between 20 and 30 years	0.30	0.31	0.25	0.29	0.30
Between 30 and 40 years	0.12	0.10	0.19	0.11	0.13
The mortgage would never be repaid	0.37	0.41	0.26	0.33	0.41
Don't know	0.18	0.16	0.23	0.23	0.13
Literacy score (0–4)	2.35	2.57	1.56	2.23	2.45
Observations	632	492	140	294	338

Note: Table shows breakdown of answers to financial literacy questions. Column 1 shows statistics for all mortgage holders. Columns 2 and 3 show statistics for mortgage holders by their mortgage repayment type and mortgage interest rate type.

Table 4: Behavioral Characteristics

	(1)	(2) Repayment Type		(3) Interest Rate Type	
	All Mortgage Holders	Standard Mortgage (SMP)	Alternative Mortgage (AMP)	Fixed Rate (FRM)	Adjustable Rate (ARM)
Patience: "Are you generally an impatient person, or someone who always shows great patience? Answers are coded on an 11-point scale, with '0' referring to 'very impatient' and '10' to 'very patient'."					
Patience (0–10)[a]	5.56	5.54	5.64	5.71	5.43
	2.55	2.57	2.50	2.40	2.67
Present biased: "I am impulsive and tend to buy things even when I can't really afford them."					
Agree strongly	0.02	0.01	0.06	0.01	0.03
Tend to agree	0.11	0.09	0.16	0.12	0.10
Neither agree nor disagree	0.20	0.20	0.21	0.18	0.22
Tend to disagree	0.32	0.33	0.27	0.36	0.28
Disagree strongly	0.34	0.35	0.29	0.32	0.35
Don't know	0.02	0.01	0.02	0.01	0.02
Present biased (= 1)[b]	0.13	0.10	0.21	0.13	0.13
Observations	632	492	140	294	338

[a] First row shows averages, second row shows the standard deviation of answers.
[b] 'Present biased' = 1 if answer 'agree strongly' or 'tend to agree', and = 0 otherwise.

Note: Table shows breakdown of answers to behavioral characteristics questions. Column 1 shows statistics for all mortgage holders. Columns 2 and 3 show statistics for mortgage holders by their mortgage repayment type and mortgage interest rate type.

Table 5: Characteristics of Mortgage Holders by Mortgage Literacy

	0	1	2	3	4
Behavioral Characteristics					
Present biased (= 1)	0.19	0.17	0.14	0.07	0.12
Patience (0–10)	5.51	6.21	5.67	5.74	4.78
Age					
18–34	0.33	0.19	0.21	0.18	0.24
35–44	0.21	0.27	0.30	0.29	0.36
45–54	0.32	0.27	0.26	0.31	0.23
55+	0.14	0.28	0.23	0.22	0.17
Demographics					
Male (= 1)	0.27	0.48	0.48	0.58	0.67
Married/living as married (= 1)	0.78	0.73	0.72	0.77	0.83
Dependent children (= 1)	0.33	0.33	0.33	0.37	0.42
Education leaving age	18.42	18.18	18.73	19.38	19.47
Math level in school (1–5)	2.92	3.37	3.68	3.93	3.99
Employment					
Employed (= 1)	0.79	0.85	0.85	0.88	0.85
Unemployed (= 1)	0.00	0.00	0.02	0.00	0.01
Retired/Student/Housewife/Disabled	0.21	0.15	0.13	0.12	0.14
Spouse employed (= 1)	0.71	0.59	0.61	0.66	0.54
Household Finances					
Household income (£)	37400 (33000)	38300 (35000)	41500 (36600)	47600 (45000)	47800 (40100)
Housing					
Property value (£)	167100 (153000)	188300 (159300)	198900 (160000)	214800 (180000)	228900 (180000)
Mortgage outstanding amount (£)	82300 (75000)	90300 (74900)	91600 (80800)	87000 (80000)	103300 (97000)
Mortgage interest rate	3.60	3.95	3.38	3.38	3.63
Loan-to-income ratio	2.31	2.92	2.37	2.09	2.54
Loan-to-value ratio	0.55	0.58	0.53	0.46	0.66
Alternative mortgage product (AMP)	0.67	0.32	0.18	0.13	0.12
Adjustable rate mortgage (ARM)	0.44	0.51	0.52	0.53	0.61
Observations	63	94	174	163	138

Note: Table shows summary statistics for mortgage holders by their financial literacy score (number of financial literacy questions answered correctly). Mean values reported, medians in parentheses for financial variables.

Table 6: Repayment Type Models

	(1) Probit Repayment Type (AMP = 1)		(2) IV Probit Repayment Type (AMP = 1)		(3) First Stage Regression
	β / SE	Margin	β / SE	Margin	β / SE
Instrument					
Math level in school (1–5)					0.444***
					(0.049)
Behavioral Characteristics					
Literacy score (0–4)[a]	−0.477***	−0.107***	−0.558***	−0.124***	
	(0.058)		(0.148)		
Present biased (= 1)	0.659***	0.147***	0.634***	0.140***	−0.223
	(0.179)		(0.185)		(0.137)
Patience (0–10)	−0.026	−0.006	−0.029	−0.006	−0.045**
	(0.027)		(0.027)		(0.019)
Age					
18–34	−1.029***	−0.230***	−1.015***	−0.225***	−0.064
	(0.242)		(0.243)		(0.164)
35–44	−0.561***	−0.126***	−0.540**	−0.120**	0.158
	(0.213)		(0.216)		(0.154)
45–54	−0.588***	−0.132***	−0.584***	−0.129***	−0.018
	(0.193)		(0.193)		(0.144)
Housing					
Adjustable rate mortgage (ARM)	0.307**	0.069**	0.318**	0.070**	0.025
	(0.134)		(0.135)		(0.094)
Mortgage debt (£10,000s)	0.026	0.006	0.025	0.006	−0.005
	(0.018)		(0.018)		(0.012)
Loan-to-value ratio	−0.392*	−0.088*	−0.409*	−0.090*	−0.226*
	(0.228)		(0.228)		(0.131)
Loan-to-income ratio	0.017	0.004	0.023	0.005	0.045
	(0.055)		(0.055)		(0.037)
Mortgage interest rate	−0.011	−0.002	−0.010	−0.002	−0.002
	(0.022)		(0.022)		(0.014)
Observations	632		632		632
t-statistic of instrument					9.210
LR chi2 / F	159.410		99.395		9.520
Prob > chi2 / F	0.000		0.000		0.000
Wald test of exogeneity			0.567		
Baseline predicted probability	0.220		0.229		2.347

Note: Table shows probit and instrumental variable probit model estimates and average marginal effects. * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses. Sample includes all mortgage holders.

In Column 1, the dependent variable is a 1/0 dummy for which a value of 1 denotes the individual holds an AMP and a value of 0 denotes the individual holds a SMP. In Column 2, literacy score is instrumented with 'math level at school' which is a categorical variable taking a value between 0 and 5, where 0 is lowest math level at school and 5 is highest. The first stage linear model is shown in Column 3.

Baseline predicted probability is the average predicted likelihood from the model. Omitted reference group for age is 55+. Further controls for (spouse) employment status, household income, education leaving age, gender, marital status, dependent children and self-assessed risk attitude.

[a] 'Literacy score' is instrumented with 'math level in school' in the specification in Column 2.

Table 7: Interest Rate Type Models

	(1) Probit Interest Type (ARM = 1)		(2) IV Probit Interest Type (ARM = 1)		(3) First Stage Regression
	β / SE	Margin	β / SE	Margin	β / SE
Instrument					
Math level in school (1–5)					0.392***
					(0.047)
Behavioral Characteristics					
Literacy score (0–4)[a]	0.093**	0.033**	0.422***	0.141***	
	(0.047)		(0.120)		
Present biased (= 1)	0.140	0.050	0.146	0.049	−0.042
	(0.165)		(0.160)		(0.132)
Patience (0–10)	−0.013	−0.005	0.001	0.000	−0.047***
	(0.022)		(0.022)		(0.018)
Age					
18–34	−0.451**	−0.161**	−0.346*	−0.116*	−0.275*
	(0.194)		(0.194)		(0.156)
35–44	−0.124	−0.044	−0.118	−0.040	0.007
	(0.181)		(0.176)		(0.147)
45–54	−0.219	−0.079	−0.147	−0.049	−0.156
	(0.169)		(0.167)		(0.138)
Housing					
Alternative mortgage product (AMP)	0.337**	0.121**	0.653***	0.219***	−0.887***
	(0.143)		(0.171)		(0.109)
Mortgage debt (£10,000s)	−0.021	−0.008	−0.020	−0.007	−0.001
	(0.014)		(0.014)		(0.012)
Loan-to-value ratio	0.466***	0.167***	0.507***	0.170***	−0.238*
	(0.170)		(0.162)		(0.124)
Loan-to-income ratio	−0.051	−0.018	−0.060	−0.020	0.043
	(0.043)		(0.041)		(0.035)
Mortgage interest rate	−0.069***	−0.025***	−0.062***	−0.021***	−0.005
	(0.017)		(0.017)		(0.013)
Observations	632		632		632
t-statistic of instrument					10.310
LR chi2 / F	81.608		99.799		13.000
Prob > chi2 / F	0.000		0.000		0.000
Wald test of exogeneity			0.009		
Baseline predicted probability	0.536		0.532		2.347

Note: Table shows probit and instrumental variable probit model estimates and average marginal effects. * p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses. Sample includes all mortgage holders.

In Column 1, the dependent variable is a 1/0 dummy for which a value of 1 denotes the individual holds an ARM and a value of 0 denotes the individual holds a FRM. In Column 2, literacy score is instrumented with 'math level at school' which is a categorical variable taking a value between 0 and 5, where 0 is lowest math level at school and 5 is highest. The first stage linear model is shown in Column 3.

Baseline predicted probability is the average predicted likelihood from the model. Omitted reference group for age is 55+. Further controls for (spouse) employment status, household income, education leaving age, gender, marital status, dependent children and self-assessed risk attitude.

[a] 'Literacy score' is instrumented with 'math level in school' in the specification in Column 2.

Table A.1: Consumer Credit and Savings

	High Cost Credit (HCC)			Savings		
	(1)		(2)	(3)		(4)
	Holds HCC		*log* of HCC	Holds Savings		*log* of Savings
	β / SE	Margin	β / SE	β / SE	Margin	β / SE
Behavioral Characteristics						
Present biased (= 1)	0.527***	0.196***	1.642**	−0.558***	−0.206***	−1.860***
	(0.161)		(0.652)	(0.162)		(0.562)
Patience (0–10)	0.033	0.012	0.124	0.034	0.013	0.025
	(0.021)		(0.098)	(0.021)		(0.089)
Age						
18–34	−0.548***	−0.204***	−0.647	−0.201	−0.074	−0.178
	(0.179)		(0.849)	(0.179)		(0.758)
35–44	−0.192	−0.071	−0.451	−0.163	−0.060	−0.116
	(0.175)		(0.822)	(0.176)		(0.712)
45–54	−0.171	−0.064	−0.870	−0.097	−0.036	0.498
	(0.165)		(0.707)	(0.166)		(0.666)
Demographics						
Male (= 1)	−0.007	−0.003	−0.873*	0.166	0.061	0.730
	(0.110)		(0.504)	(0.111)		(0.449)
Married/living as married (= 1)	−0.645***	−0.240***	1.370	−0.747***	−0.276***	−0.543
	(0.233)		(1.290)	(0.231)		(1.068)
Dependent children (= 1)	0.119	0.044	1.008*	−0.090	−0.033	−0.509
	(0.125)		(0.576)	(0.125)		(0.518)
Employment						
Employed (= 1)	−0.289*	−0.108*	1.082	0.076	0.028	−0.938
	(0.172)		(0.738)	(0.172)		(0.694)
Unemployed (= 1)	−0.128	−0.048	−2.302**	0.067	0.025	1.449
	(0.550)		(0.981)	(0.588)		(1.817)
Spouse employed (= 1)	0.256	0.096	−1.719	0.415**	0.153**	−1.409
	(0.216)		(1.261)	(0.211)		(1.042)
Spouse unemployed	0.524	0.195	−1.215	0.119	0.044	−1.364
	(0.429)		(1.752)	(0.445)		(1.605)
Spouse retired	0.113	0.042	−0.853	0.614*	0.227*	1.840
	(0.331)		(1.628)	(0.326)		(1.364)
Household Finances						
Household income < £15000	−0.319	−0.119	0.657	−0.420*	−0.155*	−3.962***
	(0.226)		(1.076)	(0.231)		(0.765)
Household income £15,000–£30,000	−0.092	−0.034	0.187	−0.094	−0.035	−1.352**
	(0.148)		(0.676)	(0.147)		(0.589)
Household income £45,000–£60,000	0.263*	0.098*	0.075	0.256*	0.095*	0.886
	(0.150)		(0.664)	(0.150)		(0.615)
Household income £60,000–£75,000	0.426**	0.159**	−0.417	0.644***	0.238***	2.551***
	(0.200)		(0.905)	(0.210)		(0.781)
Household income > £75,000	0.409*	0.152*	−1.425*	0.620***	0.229***	2.243**
	(0.216)		(0.844)	(0.218)		(0.987)
Observations	632		296	632		395
Pseudo R^2 / R^2	0.058		0.087	0.068		0.150
LR chi2 / F	50.251		3.448	59.957		4.806
Prob > chi2 /F	0.000		0.000	0.000		0.000
Baseline predicted probability	0.472		2.806	0.506		4.641

Note: Columns 1 and 3 show probit estimates and average marginal effects on whether respondents hold high cost credit and savings, respectively. Columns 2 and 4 show results of OLS models with robust standard errors on the balances of high cost credit and savings, respectively, conditional on holding those balances. * p < 0.1, ** p < 0.05, *** p < 0.01.

'High cost credit' is defined as holding two credit/store cards or more *or* holding a payday loan, pawn broker loan or home collected credit. 'Savings' are liquid savings in excess of £250. Additional control for self-assessed risk attitude.

Table A.2: Repayment- and Interest Rate Type Models with Individual Literacy Questions

	(1) Repayment Type (AMP = 1)		(2) Interest Rate Type (ARM = 1)	
	β / SE	Margin	β / SE	Margin
Mortgage Literacy Question answered correctly				
Question 1 (=1)	−0.898***	−0.195***	0.309**	0.110**
	(0.160)		(0.153)	
Question 2 (=1)	−0.389***	−0.084***	0.029	0.010
	(0.150)		(0.125)	
Question 3 (=1)	−0.571***	−0.124***	−0.007	−0.002
	(0.145)		(0.118)	
Question 4 (=1)	−0.103	−0.022	0.103	0.037
	(0.155)		(0.120)	
Behavioral Characteristics				
Present biased (= 1)	0.633***	0.137***	0.141	0.050
	(0.183)		(0.166)	
Patience (0–10)	−0.024	−0.005	−0.016	−0.006
	(0.027)		(0.022)	
Observations	632		632	
Pseudo R^2	0.258		0.096	
LR chi2	172.716		84.088	
Prob > chi2	0.000		0.000	
Baseline predicted probability	0.220		0.536	

Note: Table shows probit model estimates and average marginal effects. Specifications identical to Columns 1 of Table 6 and Table 7, respectively, except that the financial literacy score enters as 1/0 dummy variables to indicate 1, 2, 3 or 4 questions answered correctly (omitted dummy for 0 questions answered correctly).
* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

Table A.3: Repayment Type Robustness Models

	(1) Excluding Endowment Mortgage		(2) Excluding "Don't know's"		(3) Excluding (1) and (2)	
	β / SE	Margin	β / SE	Margin	β / SE	Margin
Behavioral Characteristics						
Literacy score (0–4)[a]	−0.679***	−0.132***	−0.563***	−0.119***	−0.733***	−0.134***
	(0.147)		(0.212)		(0.202)	
Present biased (= 1)	0.561***	0.109***	0.640***	0.135***	0.582**	0.106**
	(0.206)		(0.202)		(0.231)	
Patience (0–10)	−0.030	−0.006	−0.010	−0.002	−0.006	−0.001
	(0.029)		(0.031)		(0.034)	
Age						
18–34	−0.802***	−0.156***	−1.060***	−0.224***	−0.831***	−0.152***
	(0.260)		(0.284)		(0.316)	
35–44	−0.294	−0.057	−0.576**	−0.122**	−0.310	−0.057
	(0.236)		(0.240)		(0.264)	
45–54	−0.490**	−0.095**	−0.566***	−0.120***	−0.496**	−0.090**
	(0.214)		(0.209)		(0.234)	
Housing						
Adjustable rate mortgage (ARM)	0.261*	0.051*	0.392***	0.083***	0.330**	0.060**
	(0.146)		(0.146)		(0.159)	
Mortgage debt (£10,000s)	0.035*	0.007*	0.034*	0.007*	0.046**	0.008**
	(0.019)		(0.018)		(0.020)	
Loan-to-value ratio	−0.397*	−0.077*	−0.541**	−0.114**	−0.548**	−0.100**
	(0.230)		(0.254)		(0.251)	
Loan-to-income ratio	0.018	0.003	0.015	0.003	0.013	0.002
	(0.059)		(0.057)		(0.059)	
Mortgage interest rate	−0.011	−0.002	−0.005	−0.001	−0.006	−0.001
	(0.025)		(0.023)		(0.026)	
Observations	598		564		532	
F of first stage	9.160		9.640		7.880	
t-statistic of instrument	10.400		8.330		9.290	
LR chi2	94.822		92.626		95.737	
Prob > chi2	0.000		0.000		0.000	
Wald test of exogeneity	0.284		0.699		0.310	
Baseline predicted probability	0.205		0.239		0.225	

Note: Table shows IV probit model estimates and average marginal effects. The estimated sample excludes respondents who have an endowment interest-only mortgage in Column 1. In Column 2, respondents are excluded who answered 'don't know' to the first literacy question or 'don't know' to three or more financial literacy questions. Column 3 combines the sample restrictions of Columns 1 and 2. Additional control variables as in Table 6.

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

[a] 'Literacy score' is instrumented with 'math level in school' in all specifications.

Table A.4: Interest Rate Type Robustness Models

	(1) Excluding "Don't know's"	
	β / SE	Margin
Behavioral Characteristics		
Literacy score (0–4)[a]	0.449***	0.149***
	(0.168)	
Present biased (= 1)	0.242	0.080
	(0.173)	
Patience (0–10)	0.001	0.000
	(0.024)	
Age		
18–34	−0.301	−0.100
	(0.201)	
35–44	−0.019	−0.006
	(0.186)	
45–54	−0.112	−0.037
	(0.174)	
Housing		
Alternative mortgage product (AMP)	0.743***	0.247***
	(0.191)	
Mortgage debt (£10,000s)	−0.018	−0.006
	(0.015)	
Loan-to-value ratio	0.575***	0.191***
	(0.171)	
Loan-to-income ratio	−0.068	−0.022
	(0.043)	
Mortgage interest rate	−0.071***	−0.023***
	(0.018)	
Observations	564	
F of first stage	9.640	
t-statistic of instrument	8.330	
LR chi2	95.257	
Prob > chi2	0.000	
Wald test of exogeneity	0.046	
Baseline predicted probability	0.514	

Note: Table shows IV probit model estimates and average marginal effects. The estimated sample excludes respondents who answered 'don't know' to the first literacy question or 'don't know' to three or more financial literacy questions. Additional control variables as in Table 7.

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

[a] 'Literacy score' is instrumented with 'math level in school' in all specifications.

Table A.5: Extrapolation Bias

	(1) IV Probit Repayment Type (AMP = 1)		(2) IV Probit Interest Type (ARM = 1)	
	β / SE	Margin	β / SE	Margin
Behavioral Characteristics				
Literacy score (0–4)[a]	−0.701***	−0.135***	0.528***	0.151***
	(0.174)		(0.135)	
Present biased (= 1)	0.903***	0.174***	0.118	0.034
	(0.238)		(0.212)	
Patience (0–10)	−0.068*	−0.013*	0.024	0.007
	(0.037)		(0.029)	
Age				
18–34	−1.358***	−0.261***	0.235	0.067
	(0.327)		(0.244)	
35–44	−0.662**	−0.127**	0.072	0.021
	(0.286)		(0.227)	
45–54	−0.674**	−0.130**	0.084	0.024
	(0.269)		(0.224)	
Housing				
Adjustable rate mortgage (ARM)	0.201	0.039		
	(0.185)			
Alternative mortgage product (AMP)			0.664***	0.191***
			(0.219)	
Mortgage debt (£10,000s)	0.044**	0.008**	0.009	0.003
	(0.022)		(0.017)	
Loan-to-value ratio	−0.388	−0.075	0.291	0.083
	(0.270)		(0.182)	
Loan-to-income ratio	−0.018	−0.004	−0.084*	−0.024*
	(0.074)		(0.049)	
Mortgage interest rate	−0.016	−0.003	−0.085***	−0.024***
	(0.030)		(0.022)	
3-year growth of median house prices	−0.177	−0.034	−0.210	−0.060
	(0.821)		(0.620)	
Begin of current Mortgage				
2003–2006	0.175	0.034	−0.135	−0.039
	(0.336)		(0.271)	
2007–2008	0.133	0.026	−0.353	−0.101
	(0.507)		(0.390)	
2009–2010	0.582*	0.112*	−0.779***	−0.223***
	(0.321)		(0.261)	
2011–2012	−0.148	−0.028	−1.138***	−0.326***
	(0.316)		(0.256)	
2013	−0.508	−0.098	−1.928***	−0.553***
	(0.400)		(0.392)	
Observations	442		442	
LR chi2 / F	83.209		151.480	
Prob > chi2 / F	0.000		0.000	
Wald test of exogeneity	0.425		0.004	
Baseline predicted probability	0.220		0.501	

Note: Table shows IV probit model estimates for repayment type (Column 1) and interest rate type (Column 2), with additional controls: i) the 3-year growth rate of median house prices in the locality in the period before the current mortgage was taken out; ii) controls when the current mortgage was taken out (omitted group are mortgages before 2003). Due to data restrictions, the estimated sample only includes English and Welsh households. Additional control variables as in Table 6 and Table 7.

* p < 0.1, ** p < 0.05, *** p < 0.01. Standard errors in parentheses.

[a] 'Literacy score' is instrumented with 'math level in school' in all specifications.