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Consumer financial literacy and the efficiency of mortgage-related decisions: New evidence from the Panel Study of Income Dynamics

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Abstract

This study evaluated the link between financial literacy and household mortgage decisions. To this end, the longitudinal dataset for the US population from the Panel Study of Income Dynamics (PSID) was used. Evidence for links between financial literacy levels and (1) mortgage uptake, (2) mortgage interest rates, and (3) mortgage refinancing decisions were examined using the two waves (2015 and 2017) of PSID data, combined with the 2016 PSID supplementary questionnaire examining the measured financial literacy of household members. Our results revealed a positive link between financial literacy and mortgage possession and, additionally, between financial literacy and the subsequent decision to take out a mortgage. Moreover, higher financial literacy scores were associated with lower mortgage interests and a greater likelihood of mortgage refinancing. On average, a household that refinanced its mortgage was able to reduce its interest rate by almost 0.7 percentage points, providing evidence of the positive role of financial literacy in securing better mortgage terms.

Keywords: financial literacy; mortgage debt; interest rate; refinancing decisions; Panel Study of Income Dynamics

Introduction

The principal argument behind the promotion of financial literacy relates to making better informed and more efficient financial decisions. Deficiencies in financial literacy, already identified by earlier research worldwide (Klapper et al., 2015; OECD, 2020; Xu & Zia, 2012), lead to suboptimal financial decisions and unhealthy financial behaviour (see Stolper & Walter, 2017 for a comprehensive review). One of the most important financial decisions with long-lasting consequences is mortgage acquisition. First, this is because, for an average consumer, a mortgage is the heaviest financial liability in her balance sheet and is secured against an asset having the largest value, i.e., a house or a flat. As a result, in early 2020, mortgage debt amounted to $10.1 trillion out of a total of $14.3 trillion of total household debt in the US; that accounted for more than 70% of total household debt (Federal Reserve Bank of New York, 2020). Second, due to the long-term nature of a mortgage, the efficiency of its choice is largely determined by the interest rate. For a mortgage of $200,000 taken for 30 years, a 1 percentage point difference in the interest rate typically translates into a more than $1,200 difference in yearly instalment payments. Third, the long-term nature renders the selection of a mortgage a particularly complex decision because the borrower must take into account long-term prospects regarding not only her income but also price changes in the real estate market and changes in interest rates on the financial market. Finally, given that a mortgage decision is usually made extremely rarely[1], the opportunity to learn from experience is limited.

Although research on consumer mortgage decisions is important from both theoretical and practical perspectives (Xiao & Tao, 2020), little direct evidence exists on the effects of financial

[1] According to the information provided by the Consumer Financial Protection Bureau (following the requirements of The Home Mortgage Disclosure Act (HMDA)) in 2018 7.7m mortgages were granted, which, contrasted with more than 120m households in the US according to the Census Bureau, resulted in less than 1 mortgage per 15 households per year.

literacy on the essential cost component of a mortgage, i.e., the interest rate. Prior studies evidenced that lower levels of financial literacy fostered borrowing at a high cost (Disney & Gathergood, 2013; Lusardi & de Bassa Scheresberg, 2013; Lusardi & Tufano, 2015; Pak, 2018; Robb et al., 2015). Lusardi and Tufano (2015) in the US and Disney and Gathergood (2011) in the UK, studied a broad array of credit products (both secured and unsecured) and demonstrated that lower levels of financial literacy are linked to the usage of higher-cost credit. High-cost alternatives for financial services, such as payday loans, auto-title loans, rent-to-own transactions, or pawn shops, were also found to be particularly widespread among those with lower financial literacy levels (Chatterjee, 2013; Disney & Gathergood, 2013; Lusardi & de Bassa Scheresberg, 2013; Robb et al., 2015). Yet, only a few studies examined this relationship using exclusively mortgage-related data. Consequently, the purpose of this study is to examine the association between financial literacy and mortgage-related decisions. We strive to verify whether higher financial literacy prompts consumers to make desirable (beneficial) decisions concerning: (i) participation in the market for home loans, (ii) selecting a better mortgage option in terms of the interest rate, and (iii) refinancing mortgages in times of declining interest rates.

Theoretical Framework, Previous Research, and Hypotheses

Financial Literacy – conceptualization and its role for better financial decisions

This study builds on the conceptual framework consistent with human capital theory (Becker, 1962, 1975). Financial literacy – defined as knowledge of basic financial concepts and an ability to use that knowledge and other financial skills to manage financial resources (Hung et al., 2009; Huston, 2010; Knoll & Houts, 2012; Xiao & O'Neill, 2016) – is treated as a domain-specific form of human capital. Generally, financial literacy can either accumulate endogenously

because of the human capital choice, or it can be increased through domain-specific education and socialisation (Brown, Henchoz, & Spycher, 2018). This follows Becker's (1962, 1975) perspective which defines human capital as the stock of knowledge and skills that are acquired from sources such as education, experience, and socialisation.

Huston (2012) indicates two channels through which human capital can affect the cost of borrowing, such as the interest rate of a mortgage. First, human capital determines the available borrowing options (lower human capital, through shaping households' financial situation and creditworthiness, translates into fewer – and presumably costlier – borrowing options). Second, human capital determines which of the available borrowing options will ultimately be chosen (higher human capital translates into a better selection of the least expensive debt). For the latter reason, greater resources of relevant, domain-specific human capital should increase the likelihood of refinancing mortgages based on the available information regarding interest rate fluctuations. Generally, human capital should also help consumers recognise the unique benefits of a mortgage as a form of credit (i.e., particularly low cost, tax deductions) and its particular features as drivers of financial leverage (i.e., the opportunity to accelerate wealth accumulation or maximize the value of household resources) (Seay et al., 2015; Smith et al., 2012). In turn, this should contribute to a consumer's decision to participate in the market for home loans.

Financial Literacy – measurement

The measurement of human capital in the context of financial decision-making focuses on financial literacy. Yet, despite its broad applications, the concept of financial literacy has not yet gained a unique conceptualisation. Probably the most recognisable measure of financial literacy is the so call "Big Three" test initially incorporated into the 2004 wave of the US Health and Retirement Study (HRS) (Lusardi & Mitchell, 2006). The test consists of three single-choice

questions on interest, inflation, and diversification. These questions have been also added to the 2009 wave of the National Financial Capability Study (NFCS) and augmented with two additional questions (on mortgage interest and bond prices, respectively) (Hastings et al., 2013). Since then, these five questions have been used in all editions of the NFCS under the informal name of the "Big Five". Although since the introduction of the "Big Three" and "Big Five" they have dominated the international landscape for the financial literacy measurement (see Stolper and Walter 2017 for an overview), the largest study of financial literacy so far – Standard & Poor's Ratings Services Global FinLit Survey conducted in 148 countries and involving over 150,000 respondents (Klapper et al., 2015) – used a different test to measure financial literacy (comprising four questions on: compound interest, inflation, diversification and one testing numerical abilities).

Household Mortgage Behaviour

In theoretical terms, household borrowing behaviour – including mortgage behaviour – is explicated by the lifecycle hypothesis (Modigliani, 1986). Based on the hypothesis, consumers strive to smooth consumption during their lifetime and, if faced with a negative income shock, borrow to smooth consumption. It also means that when a consumer's income is lower at an earlier stage of life, it is rational to borrow to conform to normal living standards. In line with the lifecycle hypothesis (Modigliani, 1986), it is observed that when credit markets are well developed, as in most of the developed countries, borrowing is common among consumers and mortgages are the most common credit product used (Federal Reserve Bank of New York, 2020). Research also shows that education, income, and financial planning are positively associated with both mortgage ownership (Xiao & Yao, 2020), and financial literacy (Kadoya & Khan, 2019; Lusardi & Mitchell, 2014; Nicolini et al., 2013; Xiao & O'Neill, 2018).

Prior research on mortgage choices found that borrowers have a poor understanding of their contract terms and tend to underestimate the potential increase in the interest rate imposed on their mortgages (Bucks & Pence, 2008); however, those who report higher levels of financial knowledge self-assess their mortgages more accurately (Courchane et al., 2008). Although a negative association between objectively measured financial literacy and the cost of a mortgage was first mentioned by Moore (2003), to the best of our knowledge, the only study scrutinising the link was conducted by Huston (2012). Using data from the Consumer Finance Monthly survey and a unique financial literacy scoring grid allowing for classification of respondents into three classes in terms of their financial literacy, Huston (2012) established that financially literate American consumers were about twice as likely to pay lower interest on their mortgage loans than their illiterate counterparts.

Some light was shed on the reasons behind the link between financial literacy and interest rates of mortgage borrowing by other researchers. First, financially literate consumers are more likely to comparison shop before selecting a mortgage, while those who are less financially literate tend to accept a mortgage offer from the first financial intermediary they applied to (Fornero et al., 2011). Second, more literate consumers have a better understanding of differences between distinct types of mortgages and are better equipped to select the type that is well-fitted to their specific situation which, in turn, limits the mortgage costs (Gathergood & Weber, 2017; Smith et al., 2012). Third, financial literacy supports consumers' ability to assess their risk exposure and match the mortgage type to the exposure (Fornero et al., 2011). Fourth, less financially literate consumers tend to take on high-cost alternative mortgage products (AMPs) more often (Gathergood & Weber, 2017). Finally, deficiencies in financial literacy are positively related to the incidence of delays in

repaying debt and delinquency that can contribute to the total cost burden entailed by the debt (Agarwal et al., 2017; Fornero et al., 2011).

Although previous studies have advanced an understanding of the link between financial literacy and mortgage interest rates, they are subject to certain limitations. Previous studies used cross-sectional datasets and thus revealed findings of correlational nature, meaning that the reported results might be overestimating the actual relationship (Weziak-Bialowolska et al., 2020). This also implies that residual confounding and reverse causation remain a concern in these studies. Specifically, although taking on a mortgage is not usually a recurring financial act, one cannot exclude the possibility of a reversed causality, i.e., that those who took on a mortgage increased their finance-specific human capital, and consequently financial literacy, through experience (learning by doing).

To provide more rigorous evidence on the role of financial literacy in making decisions about mortgage uptake and its costs, this study uses longitudinal data. We test the temporal association between financial literacy and the ensuing interest rate on mortgage. By ensuring this logical temporal sequence, this approach helped to provide more robust and reliable evidence on the examined associations and block the reverse causal mechanism from mortgage possession to more experience with financial products and higher financial literacy levels.

Based on the conceptual background and related empirical evidence, we test the following hypotheses:

H1: Financial literacy is positively related to the probability of acquiring mortgage debt.

H2: Higher financial literacy contributes to lower interest rates on a mortgage.

H3: Financial literacy is positively associated with the probability of mortgage refinancing.

Methods

Data

The study used two waves of the Panel Study of Income Dynamics (PSID) – 2015 and 2017. Additionally, data about financial literacy was retrieved from the PSID Well-Being supplement conducted in 2016, which measured not only the well-being of respondents but also their financial literacy. Before conducting the analyses, the three datasets were linked using the household head identifier.

PSID is a biennial study that collects data on US households' income, wealth, and expenditures. It also gathers information about the employment, health, and well-being of the heads of these households (*Panel Study of Income Dynamics*, 2019). PSID assesses the situation of approximately 9,500 US households in each wave of the survey. Participants' characteristics are presented in Table 1.

Variables

Mortgage uptake. PSID provides an extensive examination of the principal property – main household residence – and other properties owned by participating households. In particular, each property is evaluated from the perspective of mortgage debt and its characteristics. In this study, we were particularly interested in mortgage debt on the first property, which was evaluated using a single question: "Do you have a mortgage or loan on this property?" with binary response.

Mortgage interest rate. The mortgage interest rate was measured with the following set of questions capturing the interest rate: (1) "What is the current interest rate on that loan? — WHOLE NUMBER", and (2) "What is the current interest rate on that loan?—FRACTION"

Mortgage refinancing. Mortgage refinancing was assessed with a single binary variable constructed based on the responses to the question: "Is that the original loan and terms, or have you refinanced?"

Financial literacy. Panel Study of Income Dynamics special supplement on Well-Being and Daily Life included a set of questions on numeracy in everyday life. The proposed instrument probes the numerical underpinnings of financial literacy, which are sometimes equated with basic financial literacy (Bannier & Neubert, 2016; Bannier & Schwarz, 2018; Lusardi & Mitchell, 2007, 2008) and have been proven to be more strictly related to financial behaviours and attitudes than financial knowledge (Piotr Białowolski, Cwynar, & Cwynar, 2020; Piotr Białowolski, Cwynar, Cwynar, et al., 2020).

Three financial literacy questions were used: (Q1) "If the chance of getting a disease is 10 percent, how many people out of 1,000 would be expected to get the disease?" (Q2) "If 5 people all have the winning numbers in the lottery and the prize is $2 million, how much will each of them get?" (Q3) "Suppose you have $200 in a savings account. The account earns 10 percent interest each year. How much would you have in the account at the end of two years?" These questions were already used as proxies of financial literacy in the HRS. Additionally, the results of Schmeiser and Seligman (2013) provided significant evidence for the usefulness of the set of questions, while Lusardi and Mitchell (2007) utilised them in the assessment of planning behaviour of Baby Boomers.

The test score was computed as a sum of points (ranging from 0 to 3) and as such applied in the analyses. Additionally, since there is an emerging trend to treat financial literacy as a binary variable distinguishing between financially literate and non-financially literate individuals, two

additional dichotomous variables were constructed. To this end, we followed the OECD methodology (OECD, 2020) and approach of Klapper et al. (2015). The former assumes that 5 out of 7 correct responses define a financially knowledgeable person, while the latter – 3 out of 4. Our instrument consisted of three questions only, so we probed thresholds set at the level of 2 correct responses out of 3, and additionally a threshold set at 3 correct responses out of 3.

In our analyses, the maximum financial literacy score obtained by either the household head or his/her partner was used as an indicator of household financial literacy level. It has been evidenced that financial literacy is strongly and positively correlated with household decision making (Piotr Białowolski, Cwynar, & Węziak-Białowolska, 2020; Hsu, 2016; Ward & Lynch, 2019). Consequently, taking the maximum financial literacy score of household members might imply the level of financial literacy of an actual financial decision-maker.

Control variables. A rich set of control variables, already established as influencing credit behaviours, was used to investigate the influence of financial literacy on the interest rate associated with mortgage debts, as well as the probability of refinancing a mortgage. A close link between the socioeconomic factors, financial standing, credit scores and, consequently, loan prices, is well-documented in the literature (Arya et al., 2013; Bialowolski et al., 2020; Cuesta & Sepulveda, 2018; Davies et al., 2019; Hollo & Papp, 2007; Kamleitner & Kirchler, 2007). Consequently, we controlled for demographics (gender, age, marital status, education, race and ethnicity), wealth and income (possession of savings, income levels), labour market status, health conditions (body mass index), and place of residence (division, i.e., higher administrative unit comprising between three and nine US States in close geographical proximity). Additionally, we controlled for the labour market status. Along with income and savings indicators, it can proxy the presence of liquidity constraints (Flavin, 1984; Hajivassiliou & Ioannides, 2007). Following the approach of Ambrose

et al. (2020) and Al-Bahrani (2016) we also included variables related to mortgage characteristics (fixed or variable interest rate, logarithm of the loan value)[2]. In order to proxy stringency of regulatory environment at the state level, the Pahl index was used (Pahl, 2007). It measures mortgage broker regulations and occupational licensing requirements across states.

<Table 1 – around here>

The financial literacy of the PSID population, measured on the scale from 0 to 3, was 2.1 points on average. Mortgage holders, and especially those mortgage holders who recently acquired a mortgage, were more financially literate than the general population (2.38 and 2.43 points on average on the financial literacy test, respectively). Among households with a mortgage, there was a larger proportion of male head-of-households than in the general population. There was also a clear tendency for the age of the head-of-household to be lower among observed mortgage holders and, especially, among recent mortgage debtors. Households with a mortgage were more often comprised of a married couple who had higher incomes and were more likely to have savings. Education levels were generally higher among mortgage debtors – 85.6% of households with mortgage debt had at least one member with some college education, and among those which recently acquired mortgage debt the percentage was 89.9%. Among mortgage debtors there were more White respondents than in the overall sample, yet there was no imbalance in terms of Hispanic or Latino ethnicity. Considering the geographical distribution of households with a mortgage, a clear overrepresentation of the New England and Pacific divisions was visible, but the

[2] When studying the impact of financial literacy on interest rates the role of interest rate arrangement (fixed vs. variable interest rate) can play an important one. One could argue that households with higher financial literacy are able to sacrifice short-term losses and utilise more often fixed interest rate mortgages to benefit in the long run. This argument is especially valid in times of very low interest rates (like in the recent years) when variable interest rate contracts can be characterised by lower instantaneous interest rates. By controlling for the interest rate arrangement, we eliminate this potential confounding effect.

most striking overrepresentation of mortgage holders was noted in the Mountain Division, comprising the states of Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.

Data Analyses

As the primary goal of the analysis was to establish a link between financial literacy and subsequent efficient credit behaviours – as revealed by the interest rates and probability of mortgage refinancing – the longitudinal data was used and a regression analysis benefitting from the longitudinal data structure was employed. This approach offered more reliable evidence for the studied associations by virtue of the logical temporal sequence of cause and effect.

The impact of financial literacy on subsequent mortgage uptake was measured using the lagged logistic regression:

$$prob[mort\_uptake_{i,T=3} = 1] = \frac{1}{1+e^{-(\alpha_0+\alpha_1 FL_{i,(T=2)}+\alpha_2 X_{i,(T=1)}+\eta_i)}} \quad (1)$$

Participants who had no mortgage in the first round in 2015 and who either obtained or did not obtain a mortgage in the following two years were selected for the analysis to ensure the logical temporal sequence of events. Consequently, 1,730 households that did not have a mortgage prior to 2016, and at least one of their members participated in the financial literacy test, and had no missing data on control variables were subject to the analysis. The impact of financial literacy on the interest rate on mortgage debt was measured using the lagged linear regression:

$$interest\_rate_{i,(T=3)} = \alpha_0 + \alpha_1 FL_{i,(T=2)} + \alpha_2 X_i, (T = 1) + \eta_i \quad (2)$$

Two approaches were used. The first one included all mortgage holders who participated in the financial literacy test and had no missing on controls. In the second, in order to provide more robust evidence of the temporal association, only households that were granted a new mortgage

after a completion of the financial literacy test were selected to ensure the logical temporal sequence of the events. Consequently, in the former approach 1,726 households were used in the analysis, while in the latter – 283 households that acquired a mortgage over the period of 2016-2017 were included.

The impact of financial literacy on mortgage refinancing was measured by applying the lagged logistic regression:

$$prob[mort\_refinance_{i,T=3} = 1] = \frac{1}{1+e^{-(\alpha_0+\alpha_1 FL_{i,(T=2)}+\alpha_2 X_{i,(T=1)}+\eta_i)}} \quad (3)$$

where i=1,…,N.

890 households that already had a mortgage in 2015 and participated in the financial literacy test were taken into consideration. Their subsequent decision to either refinance or continue with their previous mortgage was examined.

Subscript i represents an individual, the variable FL indicates financial literacy, *mort_uptake* indicates a dichotomous variable indicating whether the respondent took a mortgage or not, *interest_rate* indicates a continuous variable representing interest rate of a mortgage, *mort_refinance* is a dichotomous variable indicating whether the respondent who had a mortgage at baseline (T=1) refinanced the mortgage or not between T=2 and T=3. X is a vector of control variables.

Results were presented in the form of marginal effects. To examine the scale of the average benefits behind mortgage refinancing, the levels of interest rates between households who refinanced their mortgage and those who did not over the period of 2016-2017 were compared. A two-sample t-test with unequal variances was applied. Analyses were performed using Stata 15.

Results

Interest Rate on Mortgage and Refinancing

In the panel sample 33.8% of households reported having a mortgage. The average interest rate paid by mortgage holders surveyed in 2017 was 4.25%. The vast majority of mortgages were fixed-interest rate (92.8%), with only a minor share of variable interest rate mortgages (7.2%). Recent mortgages were subject to slightly lower interest rates. For new mortgages obtained in 2016 or 2017, the average interest rate was 3.98%, while for those that were refinanced it was only 3.83%. Recent mortgage debtors were even more inclined to the fixed interest rate scheme. In the case of new and refinanced mortgages, the share of fixed-rate mortgages was above 95%. In the total sample, the share of households with recently obtained mortgages was 4.2% (first-time mortgage takers), and 2.8% (those who refinanced their mortgage within the past two years). The average value of principal on a mortgage was $146,868. Yet, for recently acquired mortgages the average principal was higher ($167,804). The highest value of principal was observed for mortgages recently refinanced ($187,813).

<Table 2 – around here>

Mortgage holders were generally financially literate. Only 9.1% of mortgage holders in total and only 7% of recent mortgage debtors (mortgage acquired in 2016 or 2017) had scored 0 or 1 on the financial literacy test (Table 3). The share of low scoring households among those which refinanced their mortgage was even smaller. In the total population of mortgage holders, those who scored low on the financial literacy tests, experienced a demonstrably higher interest rates on their mortgage debts. The difference between those who scored low (0-1 points) and those scoring the highest (3 points) was as much as 0.61 percentage points. This difference between low

and highly financially literate households was not evident for recent mortgage debtors and households refinancing their mortgage.

<Table 3 – around here>

Financial Literacy and Mortgage Behaviours

Our primary hypothesis was that financial literacy is positively related to the probability of acquiring mortgage debt. We found that each additional point on the financial literacy test increased the probability of mortgage uptake over the two-year period (2016 or 2017) by 3.5 percentage points (Table 4, reg. 1.1). This confirmed our initial expectations that households with higher financial literacy were more likely to obtain a mortgage. When tested against a financial literacy threshold, the results confirmed that households where at least one of the members reached the score of 2/3 on the financial literacy test, had a probability of acquiring mortgage higher by 6.3 percentage points compared to those with the lower score. Households where at least one of the members reached the threshold of 100% of correct responses on the financial literacy test were more likely (by 3.7 pp.) to acquire a mortgage than those who were below this score. Our results also revealed that mortgage acquisition was positively associated with lower age of the household head, being married, the level of household income, and possession of savings (Table A1 in the Appendix).

<Table 4 – around here>

In our second hypothesis, we assumed that financial literacy allows people to seek better-priced mortgages, i.e., mortgages with lower interest rates. Our analysis conducted on the whole

sample of mortgage holders revealed a highly significant ($p<0.01$) association between financial literacy and mortgage interest rate (Table 4, reg. 2.1). A single point increase on the financial literacy scale translated into a decline in the interest rate by 0.194 percentage points. Taking into account the average value of the mortgage for those participating in the study ($146,868, see Table 2) the average annual savings associated with improvement in financial literacy can reach $285 per year per every additional point acquired on the financial literacy test. If households with at least 2 points on the financial literacy test were compared to lower scoring households, the difference in the interest rate was amounted to 0.252 percentage points, while those who scored 3 out of 3 reported interest rates lower by 0.196 percentage points than the rest.

In order to validate the results, we further tested only those households that obtained a mortgage after taking part in the financial literacy test, which precluded the risk that it was the possession of the financial product (mortgage) that was a stimulus for improving financial literacy. Our analysis (Table 4, reg. 2.2) shows that an additional point obtained on the financial literacy test (measured on the 0-3 point scale) has direct benefits that translates into interest rate reduction of 0.160 percentage points on a mortgage. Although we were not able to confirm the significant role of the lower threshold (2 out of 3) for the interest rate on prospective mortgage (most likely due to a small sample), we observed a statistically significant association between the interest rate on mortgage and the binary indicator of a perfect score on the financial literacy test with interest rate reduced by 0.244 percentage points for households where a perfect score was noted. Surprisingly, the role of controls in shaping the interest rate was very moderate (Table A1). It seemed that households with higher education level of their members and acquiring higher value mortgages were able to obtain lower interest rates. We were able to confirm racial discrepancies in the level of interest rates in the US. The sole fact of a household head being Black increased the

interest rate by 0.291 percentage points beyond other control variables, which further substantiates conclusions of other authors (Ambrose et al., 2020). The role of age, marital status, incomes, savings, and geographical location was not significant.

Our third hypothesis concerned the positive effects associated with seeking a better mortgage option (i.e., refinancing). Households with higher observed levels of financial literacy were hypothesized to be more likely to refinance. We found (Table 4, reg. 3) that financial literacy was positively associated with the probability of subsequent refinancing of mortgage debt. Each additional point on the financial literacy test increased the probability of refinancing a mortgage over the two-year period (2016-2017) by 5 percentage points. Especially high influence of financial literacy on refinancing decision was observed when passing the threshold of 2 out of 3 in the financial literacy test. Households with individuals scoring two or more on the financial literacy test were almost 10 pp. more likely to refinance their mortgage than their less financially literate counterparts. The probability of refinancing was much lower among young adults (who might have already struggled to obtain their first mortgage and did not have a chance to refinance it) but also among those who were separated. The probability of refinancing was linked to neither savings nor income, but refinancing was apparently more accessible in the Mountain division.

The role of mortgage refinancing is unclear until one understands the scale of the average benefits behind it. Although the benefits from mortgage refinancing do not increase with higher financial literacy levels, the two-sample t-test with unequal variances showed that a mere fact of refinancing is highly beneficial. There was a highly significant difference in the interest rate change between households that refinanced their mortgage and those that did not between 2015 and 2017 ($t=4.68$, $p<0.001$). Our results showed that those who did not refinance their mortgage experienced interest rate reductions of merely 0.067 percentage points, while those who did

refinance their mortgages noted a decline in the interest rate on their mortgage of 0.746 percentage points, which translated into 0.68 percentage point reduction in the interest rate attributable to the refinancing decision. If the households that refinanced their mortgage had not done it, they would have foregone a potential benefit of almost $800 in annual savings related to lower interest rate.

Robustness

Robustness of results was assessed using a series of tests. First, a different financial literacy instruments was used to evaluate sensitivity of effects in regressions linking financial literacy to mortgage uptake decisions, interest rate on mortgage and mortgage refinancing decisions (see Table A2 in the Appendix). The approach relied only on one question from the financial literacy test originally proposed in PSID ["Suppose you have $200 in a savings account. The account earns 10 percent interest each year. How much would you have in the account at the end of two years?"]. This question is the most closely related to the actual understanding of the interest rate in real-life financial applications. Applying the alternative financial literacy measure yielded comparable results to the primary analysis, which confirmed robustness of the results with respect to different financial literacy conceptualisations.

Second, an association between financial literacy and the mortgage related outcomes (H1-H3) was examined in subpopulations of households defined according to marital status of the household head and financial situation of the household (i.e., household income and savings possession). The analyses mostly showed the robustness of the original results to the sample split (see Table A3 in the Appendix). Specifically, the mortgage acquisition was found to be significantly associated with financial literacy among both married and unmarried household heads and among those with savings, as well as those with higher and lower incomes. Significant

association between financial literacy and mortgage interest rate was confirmed among married household heads and those with savings and higher incomes, while among those unmarried, without savings, and with lower incomes the role of financial literacy was not significantly related to the interest rate. Refinancing decisions were significantly linked with financial literacy among households with non-married head and among those with savings and higher incomes, while in other groups the refinancing decision was not significantly linked with financial literacy.

Discussion

By providing empirical evidence on the association between financial literacy and the terms of a mortgage, this study contributes to the literature on the benefits of financial literacy. By using 3-wave longitudinal data from the Panel Study of Income Dynamics, we found that: (1) more financially literate respondents are more likely to acquire a mortgage (confirmation of H1); (2) higher financial literacy is associated with more favourable conditions of the mortgage in terms of lower mortgage interest rates (confirmation of H2), and higher probability of mortgage refinancing (confirmation of H3).

Regarding the positive temporal association between financial literacy and the probability of holding a mortgage loan, our findings are in line with the results reported by Disney and Gathergood (2011) in the UK, Brown and Graf (2013) in Switzerland, and Feng et al. (2019) in China. Although a mortgage is a liability, such results can be easily substantiated. Using a mortgage to fund a property may be considered a desirable consumer behaviour despite the accompanying risk. The effect found in this study is, therefore, similar to a positive link between financial literacy and stock market participation, which is well-recognized in the literature (Mouna & Anis, 2017; van Rooij et al., 2011; Xia et al., 2014; Yoong, 2010). Even though stock market

participation is risky, nonparticipation is considered a serious investment mistake (Campbell, 2006) entailing costs that can result in significant welfare loss (Cocco et al., 2005). Financially savvy consumers seem to better understand the mechanisms behind risk-reward trade-offs and, as a result, they are more likely to enter the stock market.

Unlike savings – or assets in general – which have a positive effect on a consumers' financial and overall wellbeing (Brown & Gray, 2016), debt is an item on a household's balance sheet that is often compared with a double-edged sword (Hodson & Dwyer, 2014) because it raises economical, sociological and psychological controversies (Featherstone, 2019; Kamleitner et al., 2012), especially if it takes the form of excessive debt or over-indebtedness (Białowolski et al., 2019); yet a mortgage stands out from other forms of debt. First, it is one of the cheapest means of household borrowing. Second, as a financial product, it is intended to support households in acquiring a flat or a house, which is one of the key life purchases and is socially and economically desirable. In the US, households are encouraged to apply for a home loan provided by the state through the use of tax benefits. This makes mortgages even cheaper and emphasizes their desirability. Third, mortgages are used to finance assets that will likely appreciate in time. Moreover, due to exceptionally low interest rates, mortgages allow for an attractive investment of households' free cash flow (i.e., at interest rates higher than those imposed on home loans). All in all, even though a mortgage is formally a liability, holding a mortgage may be deemed a healthy (desirable, beneficial) financial behaviour (Allgood & Walstad, 2016), and more financially literate individuals should be more likely to fully understand the unique features of mortgage loans and, consequently, to apply for them. Such an effect has been confirmed with our results.

This study also confirmed the earlier findings of Huston (2012) who showed that higher financial literacy contributes to lower mortgage interest rates (H2). More generally, these findings

are consistent with growing evidence on the beneficial influence of financial literacy on the cost of borrowing (Disney & Gathergood, 2013; Lusardi & de Bassa Scheresberg, 2013; Lusardi & Tufano, 2015; Pak, 2018; Robb et al., 2015) and – even more broadly – on financial behaviours at large (Stolper & Walter, 2017). Such findings are in line with human capital theory. Statistics show that the majority of consumers have at least one experience with loans (Frank-Miller et al., 2019). Generally, they can turn to two types of loans to smooth their consumption in a manner consistent with the life cycle hypothesis (Modigliani, 1986): secured (cheaper) or unsecured (more expensive) loans. Consumers who are more financially literate are more likely to choose secured loans (including mortgages), i.e., cheaper products, because these loans are accessible due to their human capital resources. Consumers who are more financially literate might be more knowledgeable about loan types that are cheaper due to their increased level of financial sophistication, higher educational attainment and higher incomes (Kadoya & Khan, 2019; Lusardi & Mitchell, 2014; Nicolini et al., 2013; Xiao & O'Neill, 2018) – socioeconomic traits that are strongly and positively correlated with financial literacy. They can also afford more sizable loans, such as mortgages. Presumably, financially savvy individuals are more aware that it is better to take up larger but cheaper loans (a mortgage) instead of taking up several more expensive loans to meet their financial needs. Financial literacy is much more important for the level of interest rate than income or even savings, which is in line with the results of Beer, Ionescu, and Li (2018), who found only a moderate correlation between income and credit scores.

Regarding the positive association between financial literacy and mortgage refinancing, our findings also confirmed H3. It should be noted that financial literacy was identified as a likely trigger for mortgage refinancing, but no evidence was found supporting a negative association between financial literacy levels and interest rates on refinanced loans. Given that the purpose of

refinancing is usually to seek lower interest rates, this finding may be interpreted as another manifestation of better preparation to navigate financial products and select cheaper options by financially literate consumers.

Extensive economic literature suggests presence of a sizeable group of households being subject to liquidity constraints (Browning & Lusardi, 1996; Jappelli & Pagano, 1989, among others). Recent data from the Survey of Consumer Finances (Bhutta et al., 2020) suggest that 24% of American households are liquidity constrained and thus likely unable to acquire a mortgage or refinance their current debt. By using a number of controls to capture the potential role of liquidity constraints in either mortgage acquisition, shaping the interest rate or refinancing the mortgage loan (i.e., labour market status, level of incomes, and savings), we provided more robust evidence on the influence of financial literacy on mortgage acquisition and mortgage refinancing beyond the role of liquidity constraints.

Our evidence on the positive contribution of financial literacy to more efficient mortgage conditions in general, and lower interest rates in particular, is robust. We used longitudinal data, thus making a substantial adjustment for confounding and adding controls for characteristics that are known to correlate with financial literacy and mortgage uptake. We also showed that the results are robust with respect to an alternative specification of financial literacy and in different subgroups of population (i.e., more vs. less affluent households, households with savings vs. households without savings, married vs. non-married household heads). Finally, despite the fact that our study relates to the US households only, US mortgages are often subject to similar laws and conditions as mortgages offered in other developed countries. Specifically, mortgage holders in the US may choose whether to pay a fixed or floating rate of interest, lock their interest rate in between the time they apply for the mortgage and the time they purchase their house, choose the

time at which the mortgage rate resets, choose the term and the amortisation period, prepay freely, borrow against home equity freely, and obtain home mortgages with relatively low down payments (Green & Wachter, 2005).

Despite its strengths, our study also has certain limitations. First, the mortgage-related literature assumes that the appropriate measure of the true cost of a mortgage is the annual percentage rate (APR) (Al-Bahrani, 2016). However, in our study we were unable to perfectly identify the total cost of the mortgage. Although the question about the interest rate used in the PSID is very precise (the questionnaire inquires both about the interest rate expressed as a whole number and then requests fractional part to be provided), the study does not allow to capture the full costs of mortgage which can be elevated due to factors like high origination fees. Future studies might focus on collecting data on the APR of mortgage loans and examination of the link between financial literacy and the mortgage-related APR. The only previous study that focuses on the link between financial literacy and the cost of mortgage borrowing (Huston, 2012) uses nominal interest as a measure of the cost, just as our study. Second, in the analyses of mortgage uptake, interest rates on mortgage and mortgage refinancing, only a limited number of households was subject to the examination (those that made their respective mortgage decision following their financial literacy test). A larger sample could provide more robust conclusions. Third, the financial literacy test was very much focused on numeracy and thus measured financial skills rather than knowledge. It would be worth replicating the analyses on a set of indicators of financial literacy including financial skills, financial knowledge and financial attitudes.

Policy Implications

Assist consumers to engage in efficient mortgage decisions. This study implies that improved financial literacy may encourage consumers to participate in mortgage markets and make efficient decisions in mortgage choices. Policy makers who need to promote mortgage market participation should consider financial literacy education as an important factor to encourage consumers to participate in mortgage markets and make effective mortgage decisions, which will be helpful for the development and efficiency of mortgage markets. Financial service practitioners who would like to expand their mortgage product services may also consider financial literacy education and information provision as an important channel to reach consumers and provide them fair information to let them better understand various mortgage products and services. Thus, they can assist their clients in making efficient mortgage decisions. Consumer financial educators need to understand the importance of financial literacy in consumer mortgage decision making and provide relevant information for consumers who are in the lifecycle stage to take up mortgages and need basic knowledge and skills to select appropriate mortgage products. They also need to pay attention to consumers who may not be ready to take up mortgage or need a special assistance in selecting various mortgage products and services. Previous research shows that consumer debt holdings including mortgage holdings and related debt burdens are related to family structures and lifecycle stages (J. J. Xiao & Yao, 2020; Jing Jian Xiao & Yao, 2014).

Encourage clients to refinance for better interest rates when conditions are appropriate. This study finds that consumers with higher financial literacy are more likely to refinance and that consumers who refinanced have received lower interest rates. Although the interest rate is only one of six identified dimensions that influence satisfaction from banking services (Manrai &

Manrai, 2007), usually the purpose of refinancing is to seek better interest rates only. Practitioners may assist their clients to decide on the best timing and conditions for refinancing. Research shows that if done correctly, for a family with a $100,000 and a $500,000 mortgage, the optimal refinancing interest rate difference should be 193 and 118 base points, respectively (Agarwal et al., 2013). In addition, financial service practitioners should also help consumers avoid undesirable refinancing behaviour such as "cash refinancing" that caused the 2007-09 financial crisis (Lander, 2016). Consumer educators should rather provide adequate information for consumers to make desirable refinancing decisions based on their real needs in financial education programs.

Recognition of other factors causing better mortgage behaviours besides financial literacy. Even though our study shows that financial literacy is related to positive financial behaviours such as mortgage uptake, receiving better mortgage interest rates, and refinancing, it does not imply that financial literacy is the only important factor for these behaviours or decisions. Based on our findings, income, savings, and marital status also show significant effects in shaping the demand for mortgages. For predictors of better mortgage interest rates, age and marital status also show significant effects. For predictors of refinancing, the effects of other factors such as age, marital status, and region are also significant. These factors may also be considered when practitioners assist their clients in mortgage-related decisions.

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Table 1. Participant characteristics at study baseline.

	PSID (N=5,384)	Mortgage holders in 2017 (N=2,154)	Households taking up a mortgage between 2015 and 2017 (N=427)
Financial literacy (2016)			
Financial literacy test score – mean (SD)	2.10 (0.84)	2.38 (0.71)	2.43 (0.68)
Correct responses Q1, %	91.2	96.3	96.6
Correct responses Q2, %	79.7	90.0	91.0
Correct responses Q3, %	37.5	51.4	54.7
Baseline (2015) characteristic of household head			
Gender (men), %	73.0	84.1	87.1
Age, %			
Below 25	0.1	0.1	0.2
25-34	16.9	15.9	25.1
35-44	24.6	28.1	33.7
45-54	19.6	22.2	18.5
55-64	21.4	21.7	13.4
65 or more	17.4	12.1	9.1
Education level, %			
High school	94.2	98.2	98.6
At least some college	75.0	85.6	89.9
Marital status, %			
Married	55.4	74.0	76.4
Never Married	19.0	9.9	11.2
Widowed	5.4	2.9	1.6
Divorced (annulled)	16.4	11.5	9.8
Separated	3.9	1.6	0.9
Race, %			
White	62.5	72.7	77.3
Black	33.3	22.6	17.6
Asian	1.2	1.9	1.4
Other	3.0	2.9	3.8
Hispanic or Latino ethnicity, %	4.5	4.0	5.4
Natural logarithm of income – mean (SD)	9.4 (3.6)	10.7 (2.4)	11.0 (2.0)
Having savings, % of yes	74.8	87.6	89.7
Body Mass Index – mean (SD)	30.3 (12.7)	30.1 (12.8)	29.7 (11.0)
Division, %			
New England Division	3.0	4.4	5.6
Middle Atlantic Division	10.4	10.3	9.9
East North Central Division	17.1	16.4	12.4
West North Central Division	9.1	9.7	11.0

South Atlantic Division	24.3	23.6	19.5
East South Central Division	8.8	7.4	5.4
West South Central Division	9.9	9.4	9.6
Mountain Division	5.4	6.2	11.0
Pacific Division	12.0	12.7	15.5

All statistics in 2015 computed for households that took part in the financial literacy test in 2016.

Table 2. Characteristics of mortgages.

	Mortgage holders – 2017	*Mortgage taken either in 2016 or 2017 – not refinanced*	*Mortgage refinanced in 2016 or 2017*
Interest rate on mortgage – mean (SD)	4.25 (1.68)	3.98 (1.03)	3.83 (1.22)
Average principal on the mortgage (USD)	146,868	167,804	187,813
% mortgage holders with fixed-rate mortgage	92.8	97.0	95.4
% of the overall households	33.8	4.2	2.8

Source: Own calculations based on PSID

Table 3. Composition and interest rates paid by mortgage holders and households refinancing their mortgage by financial literacy levels.

		Financial literacy levels		
		0-1 points	*2 points*	*3 points*
All households	frequency, %	21.6	42.3	36.2
Mortgage holders – 2017	frequency, %	9.1	40.1	50.8
	interest rate on mortgage – mean (SD)	4.66 (2.00)	4.40 (1.67)	4.05 (1.60)
Mortgage taken either in 2016 or 2017 – not refinanced	frequency, %	7.0	46.2	46.8
	interest rate on mortgage – mean (SD)	3.74 (1.46)*	4.10 (1.20)	3.91 (0.73)
Mortgage refinanced in 2016 or 2017	frequency, %	5.3	34	60.6
	interest rate on mortgage – mean (SD)	3.85 (0.61)*	3.81 (0.91)	3.84 (1.40)

* The number of households with very low financial literacy levels and acquiring or refinancing a mortgage in 2016 or 2017 is very low (less than 15 households in each of the groups) which implies that the results of average interest rate should be treated with caution.

Table 4. Financial literacy and the probability of mortgage acquisition (reg. 1), the interest rate on the mortgage (full sample - reg. 2.1; sample limited to households acquiring a mortgage in 2016-2017 – reg 2.2), and the probability of mortgage refinancing (reg. 3) following the financial literacy test

	Reg. 1 Marginal effect (standard error)		
	Reg 1.1	Reg 1.2	Reg 1.3
Financial literacy test score	3.5*** (1.1)	---	---
Financial literacy at least 2/3	---	6.3*** (2.2)	---
Financial literacy 3/3	---	---	3.7** (1.5)
R2	0.170	0.170	0.166
N	1,730	1,730	1,730
	Reg. 2.1 Marginal effect (standard error)		
	Reg 2.1.1	Reg 2.1.2	Reg 2.1.3
Financial literacy test score	-0.194*** (0.066)	---	---
Financial literacy at least 2/3	---	-0.252* (0.151)	---
Financial literacy 3/3	---	---	-0.196** (0.088)
R2	0.078	0.074	0.076
N	1,726	1,726	1,726
	Reg. 2.2 Marginal effect (standard error)		
	Reg 2.2.1	Reg 2.2.2	Reg 2.2.3
Financial literacy test score	-0.160* (0.089)	---	---
Financial literacy at least 2/3	---	-0.056 (0.241)	---
Financial literacy 3/3	---	---	-0.244** (0.110)
R2	0.104	0.092	0.110
N	283	283	283
	Reg. 3 Marginal effect (standard error)		
	Reg 3.1	Reg 3.2	Reg 3.3
Financial literacy test score	5.0** (2.3)	---	---
Financial literacy at least 2/3	---	9.9* (5.9)	---
Financial literacy 3/3	---	---	5.5* (3.0)
R2	0.098	0.096	0.097
N	870	870	870

Table A1. Financial literacy and the probability of mortgage acquisition (reg. 1.1), the interest rate on the mortgage (full sample - reg. 2.1.1; sample limited to households acquiring a mortgage in 2016-2017 – reg. 2.2.1), and the probability of mortgage refinancing (reg. 3.1) following the financial literacy test

	Reg. 1.1 Marginal effect (standard error)	Reg. 2.1.1 Marginal effect (standard error)	Reg 2.2.1 Marginal effect (standard error)	Reg. 3.1 Marginal effect (standard error)
Financial literacy test score	3.5*** (1.1)	-0.194*** (0.066)	-0.16* (0.089)	5.0** (2.3)
Controls				
Gender (ref. female)				
Men	-0.1 (1.9)	0.139 (0.167)	0.105 (0.279)	4.7 (6.1)
Age (ref. 35-44)				
below 25	---	-0.844 (1.64)	-0.946 (0.875)	---
25-34	0.8 (1.9)	-0.113 (0.131)	0.03 (0.147)	-10.3*** (3.4)
45-54	-4.0** (2.0)	-0.135 (0.112)	-0.031 (0.144)	2.0 (3.8)
55-64	-4.7** (2.2)	0.1 (0.116)	-0.184 (0.173)	0.0 (4.5)
65 or more	-5.0 (3.3)	0.213 (0.167)	0.073 (0.232)	10.2 (7.1)
Education (ref. no education)				
High school	8.1 (6.2)	0.091 (0.334)	-0.792 (0.581)	-4.5 (11.7)
At least some college	0.6 (2.1)	-0.226* (0.127)	-0.193 (0.207)	7.7 (4.8)
Marital status (ref. married)				
Never married	-4.9*** (1.9)	0.233 (0.172)	-0.225 (0.24)	-6.6 (5.1)
Widowed	-1.3 (6.1)	0.215 (0.28)	-0.467 (0.499)	-1 (10.9)
Divorced (annulled)	-3.3 (2.4)	0.107 (0.167)	0.127 (0.253)	-2.5 (5.5)
Separated	-1.8 (3.7)	0.114 (0.346)	-0.545 (0.905)	-14.7* (8.6)
Race (ref. White)				
Black	-2.4 (1.6)	0.291** (0.118)	0.152 (0.168)	-0.7 (4.1)
Asian	9.4 (9.6)	-0.322 (0.295)	-0.25 (0.44)	4.2 (12)
Other	0.7 (4.4)	-0.107 (0.256)	-0.593** (0.282)	-2.5 (7.2)
Hispanic or Latino ethnicity	-3.0 (3)	0.054 (0.219)	0.181 (0.253)	12.6* (6.7)
Natural logarithm of income	1.5*** (0.5)	0.02 (0.024)	-0.013 (0.043)	-1.1 (0.9)
Having savings	7.4*** (1.9)	0.024 (0.137)	0.235 (0.195)	0 (4.6)
Employment status (ref. employed)				
Unemployed	-4.3 (3.9)	-0.063 (0.136)	-0.341 (0.515)	-3.7 (10.5)
Non-active	-0.3 (2.8)	0.07 (0.136)	-0.193 (0.258)	-10.2 (6.3)
Body Mass Index	0.0 (0.0)	0.004 (0.004)	0.003 (0.006)	0 (0.1)
Pahl index - mortgage broker regulations	-0.2 (0.2)	-0.004 (0.012)	-0.001 (0.017)	0.1 (0.4)
Division (ref. New England)				
Middle Atlantic Division	-6.9 (5.5)	-0.034 (0.219)	0.033 (0.275)	2.3 (8.2)
East North Central Division	-3.8 (5.5)	0.009 (0.21)	-0.015 (0.268)	-7.4 (7.6)

West North Central Division	-7.8 (5.5)	-0.127 (0.218)	-0.1 (0.257)	2 (8.2)
South Atlantic Division	-3.5 (5.5)	0.146 (0.21)	-0.093 (0.267)	-2.6 (7.8)
East South Central Division	1.9 (6.1)	0.246 (0.241)	0.292 (0.332)	-5.7 (8.5)
West South Central Division	-2.3 (6)	0.078 (0.236)	-0.018 (0.298)	-8.6 (7.9)
Mountain Division	-2.8 (5.9)	-0.179 (0.239)	0.209 (0.257)	26.9*** (9.2)
Pacific Division	-4.6 (5.5)	-0.16 (0.219)	-0.068 (0.266)	9.4 (8.6)
Variable interest rate mortgage	N.A.	-0.254 (0.163)	-0.205 (0.225)	-4.2 (5.7)
Log loan amount	N.A.	-0.285*** (0.052)	0.026 (0.076)	1.9 (1.9)
Constant	N.A.	7.612*** (0.757)	4.7*** (1.182)	N.A.
R2	0.17	0.08	0.10	0.098
N	1,730	1,726	283	870

Significance levels: ***p<0.01; **p<0.05; *p<0.1

Note: Since the results of regression 1 and 3 are presented in percentage points, we rounded the numbers to one decimal place instead of three (reg. 2).

Table A2. Financial literacy and the probability of mortgage acquisition (reg. 1.1), the interest rate on the mortgage (full sample - reg. 2.1.1; sample limited to households acquiring a mortgage in 2016-2017 – reg. 2.2.1), and the probability of mortgage refinancing (reg. 3.1) following the financial literacy test – robustness check with different specification of financial literacy

	Reg. 1.1 Marginal effect (standard error)	Reg. 2.1.1 Marginal effect (standard error)	Reg 2.2.1 Marginal effect (standard error)	Reg. 3.1 Marginal effect (standard error)
Single question (Suppose you have $200 in a savings account. The account earns 10 percent interest each year. How much would you have in the account at the end of two years?)	5*** (1.5)	-0.222** (0.089)	-0.202* (0.111)	4.5 (3)
R2	0.1738	0.0764	0.0988	0.094
N	1,800	1,740	286	880

Significance levels: ***p<0.01; **p<0.05; *p<0.1

Note: Since the results of regression 1 and 3 are presented in percentage points, we rounded the numbers to one decimal place instead of three (reg. 2); the results were controlled for gender, age, education, marital status, race, ethnicity, income, savings, employment status, BMI, Pahl's index, geographic location, mortgage amount (only reg. 2.1, reg. 2.2., and reg. 3), variable interest rate indicator (only reg. 2.1, reg. 2.2., and reg. 3)

Table A3. Financial literacy and the probability of mortgage acquisition (reg. 1), the interest rate on the mortgage (full sample - reg. 2.1; sample limited to households acquiring a mortgage in 2016-2017 – reg. 2.2), and the probability of mortgage refinancing (reg. 3) following the financial literacy test in groups of households split by marital status, presence of savings, and income level

	Reg. 1 Marginal effect (standard error)					
	Married	Other marital status	With savings	No savings	High incomes	Low incomes
Financial literacy test score	4.6* (2.5)	2.8** (1.1)	6.6*** (1.8)	-0.4 (1.1)	6.5*** (2.2)	1.3* (0.8)
R2	0.1263	0.1711	0.1371	0.1349	0.0739	0.1970
N	503	1213	970	603	733	997
	Reg. 2.1 Marginal effect (standard error)					
	Married	Other marital status	With savings	No savings	High incomes	Low incomes
Financial literacy test score	-0.201** (0.080)	-0.170 (0.119)	-0.202*** (0.070)	-0.268 (0.218)	-0.201*** (0.070)	-0.115 (0.196)
R2	0.0594	0.1784	0.0808	0.1939	0.0780	0.1260
N	1319	407	1546	180	1422	304
	Reg. 2.2 Marginal effect (standard error)					
	Married	Other marital status	With savings	No savings	High incomes	Low incomes
Financial literacy test score	-0.179* (0.104)	-0.114 (0.236)	-0.205** (0.095)	STS	-0.174* (.099)	STS
R2	0.1032	0.5666	0.1216	STS	0.1296	STS
N	238	45	260	23	255	28
	Reg. 3 Marginal effect (standard error)					
	Married	Other marital status	With savings	No savings	High incomes	Low incomes
Financial literacy test score	3.4 (3.0)	10.5** (4.6)	5.1** (2.5)	3.1 (7.3)	5.1** (2.6)	4.2 (5.2)
R2	0.0811	0.1978	0.0962	0.3466	0.1036	0.3034
N	632	175	753	102	726	134

STS – sample too small – standard errors not computed.

Significance levels: ***p<0.01; **p<0.05; *p<0.1

Note: Since the results of regression 1 and 3 are presented in percentage points, we rounded the numbers to one decimal place instead of three (reg. 2); the results were controlled for gender,

age, education, marital status, race, ethnicity, income, savings, employment status, BMI, Pahl's index, geographic location, mortgage amount (only reg. 2.1, reg. 2.2., and reg. 3), variable interest rate indicator (only reg. 2.1, reg. 2.2., and reg. 3)