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Highlights

- We study the effect of a reform abolishing prepayment fees and simplifying mortgage refinancing in Italy.
- Although important gains were in place, only 13 percent of fixed-rate borrowers refinanced their loan.
- The less educated, the poor, immigrants, women, and households in the south of Italy are less likely to refinance their loan.
- Financial literacy and an educational background in economics or finance increase the refinancing propensity of borrowers.

Financial Illiteracy and Mortgage Refinancing Decisions

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We analyze the effect of an exogenous shock to the Italian mortgage market, where a reform has abolished prepayment fees and simplified mortgage refinancing, making it a virtually cost-free decision for households. This law, along with the considerable drop in market interest rates, has generated important gains for fixed-rate borrowers, which we quantify at up to 15 percent of the principal balance. Nevertheless, only about 13 percent of borrowers have locked in this opportunity. We study the relationship between this sluggish behavior and their level of financial literacy.

JEL Classification: G14; G32.

Keywords: Mortgage refinancing; Financial literacy; Household finance.

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1. Introduction

In 2007 the Italian government passed new legislation, granting households the right to refinance their mortgage at no cost, regardless of the contractual prepayment fee that had been agreed upon at the time of mortgage origination. Other than prepayment fees, all other costs associated with mortgage refinancing (e.g., notary fees, registration fees, etc.) were also eliminated. This intervention has produced a break in the previously rigid Italian mortgage market, where the overall cost of refinancing was extremely high (from 5 to 8 percent of the principal). Consequently, fixed-rate mortgage (FRM) borrowers have experienced the opportunity to cash in a sizeable gain from the sharp interest rate drop which has since occurred.

In this paper, we employ a large proprietary dataset of approximately 147 thousand FRMs issued by a primary Italian bank, and we estimate that the cross-section average refinancing gain for fixed-rate borrowers has reached 15 percent of the average principal balance. This figure corresponds to a €112 reduction of the monthly instalment and an annual saving slightly lower than the average monthly income in our sample (about €1.5k). Despite this important gain, we document that only a scant minority of FRM borrowers (about 13 percent) has taken advantage of this opportunity in the 8 and a half years following the introduction of the new legislation. Two main possible financial motivations may explain this sluggish behavior.

First, the economic convenience of refinancing an FRM only arises if the new prevailing market conditions are more favorable than those at the loan's inception. This gap depends on both the evolution of base interest rates and credit spreads, and the point in time at which the mortgage originated. For approximately one-tenth of households in our sample this difference is on average negative. Second, since both the subprime and the European sovereign debt crises fall in our investigation period, we capture the effects of the credit crunch, when banks generally tightened credit supply. A stricter lending policy might have excluded some borrowers who would otherwise have been willing to capture the gain offered by the new law.

Other than financial rationales may have partially driven this phenomenon. For instance, some

borrowers may have been reluctant to move their mortgage elsewhere, as this decision would probably deteriorate their relationship with their financial institution and its employees. This might not be a strong argument in countries characterized by a low level of relationship lending, but it plays a very important role in Italy, where about 80 percent of households use only one bank (Brunetti *et al.*, 2016). Also, although the refinancing process introduced by the new reform is straightforward and not time-consuming, some individuals might be discouraged due to the perceived hassle and an over-estimation of the paperwork involved.

Even though all these motivations partially explain why some households have not refinanced their mortgages, the remarkably low number of refinancers remains a puzzle. Also, this evidence raises serious doubts about the effectiveness of the new reform, which *de facto* did not produce the tangible impact that it was aimed at having. We argue that households have underestimated the effective refinancing gain in place. In fact, the existence of the new refinancing opportunity does not ensure that households can understand its economic repercussions.

Appraising the refinancing gain represents a complex undertaking for an average household, and only financially literate borrowers may have fully perceived the value of the new opportunity. If this is generally true, it becomes even more important in our setting, as Italy exhibits one of the lowest levels of financial literacy among the industrialized countries. For instance, in July 2014 the OECD released the results of the Programme for International Student Assessment (PISA) on financial literacy, the first large-scale study to assess the financial literacy of young people (i.e., 15-year-old students from 18 countries). The results showed an alarming level of financial illiteracy in Italy, ranking 17th (just above Colombia), and in the very last position among the 13 participating OECD countries. In this paper we find that the sluggish refinancing behavior is strongly driven by socio-demographic characteristics and household financial illiteracy. We show that the less educated, the less wealthy, immigrants, women, and households living in less developed areas of Italy are more likely to miss this favorable refinancing opportunity. Also, and strikingly, borrowers holding specific financial knowledge (e.g., a college degree in economics or finance), or a deeper financial experience

(of banking products and other financial services), are more likely to timely exercise the refinancing option.

This paper contributes to the bodies of literature on financial literacy and mortgage refinancing. The detrimental effects of poor financial literacy on household financial decisions are well recognized. An individual's inability to understand even simple financial problems leads to non-negligible economic losses and inefficient behavior. The level of financial literacy is highly correlated with an individual's socio-demographic characteristics. Less educated and low-income individuals, women, and immigrants are less able to correctly answer unsophisticated financial questions, and act irrationally when it comes to making financial decisions (Campbell, 2006; Lusardi, 2008; Calvet *et al*., 2007, 2009; Lusardi and Mitchell, 2008; Jappelli and Padula, 2013).[1] The saving and investment behavior of households are deeply affected. Insufficient accumulation of wealth before retirement (Lusardi and Mitchell, 2007), poor participation in stock markets (van Rooij *et al*., 2011), choice of high-cost financial instruments (Hastings and Mitchell, 2011), inadequate portfolio diversification (Guiso and Jappelli, 2009), borrowing at higher cost (Lusardi and Tufano, 2009), and over-indebtedness (Gathergood, 2012), are all examples of sub-optimal economic choices attributable to poor financial literacy. In a very recent paper, Brown *et al*. (2017) show that "growing up without finance" has relevant and negative implications on financial inclusion and hinders an individual's financial health.

The literature on mortgage refinancing suggests that fixed-rate borrowers should refinance their loans whenever the present value of future interest savings from lower interest rates compensates refinancing costs, including the time value of the refinancing option (Bennett *et al*., 2001; Agarwal *et al*., 2013). The empirical behavior of fixed-rate borrowers is instead less clear-cut, as borrowers do not generally follow this refinancing rule (Green and LaCour-Little, 1999; Agarwal *et al.*, 2016), prepaying their loan when it is not optimal (Chang and Yavas, 2009), and failing to prepay when it

[1] Very interestingly, however, Cronqvist and Siegel (2014) show that for a number of investment biases (such as insufficient diversification, excessive trading, and the "disposition effect") genetic differences explain up to 45 percent of the variation across individual investors, after controlling for socio-demographic characteristics. Their results demonstrate that an individual's choices (and in particular financial mistakes) are (also) caused by innate and evolutionary genetic factors.

would be optimal (Giliberto and Thibodeau, 1989). Active refinancers are found to be younger, better-educated, white individuals with high-value houses (Campbell, 2006). Keys *et al*. (2016) and Andersen *et al*. (2015) provide further evidence of late mortgage refinancing in the US and Danish mortgage market, respectively, confirming that age and wealth increase refinancing inertia, whilst education and income operate in the opposite direction. Lack of financial sophistication leading to refinancing mistakes is also documented in a recent paper by Agarwal *et al*. (2017). Non-financial drivers also affect the likelihood of mortgage refinancing. Maturana and Nickerson (2018) show that peer effects reduce informational frictions and enhance mortgage refinancing activity. Johnson *et al*. (forthcoming) show that suspicion of the underlying motives explains why borrowers often reject a refinance offer sent by financial institution, and hence miss out a profitable refinancing opportunity.

Unlike the existing literature, our study leverages on a shock which occurred in Italy in 2007, that is the introduction of new legislation on mortgage refinancing. This event has to be considered as unique for the following reasons: (a) the new legislation has cancelled the refinancing fees which were previously in force, as well as any other related cost; (b) the large interest rate drop that followed, combined with the absence of a refinancing cost, has provided FRM borrowers with a highly profitable opportunity; (c) in spite of this profitable opportunity, the reform has mostly been ineffective, as only a small proportion of FRM borrowers have effectively refinanced their loans. Combining these elements produces a clean environment for testing the determinants of sub-optimal refinancing decisions.

The remainder of the paper is organized as follows. The next section overviews the Italian market for mortgages and describes the new legislation passed in 2007. Section 3 details our research methodology. Section 4 presents our empirical findings. Section 5 contains a number of robustness checks. Finally, section 6 concludes.

2. Legal framework on mortgage refinancing

On February 1, 2007 a new law entered into force in Italy, with the aim of promoting

competition and strengthening consumer rights. A significant innovation introduced by this decree (7/2007, subsequently ratified as law 40/2007), called "Decreto Bersani" after the name of the minister who proposed it, is greater flexibility in the mortgage market. Before 2007, the Italian mortgage market was extremely rigid compared to other European countries, as both prepayments and renegotiations were exceptionally rare.[2] Italian banks used to discourage borrowers from these practices through high fees for early redemption. A report published by the European Central Bank (2009) shows that only 1 percent of loans for house purchase were subject to early repayment in 2007, *vs*. 6 percent on average for the Euro area. Since 2007 was the first year in which the Italian mortgage market was liberalized, this percentage is expected to be far smaller in the earlier years. Anecdotal evidence supported by some bankers we have interviewed suggests that before 2007 both early redemption of a mortgage (with the aim of achieving more favorable economic conditions with a new lender), or renegotiation of mortgage provisions with the original lender, were very unusual practices. For a standard fixed-rate mortgage of €100,000 (roughly the median amount in our sample), the total completion costs attached to mortgage refinancing (consisting of prepayment fee, application fee, mortgage registration tax, and notary fees) may have reached 5 to 8 percent of the value of the mortgage, making mortgage refinancing an economically unattractive choice.

The new legislation in force since 2007 has simplified mortgage refinancing, eliminating prepayment fees, and introducing the so-called *subrogation*. Thanks to this right, borrowers now have the opportunity to switch from the original bank to another financial institution, without having to redeem the old mortgage and register a new one. The borrower is only required to notify the previous bank of this change, and the financial institution can neither oppose this decision, nor request any repayment fees, even if they are contractually applicable. When the mortgage is subrogated, the new market conditions apply, and the fixed-rate borrower can benefit from a decrease in interest rates with the new bank.[3] In this regard, the market for mortgage refinancing is now similar to the US, where

[2] In the US refinancing a mortgage is instead much more common. According to Agarwal *et al*. (2016), "*[r]efinancing a mortgage is as American as apple pie*." The authors report that 52 million new mortgages were taken out in the US over the period 2000-2009, and 71 million mortgages were issued to refinance existing ones.

[3] More precisely, according to the new legislation, (a) no penalty fee is applicable should the old mortgage be subrogated, i.e. moved to another financial institution without modifying the principal amount and the maturity. Also: (b) all new

borrowers are not subject to any prepayment fee. Instead, the usual practice in Europe (with the notable exception of Denmark) is that FRMs are subject to a prepayment penalty (in some countries, such as France and Spain, this fee is capped).

3. Data and preliminary evidence

3.1. Data

We examine the universe of fixed-rate mortgages issued by a primary Italian bank in the period from January 1, 2003 to June 30, 2009, and we investigate the refinancing opportunity of borrowers from the introduction of the new mortgage legislation (February 2, 2007) up to the end of June 2015. Figure 1 illustrates the relevant dates for the empirical analysis.

[Insert figure 1 about here]

We use two sources of proprietary data. The first set of data comprises loan-level data, providing information on both mortgage (contractual) and borrower (socio-demographic) characteristics. The second set profiles the level of knowledge and financial experience (i.e., financial literacy) of the borrowers.

The first dataset includes full information on fixed-rate domestic mortgages provided to households in Italy from 2003 to the end of June 2009, for a total of about 190,000 loans.[4] From this dataset we exclude (a) mortgages with favorable conditions for bank employees, (b) non-performing mortgages,[5] and (c) loans transferred (subrogated) from other institutions, as for these mortgages (1)

mortgage loans, originating after 2007, must be free of any prepayment penalty, and (c) old mortgage loans, originating before 2007, must have their maximum prepayment penalty automatically reduced to an amount set forth by the law, with a further reduction for mortgages close to expiry. The maximum prepayment penalty is equal to 0.5 percent of the principal for loans originating before 2001, with a reduction to 0.2 percent and 0 percent for mortgages maturing in three years and two years or less, respectively. Loans originating after 2001 can be charged a maximum prepayment fee of 1.9 percent, but if they expire in three years and two years or less, the fee drops to 0.2 percent and 0 percent, respectively.

[4] The same source also includes adjustable-rate mortgages (ARMs). We use this information in figure 2, when comparing the time-varying proportion of FRMs to ARMs.

[5] This category includes (a) bad loans (the borrower is insolvent), (b) sub-standard loans (the borrower is facing temporary difficulties in paying their instalments), (c) restructured loans (the bank has agreed to reschedule deadlines, or reduce interest rates due, accepting a loss due to the borrower's deteriorated conditions), and (d) past due (exposures other than those

we lack information on the time of inception, and (2) they can be considered mortgages which have already been refinanced. We also filter out (d) mortgages with incomplete information on basic mortgage characteristics (i.e., loan amount, maturity, loan-to-value ratio, and contractual interest rate), and (e) a small number of mortgages that have been refinanced within the bank, for which we are not able to trace the refinancing date. Data screens leave us with 146,222 FRMs. Variables covered can be classified into two categories.

(a) Mortgage-specific information, comprising the loan amount, its duration, the base rate (i.e., the swap rate, Eurirs), the credit spread, the loan-to-value (i.e., the ratio between the mortgage principal and the appraised value of the real property), the number of guarantors other than the borrower, details on the location of the property (at the level of the zip code), and details on the location of the bank branch where the mortgage originated (at the level of the zip code).

(b) Borrower-level information, including gender, occupation, monthly net income (for a subset of about 27,000 observations),[6] wealth segmentation,[7] and details on date and place of birth and nationality. From this source we do not possess the level of education (*Graduate* dummy), but we do infer it from the borrower's occupation.[8]

To investigate the refinancing opportunity enjoyed by FRM borrowers since the introduction of the new legislation (on February 2, 2007), we track the status of these loans until the end of June

classified as bad, sub-standard or restructured, that are past due for more than 90 days on a continuous basis). This classification, provided by the Italian bank regulator (Bank of Italy), has now been harmonized (since January 2015) to meet European Banking Authority standards, and the three sub-categories of non-performing loans are: (a) bad loans, (b) unlikely-to-pay exposures, and (c) overdrawn and/or past due exposures. In Italy (as in many European countries) mortgages are recourse loans.

[6] Since information on the borrower's income is only available for a subset of observations, we impute this variable extending it to the full dataset. To do this, we run a median regression of the reported net income on 18 occupation dummies (describing the profession of the borrower), the gender of the borrower, the age, and the geographic region, for the subset of about 27,000 observations for which net income is available. We then predict the net income for the complementary portion of our dataset for which the net income is not available. All coefficients from the median regression are statistically significant at the 1 percent level.

[7] We maintain the bank's client segmentation: individuals with total financial assets of less than €100,000 are classified as "mass market," those owning a total wealth of €100,000 to €500,000 are classified as "affluent," and clients with a total wealth higher than €500,000 are classified as "private."

[8] The correspondence between occupation and education is one-to-one for some professions (e.g., physician, teacher, magistrate, etc.). For some other professions (e.g., lawyer, architect, public accountant, engineer, etc.), it is mandatory to join specific associations for practice, and a university degree is compulsory to obtain association membership. For other occupations, we infer the higher education level when the definition "director," "manager," or "executive" is present within the profession description. Residually, we set the *Graduate* dummy to zero. This procedure conservatively underestimates the number of individuals with a university degree.

2015 (this period is labelled as the "refinancing propensity analysis" in figure 1). In particular, we detect whether and when the mortgage has been subrogated (i.e., transferred to another bank). Also, for the length of the same period we collect some mortgage-specific information of newly issued FRMs (that is, amount, duration, base rate, credit spread, and geographical origin at the level of zip code). This additional data is employed to estimate the potential (time-varying) fixed rate applied to old mortgages in case the borrowers decided to subrogate them, and therefore to measure the refinancing gain.

Besides our main dataset, we obtain information on the level of financial literacy of a subset of borrowers from the Markets in Financial Instruments Directive (MiFID) questionnaire. The MiFID directive (2004/39/EC) has been in force since November 2007, and since the January 3, 2018 a newer version has been applied, called MiFID II. The aim of this directive is to protect retail investors, requiring banks to assess their client's knowledge and experience related to investment in financial instruments. As a consequence, every bank must require its clients to fill out a questionnaire before allowing them to submit any purchase or sale order. The questionnaire includes questions on a client's investment experience, knowledge of financial products, and risk appetite. A sample of the questionnaire is reported in appendix 1 (for brevity, we only report the fields related to the level of financial literacy that we use in our analysis). The directive imposes the assessment of financial literacy only for investment activities. Mortgage borrowers are not directly affected by the MiFID, and they do not have to fill out the questionnaire before taking on their loan. However, it is not uncommon for households to keep their investments (if any) under management with the same bank where they have a borrowing relationship, especially in Italy where about 80 percent of households use only one bank (Brunetti *et al*., 2016). From the same bank we collect information on MiFID questionnaires for those clients having both a FRM and a financial portfolio. Relative to our mortgage sample of 146,222 observations, we retrieve questionnaires for 15,254 borrowers, and we obtain information on:

(a) the self-declared level of knowledge of different asset classes which are directly related to the refinancing decision (i.e., fixed income, bank products, and financial derivatives);

(b) the self-declared level of experience (based on the number of trades in the last 5 years) of the same asset classes;

(c) personal characteristics, such as whether the borrowers have an educational background in economics, finance, or other related fields, whether they hold or have held in the past a working position in the financial services, and their risk propensity.

The first two sets of information are also broken down into further detail. Each of the three asset classes is divided into different types of instruments, and for every instrument the respondents have a four-notch scale to declare their level of knowledge and experience. Regarding the "knowledge," the respondent has to declare a level from 0 (none) to 3 (high), while for "experience" the respondent reports the number of past transactions of every financial instrument according to the following clusters: 0, 1 to 3, 4 to 6, or higher than 6. Consistent with the "knowledge" variable, we label "experience" as 0 (none) if the respondent has declared no past transactions, to 3 (high) if the number of past transactions is higher than 6. To construct a measure of financial knowledge (*Awareness*) and financial experience (*Experience*), for each of the three asset classes we average out the responses provided by the borrower across the sub-levels. For instance, the debt (fixed income) asset class is divided into four sub-classes (Treasury, corporate, structured, and subordinated bonds). We measure knowledge and experience of fixed income products (*Fixed Income Awareness* and *Fixed Income Experience*) with the average of the score attributed to each of the four sub-classes by the respondent. Borrowers' personal characteristics are described with dummy variables, such as *Economics Background* (an educational background in economics, finance, or a related field), *Financial Expertise* (the current or past job is in the financial services), and *Risk Averse* (the risk propensity is defined as "prudent" or "cautious", instead of "balanced" or "dynamic").

Finally, we gather market data on interest rate swap (Eurirs) and Euribor yield curves (from Thomson Reuters Datastream), and statistical data on population divided by geographical area, at the level of the zip code (from the Italian National Institute of Statistics, ISTAT).

Our mortgage collection period (6.5 years in length) is representative of very different economic conditions. During this time span the economy has gone through an expansion, followed by a downturn due to the subprime crisis. Interest rates and the number of new mortgages have experienced large intertemporal variation too. To study the refinancing propensity of borrowers we track the mortgages in our sample up until June 2015, i.e. for about 8 and a half years since the introduction of the new mortgage legislation. In the course of this long time span we document an important change in the funding cost, with a general reduction of interest rates and a resulting increase of refinancing gain.

3.2. Preliminary evidence

Figure 2 shows the number of FRMs in our sample as a function of the quarter of initiation, compared to the number of ARMs and the difference between the average fixed rate and the average floating rate, by quarter.

[Insert figure 2 about here]

The total number of mortgages registers an increase from the first quarter of 2003 to 2007. Afterward, we document a steady trend, followed by a severe fall during the second part of 2008, and particularly in the first half of 2009. Both the upward and the downward movements can be mostly explained by the real estate bubble and the following subprime crisis. As for the total number of new mortgages, the ratio of ARMs to FRMs is also time dependent. The portion of FRMs increases after 2005, and from 2007 it becomes prevalent. The rise of short-term interest rates has progressively induced new borrowers to prefer FRMs, as the term spread is one of the most important determinants

in the choice of the mortgage type (Campbell and Cocco, 2003, 2015; Campbell, 2006; Koijen *et al*., 2009). Toward the end of 2008, as the yield curve flattens, the proportion of FRMs reaches its peak.

Figure 3 displays the behavior of long-term fixed interest rates from 2003 to the first half of 2015.

[Insert figure 3 about here]

The average base rate (i.e., the Eurirs) for newly issued mortgages is around 5 percent in early 2003, it slides down to 3.5 percent in mid-2005, then it reverts to the initial starting point in 2007 (when the mortgage reform enters into force), and it progressively decreases from the third quarter of 2008 to the end of the period, when it reaches 1 percent. This large drop in the base rate has been partially counterbalanced by the widening of credit spreads following the subprime crisis and, more important, the European sovereign debt crisis. This pattern is evident from figure 3, where the average mortgage fixed rate (i.e., base rate plus credit spread) is also plotted. In particular, we note that at the end of 2011 the mortgage fixed rate increases despite a declining Eurirs, due to rapidly increasing credit spreads. However, even considering credit spreads, figure 3 shows that FRM borrowers have experienced two major profitable opportunities for refinancing their loans. The first sharp decline in FRM rates occurred in the second half of 2009 and in 2010, and the second from 2013 up to the end of the period we analyze. The option to refinance at no cost represents a valuable opportunity for a mortgage borrower. For example, in 2015 a hypothetical borrower who refinances a mortgage taken up 8 to 12 years before cashes in a gain of 250 basis points.

3.3. Summary statistics

Table 1 depicts the descriptive statistics of our sample, divided by (a) mortgage-specific variables and market conditions, (b) borrowers' socio-demographic characteristics and breakdown of geographical areas, and (c) proxies of financial literacy.

[Insert table 1 about here]

The dummy variable *Refinancers* identifies borrowers who have taken advantage of the more favorable market conditions and have refinanced their mortgage. From table 1 it is evident that only a small fraction of borrowers have decided to refinance their loan, i.e. 18,503 out of 146,222 mortgages. This scant proportion is puzzling if we consider the potential refinancing gain in place. We quantify this benefit, at borrower and quarter level, as the present value of future instalments from the original mortgage (at the contractual fixed rate) minus the present value of future instalments according to potential fixed rate prevailing at each quarter, considering an amortized mortgage with constant instalments. To compute the present value of the cash flow stream at each quarter we use the prevailing zero-curve up to the mortgage maturity, i.e. the curve of Euribor spot rates bootstrapped from the Eurirs rates. Since the fixed rate chargeable to each refinancer at each quarter is unobservable, we infer it by adding a synthetic credit spread to the base Eurirs rate with a maturity equal to the residual duration of the mortgage. Therefore, for each quarter we estimate this synthetic credit spread using the predicted values from an OLS regression of the credit spread from newly issued mortgages on mortgage specific characteristics (i.e., loan amount, duration, and mortgage location, that is the North, Center, or South of Italy). Although for about 10 percent of borrowers this gain is negative over the entire time period, i.e. from February 2007 to the end of June 2015, the average figure is 5.1 percent of the residual balance, equivalent to €5,431, with a peak of about 15 percent in the last quarter of 2014. Based on the average mortgage in our sample, a 15 percent refinancing gain corresponds to a present value of almost €17,000, and a €112 reduction of the monthly instalment. Therefore, the annual saving is roughly comparable to the average monthly income in our sample (about €1.5k). Table 1 reports the descriptive statistics of *Positive Refinancing Gain*, a dummy variable which detects the positive refinancing gain in place. The cross-sectional average over the time is close to 70 percent (73.5 percent in median), meaning that for 70 percent of the average mortgage residual life there is a profitable refinancing gain in place. The table also reports the descriptive statistics of *Number of Profitable Quarters*, which counts the number of quarters since the mortgage originated in which there has been a profitable refinancing opportunity (i.e., a positive refinancing gain). The cross-sectional average over time of this figure is 9.3 quarters. This evidence

suggests that the refinancing gain has significantly persisted overtime, but borrowers have behaved sluggishly, not immediately exploiting it. The median mortgage in our sample amounts to €100,000, expires in 20 years, has an LTV of about 67 percent, and shows no guarantors other than the borrower. In terms of market conditions, the base (swap) rate at origination has experienced significant variability, ranging from a minimum of 2.7 percent to a maximum of 5.1 percent, with a negatively skewed distribution (mean 4.5 percent, median 4.7 percent). We also report the mortgage fixed rate at inception. The average (and median) contractual rate is 5.6 percent, resulting in an average credit spread over the base rate of approximately 110 basis points. It is worth noting that from 2003 to 2009 the fixed rate showed a very large variability, ranging from a maximum of 8.2 to a minimum of 3.7 percent.

In terms of demographic characteristics, table 1 shows that the average borrower is about 39 years old, and earns an after-tax monthly income slightly below €1,500. The reported net monthly income is marginally larger than the average net income of Italian households (€1,239, source: Italian National Institute of Statistics, ISTAT, 2008). However, this difference is expected, as mortgage borrowers are likely to have higher wealth and income than the average population. About one tenth of the borrowers in our sample are classified as "wealthy," i.e. they own a portfolio of total financial assets worth more than €100,000. Two thirds of our borrowers are male, 12.6 percent of them have reached college graduation, and about 10 percent are immigrants. The same panel shows the geographical dispersion of borrowers. More than half of mortgages are located in the North of Italy, the more industrially developed area of Italy.

The second panel reports financial literacy proxies (ranging from a minimum of 0 to a maximum of 3) drawn from the MiFID questionnaires. The first three variables (*Awareness*) provide information on the self-declared level of knowledge of fixed income instruments (such as Treasury and corporate bonds), bank products (such as certificates of deposit and repos), and financial derivatives (such as warrants, options, and futures). As expected, the knowledge of sophisticated financial derivatives is quite low, as the average figure is 0.2 out of 3. On the contrary, households

seem to be more familiar with fixed income and bank products, showing an average (median) score of 1.8 (2.0) and 1.5 (1.3), respectively. Looking at the quartiles, in both cases at least three-fourths of households declare some (low, since the score is close to 1) knowledge of these instruments. The next three variables (*Experience*) report the level of trading experience on the same asset classes. Insights are in line with the level of knowledge. Very few respondents have traded in financial derivatives, whilst investment in bank products or in the bond market is more common. If we compare the *Awareness* variables to the *Experience* variables we note that respondents declare more familiarity with these instruments than trading practice, the former being on average roughly twice as much as the latter. From the MiFID questionnaire we also profile borrowers for their investment risk appetite and past exposure to financial instruments due to profession or studies: 9.3 and 3.7 percent of respondents have an educational background (college degree) in finance or economics (*Economics Background*), and have worked in the financial services (*Financial Expertise*), respectively. Roughly one third of individuals self-describe as risk averse.

MiFID profiling is mandatory for bank clients who have financial investments under management, and therefore it does not apply to the majority of mortgage borrowers. For this reason, the sample of individuals who filled out the questionnaire may not be considered as representative of the population of mortgage borrowers. Table 2 compares the MiFID and the non-MiFID sub-samples.

[Insert table 2 about here]

The most apparent difference concerns the level of wealth and the percentage of immigrants. Households belonging to the MiFID sub-sample are wealthier, as about one third of them own more than €100,000 in financial assets, *vs*. 8.4 percent of borrowers in the residual sub-sample, and the percentage of immigrants is lower (6.4 *vs*. 10.3 percent). In terms of other socio-demographic characteristics, although differences are statistically significant, the gap is smaller. The last two columns of table 2 show that the statistical significance somewhat weakens after controlling for mortgage specifications.

4. The refinancing decision

We first compare the subsamples of refinancers *vs.* non-refinancers. As our interest is in the effects of individual attributes on refinancing decisions, we also present a propensity score matching analysis, as the choice of mortgage specifications may be non-random across socio-demographic characteristics. Next, we present a multivariate analysis and we estimate a linear probability model for the likelihood of mortgage refinancing, including household characteristics, mortgage-specific attributes and exogenous market conditions.

4.1. *Refinancers* vs. *non-refinancers*

Table 3 compares the subsamples of 18,503 refinancers *vs.* 127,719 non-refinancers.

[Insert table 3 about here]

In terms of mortgage characteristics, refinanced mortgages are larger, longer-dated, exhibit higher LTV, a lower number of guarantors, and appear to be slightly more expensive. Although these variables are statistically significant, the difference between the two subsamples is not markedly large. Only the average amount (€130,963 *vs.* €109,948) and the maturity (23.6 *vs.* 21.7 years) are considerably greater for refinanced loans, while LTV and the contractual fixed rate of refinanced mortgages exceed the corresponding figure for non-refinanced mortgages by about 4 percent and only 4 basis points, respectively. These differences are expected, as a larger amount and a longer duration increase the borrower's refinancing gain following an interest rate drop. Interestingly, however, refinancers do not appear to have taken up the loan in a more unfavorable market momentum.

The next set of variables focuses on borrowers' personal characteristics and geographical distribution of mortgages. Refinancers appear to be rather different, as they are younger (36.7 *vs.* 39.0 year old), less wealthy, more likely to be men (70.9 *vs.* 67.6 percent), more educated (15.8 *vs.* 12.2 percent of graduates), and less likely to be immigrants (6.8 *vs.* 10.3 percent). These differences are in line with our expectations and previous literature, where it is shown that financial mistakes are more

common among women, the less-educated and older people, and immigrants (Agarwal *et al*., 2009; Calvet *et al*., 2007, 2009). Also, refinancers live in less densely populated cities, and they are less concentrated in the southern part of Italy.

Since borrowers' characteristics may self-select mortgage specifics, we compare the two subsamples after controlling for this effect. We match mortgage characteristics using a propensity score matching procedure, and the following variables: *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*. The significance of the average effect of treatment on treated (ATT) in table 3 confirms our previous insights. After controlling for mortgage and market characteristics between the two groups, we find that socio-demographic characteristics affect the propensity to engage in optimal mortgage refinancing. Refinancers are younger and better educated men, and they are less likely to be immigrants.

4.2. Refinancing propensity

In this section we refine our previous findings estimating a linear probability model for the likelihood of mortgage refinancing as a function of mortgage and socio-demographic characteristics, controlling for the potential positive refinancing gain and time fixed-effects. Table 4 reports the results of our regressions.

[Insert table 4 about here]

The evidence is consistent with our prior expectation of a positive relationship between refinancing propensity and socio-demographic characteristics. The variables describing mortgage and borrowers' characteristics largely confirm the insights from the univariate analysis. In short, refinancing propensity is positively affected by the size of the mortgage, the education and the geographical origin of the borrower, and negatively by the wealth and the income of the individual, along with the status of immigrants and the female gender. Table 4 also documents a negative relationship between refinancing activity and *LTV*. The sign of *LTV* could appear as counterintuitive,

as we might believe that a larger (and not a smaller, as we find) proportion of debt coverage makes the borrowers more willing to reduce their financing cost. However, as the size of the mortgage has been controlled for, a less pronounced recourse to debt means that the equity stake is larger. Mortgages showing higher LTV are therefore associated with lower creditworthiness. The negative sign of *Age*, *Ln(Income)* and *Wealthy* suggests that older and richer borrowers tend to miss the refinancing opportunity offered by the new law. These results are in line with those on refinancing inertia found in a recent study by Andersen *et al*. (2015) for the Danish market. The sign of *Age* and *Wealthy* might also be explained by the higher propensity of the young and the less wealthy to switch bank, even though caused by different motivations. The young are culturally more distant from a fiduciary relationship with their bank, whilst the less wealthy are also the least profitable clients. At the same time, it is also plausible that wealthier borrowers are offered attractive alternatives that keep these borrowers from changing banks. Other personal traits and geographical characteristics of the mortgage are important. In model 1, men and more educated individuals show about a 0.07 and 0.15 percent higher refinancing probability, respectively, while immigrants are 0.19 percent less likely to refinance their loans. Table 4 also confirms that residents in the northern and central parts of the country and living in less populated cities have a higher propensity to refinance. The former insight is intuitive, as the northern and central area of Italy has a higher *per capita* GDP, and also higher financial literacy. Less clear-cut is the negative effect of the size of the urban area where the borrower lives. A possible explanation relates to the fact that the refinancing decision is triggered only if the borrowers can understand the economic benefit of it. After controlling for socio-demographic characteristics, we conjecture that the refinancing probability is larger in small cities since the information spreads there by word-of-mouth, and the imitation of neighbors and relatives is expected to drive individuals' behavior (similar to peer effects driving mortgage refinancing in the study of Maturana and Nickerson, 2018).

The regressions also control for two relevant explanatory variables. The first is the existence of a positive refinancing gain. As expected, the dummy *Positive Refinancing Gain* is positive and highly significant. It might be argued that not only the presence but also the size of the potential

refinancing gain matters and in turn triggers the refinancing decision. However, when we rerun our regressions replacing the dummy variable with the magnitude of the potential refinancing gain, it loses statistical significance. This evidence can be explained as follows. First, a time lag is reasonably observed from the moment the borrower realizes about the potential refinancing opportunity (when the refinancing gain is high), and the time the new mortgage is settled (refinancing date).[9] As a consequence of this time lag, the size of the refinancing gain can be expected to not be increasing and monotonic as the effective refinancing date approaches. Second, refinancers may have reacted to the refinancing gain in place in a heterogeneous way. Some borrowers may have refinanced their mortgage as soon as the gain appeared, hence missing out on larger savings possibly deriving from lower interest rates in the future. Some other borrowers may have postponed the refinancing decision in the hope of a further decrease in the interest rate, and finally exercise their option when the refinancing gain had passed its peak and is on its descending path. Both these situations lead to an *ex-ante* non-predictable relationship between the size of the refinancing gain and the refinancing decision (but obviously not between the refinancing decision and the positive refinancing gain in place). Finally, it is worth mentioning that our measure of refinancing gain is based on an estimated credit spread chargeable to each refinancer over time, and hence it only proxies the actual refinancing gain in place.

The second relevant variable is a proxy of the so-called "burnout," i.e. the gradual decline of the marginal number of refinancers within a pool of mortgages due to the large number of loans already extinguished. The origin of burnout lays in the heterogeneity of borrowers, who respond to an interest rate drop in different ways. If the pool of borrowers could be split up into "fast" and "slow" prepayers, as the time passes fast-prepayers would be "burned out," and the residual sample would be mostly composed of slow-prepayers, showing a natural smaller prepayment propensity. Given the tiny number of refinancers in our mortgage pool (less than 13 percent of the total), burnout should not be a concern with our sample. However, in the second and third model of table 4 we control for burnout

[9] From conversations with some bankers we report that the time lag is usually in a range between two to three months. After a client lodges a request for mortgage subrogation, the bank completes the process in approximately one month. However, before applying for mortgage subrogation the borrower needs to realize about the refinancing opportunity, potentially request and compare multiple loan offers, select the new bank, file for a mortgage application and get it approved.

using two different proxies. In model 2, as in Hall (2000), we use the *Number of Profitable Quarters*, i.e. the number of quarters with a profitable refinancing opportunity since the mortgage was originated. If burnout exists, this variable is expected to be negative and significant, as fast-refinancers are likely to quickly exit the mortgage pool as soon as a positive refinancing opportunity appears. In model 2 *Number of Profitable Quarters* turns out to be statistically insignificant. In model 3, as in Peristiani *et al.* (1997), we use the *Mortgage Age* and its square to proxy for burnout. While the squared variable is meant to absorb non-linearities, the number of months since a mortgage inception (*Mortgage Age*) should capture the declining trend in the number of refinancers. This variable is statistically significant, even though the sign is positive and not negative as we would expect if burnout were in place. Since our sample begins in 2003, the reform took effect from 2007, and the first relevant interest rate drop occurred toward the end of 2008, the first profitable refinancing opportunity of early mortgages in our sample arose from 2009 onwards, when they were somewhat old. Also, starting from 2009, newspapers have progressively covered the refinancing opportunity more extensively, and this visibility shock has contributed to the (modest) wave of mortgage refinancing. Regarding the squared variable, it exhibits a negative sign, and hence it is consistent with a deceleration of the mortgage refinancing rate, probably due to a progressively smaller proportion of fast-refinancers. If so, controlling for burnout is important. Still, the third model appears to be robust to this specification.

4.4. The role of financial literacy

Previous analyses have shown that individual attributes are important drivers in explaining the refinancing behavior of Italian borrowers. These findings suggest a causal relationship between poor financial knowledge and sub-optimal refinancing decisions. Immigrants, low income, low-educated and older individuals, and households living in the southern and less-developed area of the country are less likely to take advantage of a profitable refinancing opportunity. However, direct measures of financial literacy may have additional explanatory power over socio-demographic characteristics. In this section, we aim at shedding light on how the level of financial knowledge and

expertise contributes to driving optimal refinancing decisions. To investigate this matter, we leverage on the information obtained from the MiFID questionnaire, which profiles each household in terms of self-declared level of knowledge and past experience over a number of financial products. This source also allows us to control whether the borrowers have an educational background (college degree) in economics, finance, or a related field, if they have some professional financial expertise, and their level of risk aversion.

[Insert table 5 about here]

Table 5 estimates the mortgage refinancing propensity augmenting our previous analysis with proxies of financial literacy. For each model reported in table 4, we add the borrower's educational or professional financial experience (*Economics Background* and *Financial Expertise*, respectively), his/her risk aversion (*Risk Averse*), and two sets of variables measuring financial awareness and experience in trading financial instruments. For the level of knowledge and experience we consider investment in fixed income, bank products, and derivatives. The MiFID questionnaire is broader, and reports knowledge and experience of other products. However, we select those financial instruments which are more closely related to the mortgage refinancing decision, i.e. fixed income (as a FRM may be considered as a short coupon bearing bond), bank products (which proxy the familiarity of the investor to the banking practice, broadly including both investment and financing products), and financial derivatives (as the refinancing decision may be viewed as the exercise of an option). All these variables are interacted with the dummy *Positive Refinancing Gain*, as financial literacy should not increase the unconditional refinancing probability, but rather the refinancing probability conditional to a positive refinancing gain in place. All models show that a college degree in economics or finance increases the refinancing probability, and its explanatory power is additional over a generic university degree. Previous working experience in the financial industry and the borrower's stated risk aversion do not seem to be relevant. In terms of *Awareness* and *Experience* of

financial instruments, we note that only the latter plays a role. In particular, *Bank Products Experience* is positive and significant in all models.[10]

The measures of financial literacy we employ are naturally correlated, and therefore once we interact them with *Positive Refinancing Gain* as in table 5, it can be argued that collinearity problems arise. In table 6 we repeat the analysis adding a number of alternative models to ensure that our inference is unaffected.

[Insert table 6 about here]

Models from 1 to 3 consider one of the *Experience* variables at a time interacted with the dummy *Positive Refinancing Gain* (*PRG*) and no other interactions for *Economics Background*, *Financial Expertise*, and *Risk Averse*. Models from 4 to 6 consider one of the *Experience* variables at a time (not interacted with *PRG*), and the three variables *Economics Background*, *Financial Expertise*, and *Risk Averse* interacted with *PRG*. Finally, model 7 only considers *Bank Products Experience* interacted with *PRG*, and no other financial literacy variables. We choose this variable as it proved to be positive and significant in all models of table 5. Table 6 shows that our results are extremely robust to this check: *Bank Products Experience* and *Economics Background* confirm their importance in increasing the mortgage refinancing propensity.

Including financial literacy variables in our analysis reduces the number of observations, and the resulting inference may be affected by this selection criterion. Results from table 2 suggest that the subsample of individuals who filled out the questionnaire is not representative of the population of borrowers in our sample. However, we argue that the likely selection bias strengthens rather than weakens our results. As financial literacy is poorer amongst low-educated and less wealthy individuals, the young, and ethnic minorities (Lusardi, 2008; Lusardi and Mitchell, 2008; Calvet *et al*., 2007, 2009), our MiFID subsample is likely to exhibit higher-than-average financial literacy.

[10] *Derivatives Experience* is negative and slightly significant. However, it should be noted from table 1 that this variable is equal to zero up to the third quartile. Also, *Derivatives Experience* is positively correlated with *Wealthy*, and we previously showed that the latter negatively affects mortgage refinancing.

Accordingly, the potential selection bias resulting from sampling highly-educated, wealthier, older individuals with a lower fraction of immigrants should act toward reducing the statistical significance of our financial literacy proxies. Accordingly, we believe that previous findings suggesting a role for financial literacy should be regarded as a conservative estimation of the real effect in place.

To corroborate this evidence, table 7 contrasts the financial literacy of individuals who did and did not refinance their mortgage, reporting simple and propensity-score matched differences. Propensity score matching controls for selection based on observable mortgage and socio-demographic characteristics. The variables used for matching are *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*, and socio-demographic characteristics, i.e. *Age*, *Income*, *Wealthy*, *Man*, *Graduate*, *Foreign*, *Population*, *North*, and *Center*. Considering *Awareness* and *Experience*, the difference between the two samples denotes a higher financial literacy among refinancers for all variables, with the exception of *Derivatives Experience*. Some of the distance between the two subsets weakens once the differences are corrected for mortgage-specific and socio-demographic attributes between groups. However, the three *Awareness* variables remain statistically significant (although two of them at the 10 percent level), and the experience of bank products confirms the result from the multivariate analysis. The effect of *Economics Graduate* is particularly strong (13.8 percent of refinancers *vs*. 8.9 percent of non-refinancers have an educational background in economics or finance), and this effect holds after controlling for mortgage and socio-demographic matching variables. *Financial Expertise* also has a positive effect on refinancers (4.7 percent *vs*. 3.6 percent), but ATT loses statistical significance.

5. Robustness

To confirm our previous results, we carry out a number of robustness exercises. First, we check whether the effect of socio-demographic characteristics and financial literacy is driven by ineligibility for refinancing the mortgage due to post-crises credit crunch and lower household creditworthiness. Less wealthy, immigrant, less educated and less financial literate borrowers might

not have refinanced their loans because they had become ineligible given the tighter post-crises credit requirements, and not due to their inability to understand the benefit in place. Second, since in our main analyses we drop from the sample 753 mortgages which have been refinanced within the originating bank (as we have no information on their refinancing date), it can be argued that the inference is affected by a selection bias. We provide some univariate evidence supporting the conclusion that this filter does not carry a relevant impact on the determinants of mortgage refinancing. Finally, we provide some robustness on the validity of our self-declared measures of financial literacy, as the literature has shown that self-assessed financial literacy is strongly but not perfectly correlated with intrinsic financial literacy (Agnew and Szykman 2005; Lusardi and Mitchell, 2014). For brevity, we report this exercise in appendix 2.

5.1. Ineligibility for refinancing

A possible caveat in interpreting our results consists in the complexity of discriminating non-refinancers due to their inability to anticipate the potential gain from those who were not eligible due to their poor creditworthiness. To this purpose we run two checks. The first excludes from the analysis the left tail of the distribution of households based on their creditworthiness, as proxied by the credit spread at mortgage origination. For the second check we conservatively estimate the refinancing likelihood on a restricted subsample of wealthy individuals, for whom the probability of qualifying as non-refinanceable should be insignificant. The results are reported in table 8.

[Insert table 8 about here]

The first approach involves sorting our observations by the credit spread at the loan origination and then running our baseline regressions excluding the lowest tenth and twenty-fifth percentiles in terms of credit quality, respectively. The rationale for this check is to verify whether our results are robust after excluding an increasing portion of poor quality loans, given the tighter mortgage supply. Regardless of the credit quality percentiles, the magnitude and statistical significance of the coefficients is in line with previous evidence. This confirms the effects of socio-

demographic characteristics, supporting the conclusion that financial literacy plays a role in explaining the refinancing activity.

As a more radical additional check, the last model restricts the analysis to the subsample of wealthy individuals (*Wealthy* = 1). Once again, no differences in significance and size of the regression coefficients are in place. This (very prudent) check should rule out the likelihood that the results of the multivariate analysis are driven by the borrowers' ineligibility to refinance, especially due to tighter credit requirements in the wake of the financial crises.

Table 9 presents the same robustness exercise on the models shown in table 5, which also include financial literacy proxies. The previous results are generally confirmed, with the only exception of *Economic Graduate*, whose significance weakens.

[Insert table 9 about here]

In addition to these robustness checks, it may be argued that the substantial run-up in real estate prices before 2008 and their decline in the post-European debt crisis period may have pushed the loan-to-value of some mortgages outside the required range. However, the housing price decline experienced in Italy is far less severe than that occurred in the US. The Italian house price index increased to about 130 in the first semester of 2008, starting from a level of 100 at the beginning of 2004, it then remained constant up to the end of 2011 and declined thereafter, but only reaching a minimum of about 115 in 2015, to slightly recover afterward (source: PricewaterhouseCoopers, 2016).

5.2. Refinancers within the same bank

The sample of 18,503 refinancers that we use in our analysis excludes 753 loans which have been refinanced within the same originating bank. These borrowers may have exploited the opportunity offered by the new reform and the more competitive mortgage market to renegotiate their loan with the originating bank, thus obtaining better conditions. Despite these mortgages contributing

to the refinancing phenomenon, from our sample we are not able to detect their refinancing date. This lack of information prevents us from using these loans in the multivariate analysis. Also, we can only trace these refinancers up to the end of June 2009. Neglecting these mortgages may impact the results of the multivariate analysis, unless these borrowers differ from non-refinancers in terms of the same socio-demographic characteristics we have previously presented.

[Insert table 10 about here]

To check whether refinancers within the same bank are different from non-refinancers, we compare the two samples and we also perform a propensity score matching analysis using mortgage characteristics as matching variables. From the results of table 10 we note that refinancers within the same bank are younger, less wealthy, and more likely to be male. They are also more educated, and less likely to be immigrants, when we inspect ATT differences. Finally, they are more concentrated in the northern part of the country. Overall, these statistics are in line with the univariate analysis of table 2, whose sign and statistical significance are confirmed when passing to the multivariate analysis. These results seem to indicate that refinancers within the same bank contribute to the refinancing propensity in no different way relative to the 18,503 refinancers considered in our main analysis.

6. Conclusion

In February 2007 the Italian government passed new legislation on mortgages, granting households the right to refinance their loans at no cost, as prepayment fees and other costs associated with refinancing (e.g., notary fees, registration fees, etc.) were abolished. This reform, along with the substantial drop in interest rates which occurred in the following years, has endowed households with the opportunity to refinance fixed-rate mortgages with important gains, which we quantify at up to 15 percent of the principal balance. This figure corresponds to a €112 reduction of the monthly instalment and an overall annual saving slightly lower than the average monthly income in our sample (about €1.5k). Despite this benefit, the new legislation has turned out to be mostly unsuccessful, as

only a modest minority of borrowers (about 13 percent) have taken advantage of this opportunity in the 8 and a half years since its introduction.

We believe that the lack of borrowers' ability to understand the law and a misjudged perception of its impact have a strong predictive power in explaining this suboptimal behavior. In fact, for individuals exhibiting a poor level of financial literacy, understanding the impact of the new reform and assessing the potential benefit exploitable is unlikely to be a trivial undertaking.

In this paper we provide evidence that financial literacy as well as socio-demographic characteristics contribute to explaining why only a scant minority of households have captured this profitable opportunity. More specifically, we document that financial literacy, proxied by the presence of a college degree in finance or economics, or prior experience in bank products, increases the likelihood of a loan being refinanced. Consistent with previous literature, we provide evidence that suboptimal borrower behavior is positively associated with the less educated, the poor, immigrants, women, and households living in less developed areas of the country.

Our findings convey policy implications. The effectiveness of a new reform for individuals should not be assessed without considering their actual understanding of the potential benefits. Conditional on the complexity of the reform, financial literacy is a crucial precondition for households to exploit these benefits. Investment in enhancing financial literacy is therefore essential, and should even come before legislative interventions in order to protect individuals from making sub-optimal economic decisions and financial mistakes.

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Appendix 1 – MiFID questionnaire

► **Knowledge and experience in investing**

	Knowledge What do you think is the level of your knowledge with respect to the following financial instruments? (0 = none, 1 = low, 2 = medium, 3 = high)				**Experience** How many purchases/subscriptions have you made with the following investment instruments in the last 5 years?			
	0	**1**	**2**	**3**	**0**	**1-3**	**4-6**	**>6**
Debt products								
a) Treasury bonds								
b) Corporate bonds and convertible bonds								
c) Structured bonds								
d) Subordinated bonds								
Equity products								
a) Stocks								
b) Other equity products								
Bank products								
a) Certificate of deposits								
b) Repurchase agreements								
c) Securities lending								
Funds								
a) Mutual funds								
b) Exchange traded funds								
c) Real estate funds								
d) Hedge funds								
Financial derivatives								
a) ETC								
b) Other certificates								
c) Equity and covered warrants								
d) Options and futures								

► **Level of education, professional experience in finance**

	Yes	**No**
Have you studied a field that deals with financial services?		
Do you have working experience in financial services?		

► **Risk propensity**

Which of the following goals corresponds to your risk propensity?

a) Very high return, with risk of a large loss
b) High return, with risk of a medium loss
c) Medium return, with risk of a medium/low loss
d) Low return, with risk of a low loss

Appendix 2 – Self-declared *vs*. actual measures of financial literacy

Agnew and Szykman (2005) and Lusardi and Mitchell (2014) (among others) show that self-declared measures of financial literacy overrate their actual levels. We break down financial literacy variables as a function of borrowers' socio-demographic characteristics. This check allows us to investigate how self-declared financial literacy is distributed among our sample of borrowers, and to compare these correlations with the relations shown in the literature for objective financial literacy variables.

[Insert table 11 about here]

Table 11 shows that older and wealthier borrowers exhibit a significantly higher self-declared financial literacy, and the same evidence is found for men, individuals with superior education, non-immigrants, and households located in Central and Northern Italy and in more populated cities. These conclusions hold in general, regardless of the financial literacy measure that we consider (i.e., *Awareness vs*. *Experience*). The same pattern is commonly observed when considering objective financial literacy metrics, and it is consistent across different countries (Lusardi and Mitchell, 2014, provide an extensive review, and Monticone, 2010, and Fornero and Monticone, 2011, study the Italian framework, in particular). Although in this paper we do not rely on objective financial literacy metrics, this very similar behavior with respect to socio-demographic characteristics of individuals leads us to conclude that their explanatory power should not be sensibly affected by this potential bias.

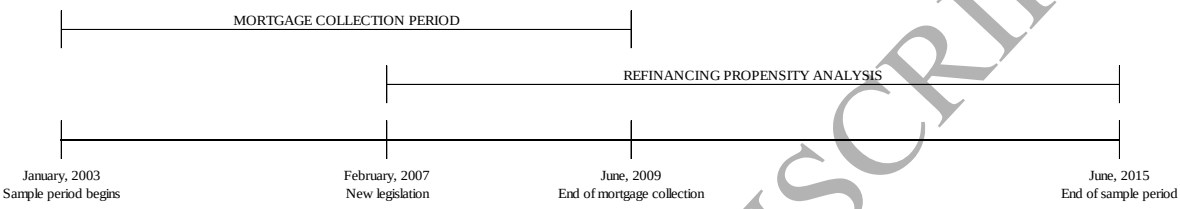

Figure 1—*Timeline of the research design*. The figure shows the relevant dates for the empirical analysis. From January 01, 2003, to June 30, 2009, newly issued mortgage loans are collected ("mortgage collection period"). The new legislation on mortgage refinancing entered into force on February 2, 2007. From this date to June 30, 2015, we track our sample of mortgages and analyze their refinancing propensity ("refinancing propensity analysis").

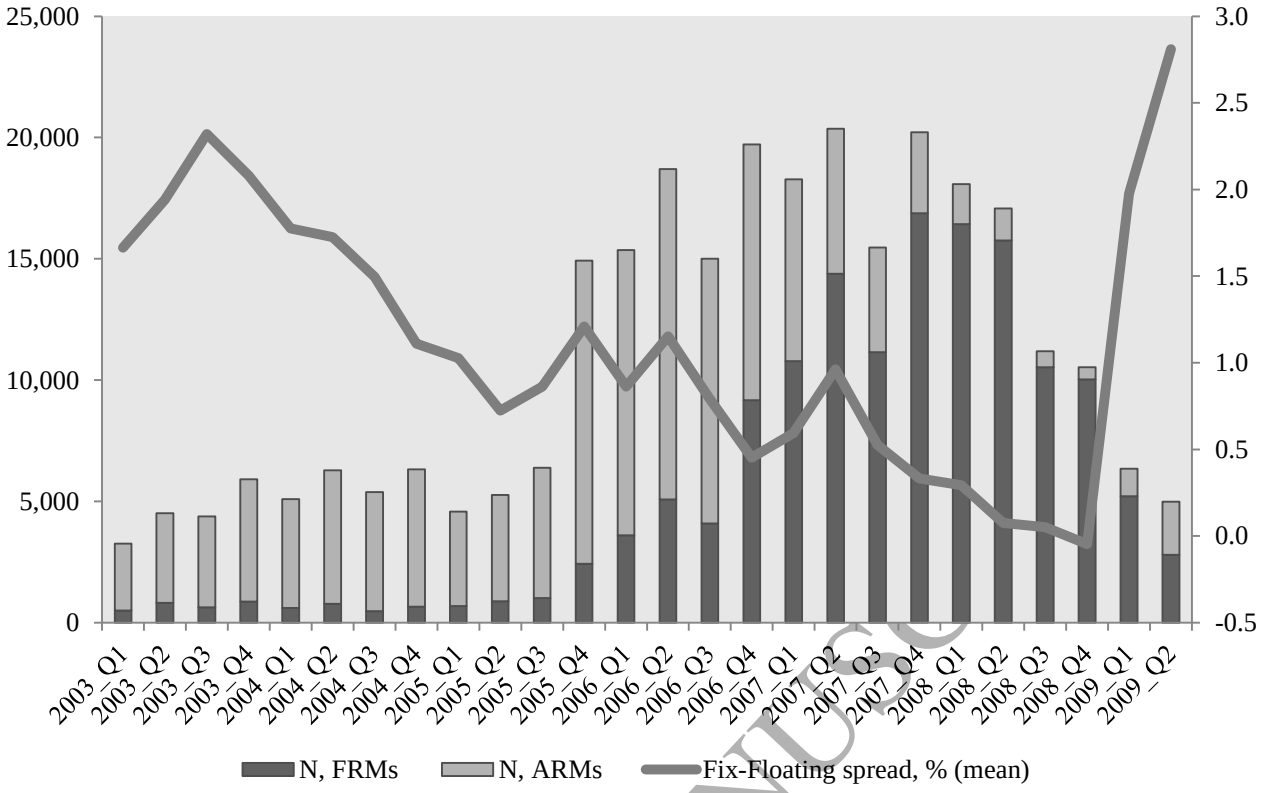

Figure 2—*Distribution of mortgages over time*. The figure depicts the number of mortgage loans (283,591) (rectangles, left axis), divided by FRMs (dark grey, 146,222 mortgages) *vs*. ARMs (light grey, 137,369 mortgages), and the average fix-floating spread, i.e. the difference between the average fixed rate and the average floating rate of new mortgages by quarter, as a function of the quarter of inception, from 2003_Q1 (year 2003, first quarter), to 2009_Q2 (year 2009, second quarter).

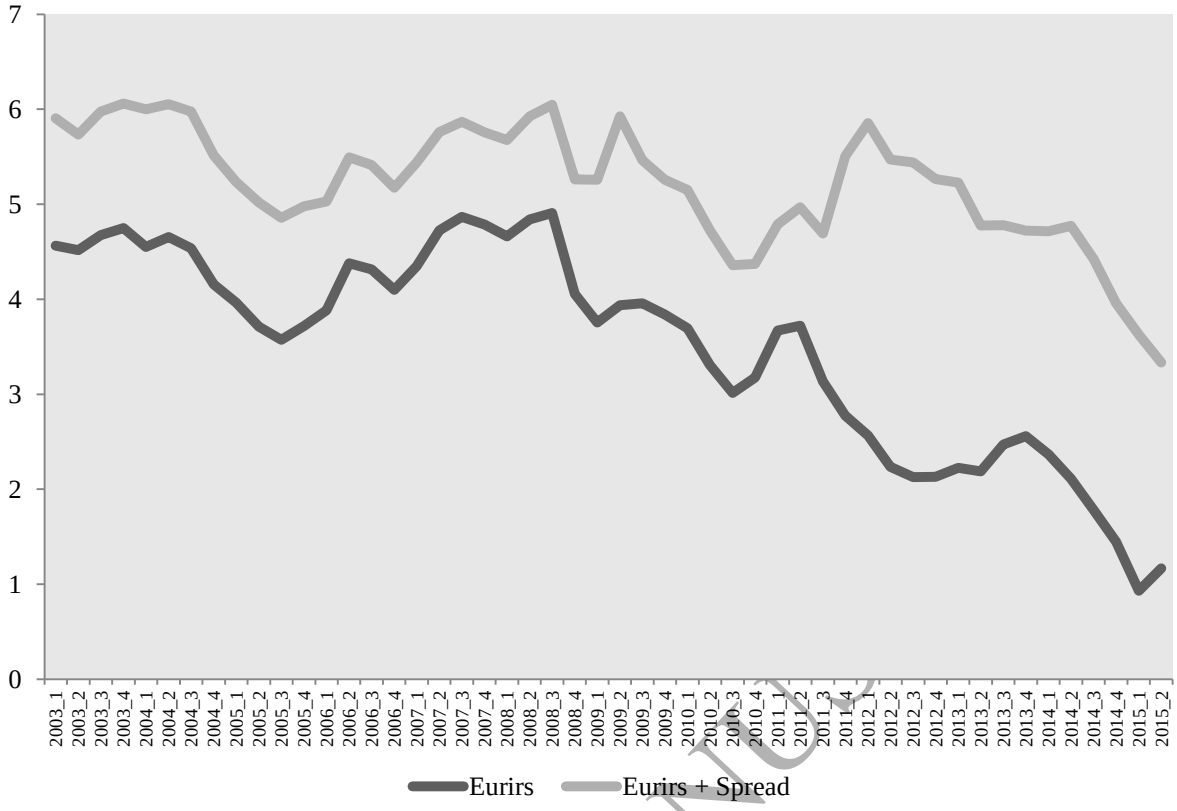

Figure 3—*Pattern of interest rates*. The figure depicts the pattern of the average Eurirs (dark grey line) and the average FRM rate at origination (light grey line), by quarter, from 2003_Q1 (year 2003, first quarter), to 2015_Q2 (year 2015, second quarter). Numbers are expressed in percentage.

	N	Mean	SD	Min	Q1	Median	Q3	Max
Mortgage Variables								
Refinancer, %	146,222	12.65	33.25	.	.	.	.	.
Positive Refinancing Gain, %	146,222	68.27	19.14	0.00	58.82	73.53	79.41	100.00
No. of Profitable Quarters	146,222	9.31	3.97	0.00	7.06	9.97	11.85	17.50
Amount, €	146,222	112,608	68,341	1,422	70,000	100,000	140,000	4,000,000
Maturity, y	146,222	21.9	7.1	1.5	15.0	20.0	30.0	40.0
LTV, %	146,222	60.6	20.4	11.9	45.2	66.7	78.4	100.0
No. Guarantors	146,222	0.8	1.0	0.0	0.0	0.0	1.0	5.0
IRS at Origination, %	146,222	4.51	0.40	2.71	4.25	4.66	4.82	5.10
Fixed Rate at Origination, %	146,222	5.63	0.45	3.67	5.34	5.66	5.93	8.20
Socio-Demographic Variables								
Age	144,876	38.7	10.0	21	31	37	45	67
Income (pred.), €	143,370	1,490	332	939	1,350	1,488	1,504	3,569
Wealthy, %	143,941	10.9	31.2	.	.	.	.	.
Man, %	144,872	68.0	46.7	.	.	.	.	.
Graduate, %	143,426	12.6	33.2	.	.	.	.	.
Foreign, %	144,435	9.9	29.9	.	.	.	.	.
Population	146,178	677,525	780,548	98	28,964	205,535	1,324,110	2,761,477
North, %	146,196	57.6	49.4	.	.	.	.	.
Center, %	146,196	15.1	35.8	.	.	.	.	.
South, %	146,196	27.3	44.6	.	.	.	.	.
Financial Literacy Variables								
Fixed Income Awareness	15,254	1.8	0.7	0.0	1.3	2.0	2.0	3.0
Bank Products Awareness	15,254	1.5	0.7	0.0	1.0	1.3	2.0	3.0
Derivatives Awareness	15,254	0.2	0.5	0.0	0.0	0.0	0.0	3.0
Fixed Income Experience	15,254	0.5	0.6	0.0	0.0	0.3	1.0	3.0
Bank Products Experience	15,254	0.6	0.7	0.0	0.0	0.5	1.0	3.0
Derivatives Experience	15,254	0.1	0.3	0.0	0.0	0.0	0.0	3.0
Economics Background, %	15,052	9.3	29.0	.	.	.	.	.
Financial Expertise, %	15,052	3.7	18.9	.	.	.	.	.
Risk Averse, %	15,254	36.5	48.2	.	.	.	.	.

Table 1—*Descriptive statistics*. The table reports descriptive statistics for the whole sample of 146,222 fixed-rate mortgage loans. *Refinancer* is a dummy taking the value of 1 if the mortgage has been refinanced; *Positive Refinancing Gain* is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *No. of Profitable Quarters* counts the number of quarters since the mortgage was originated that there is a profitable refinancing opportunity (i.e., a positive refinancing gain); *Amount* is the principal of the loan (in euros) at the origination; *Maturity* is the duration of the loan at inception (in years); *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *IRS at Origination* is the fixed base rate of the loan mortgage; *Fixed Rate at Origination* is the sum of *IRS at Origination* and the credit spread (i.e., the spread over the swap rate paid by the borrower); *Age* is the age of the borrower at the inception of the mortgage; *Income (pred.)* is the predicted monthly income of the borrower from median regression of income on borrower's occupation, age and gender (please refer to the body of the paper for details); *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Population* is the resident population in the urban area where the bank is located (by zip code); *North* (resp. *Center* and *South*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center and South) of Italy; *Fixed Income Awareness*, *Bank Products Awareness*, and *Derivatives Awareness* are financial literacy variables and measure the degree of awareness (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Economics Background* is a dummy variable taking the value of 1 if the borrower has an educational background (college diploma) in a field related to finance or economics; *Financial Expertise* is a dummy variable taking the value of 1 if the borrower's current or past job is related to financial services; *Risk Averse* is a dummy variable taking the value of 1 if the borrower's profile can be described as "prudent" or "cautious" (*vs.* "balanced" and "dynamic").

Socio-Demographic Variables	MiFID Subsample		Non-MiFID Subsample		Mean Difference	t-Statistic	ATT Difference	t-Statistic
	N	Mean	N	Mean				
Age	15,179	41.3	129,697	38.4	2.9	32.5 ***	1.3	10.3 ***
Income (pred.), €	14,957	1,520.1	128,413	1,486.9	33.3	9.7 ***	7.1	1.5
Wealthy, %	15,196	32.70	128,745	8.35	24.35	62.7 ***	21.85	46.4 ***
Man, %	15,179	65.04	129,693	68.34	-3.30	-8.1 ***	-2.21	-3.9 ***
Graduate, %	14,959	14.54	128,467	12.41	2.13	7.0 ***	-0.82	-1.9 *
Foreign, %	15,161	6.40	129,274	10.32	-3.93	-18.2 ***	-0.73	-2.4 **
Population	15,250	412,041	130,928	708,447	-296,406	-49.1 ***	-228,369	-25.1 ***
North, %	15,254	49.94	130,942	58.45	-8.51	-19.9 ***	-3.61	-6.0 ***
Center, %	15,254	14.64	130,942	15.15	-0.51	-1.7 *	-2.26	-5.1 ***
South, %	15,254	35.42	130,942	26.40	9.02	22.2 ***	5.87	10.4 ***

Table 2—***Mean socio-demographic statistics for MiFID* vs. *non-MiFID sub-samples***. The table reports the mean of socio-demographic variables for the whole sample of 146,222 FRMs, distinguishing observations for which the MiFID questionnaire was available *vs.* those for which it was unavailable. *Age* is the age of the borrower at the inception of the mortgage; *Income (pred.)* is the predicted monthly income of the borrower from median regression of income on borrower's occupation, age and gender (please refer to the body of the paper for details); *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Population* is the resident population in the urban area where the bank is located (by zip code); *North* (resp. *Center* and *South*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center and South) of Italy. ATT (and its t-statistic) represents the average treatment effect on treated, obtained through the 10 nearest neighbours (with replacement) propensity score matching methodology (variables used for matching are mortgage-specific characteristics: *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*) (Rosenbaum and Rubin, 1983; Imbens, 2000). ***, **, *, denote statistical significance at 1, 5 and 10 percent level, respectively.

	Refinancers		Non-Refinancers		Mean Difference	t-Statistic	ATT Difference	t-Statistic
	N	Mean	N	Mean				
Mortgage Variables								
Amount, €	18,503	130,963	127,719	109,948	21,015	37.99 ***	.	.
Maturity, y	18,503	23.64	127,719	21.70	1.95	38.41 ***	.	.
LTV, %	18,503	0.64	127,719	0.60	0.03	22.74 ***	.	.
No. Guarantors	18,503	0.78	127,719	0.77	0.02	2.16 **	.	.
IRS at Origination, %	18,503	4.62	127,719	4.50	0.12	42.74 ***	.	.
Fixed Rate at Origination, %	18,503	5.67	127,719	5.63	0.04	12.12 ***	.	.
Socio-Demographic Variables								
Age	18,443	36.7	126,433	39.0	-2.3	-31.68 ***	-1.2	-12.14 ***
Income (pred.), €	18,214	1,519.9	125,156	1,486.0	33.9	12.35 ***	16.3	4.15 ***
Wealthy, %	18,401	9.15	125,540	11.18	-2.03	-8.79 ***	-2.4	-6.95 ***
Man, %	18,443	70.92	126,429	67.56	3.35	9.33 ***	2.84	5.53 ***
Graduate, %	18,223	15.84	125,203	12.17	3.67	12.85 ***	2.18	5.54 ***
Foreign, %	18,406	6.76	126,029	10.37	-3.61	-17.71 ***	-4.36	-13.63 ***
Population	18,493	625,624	127,685	685,042	-59,418	-9.52 ***	-55,520	-6.33 ***
North, %	18,494	57.3	127,702	57.6	-0.25	-0.64	-1.42	-2.58 ***
Center, %	18,494	19.5	127,702	14.5	5.06	16.46 ***	4.17	9.97 ***
South, %	18,494	23.1	127,702	28.0	-4.81	-14.39 ***	-2.76	-5.75 ***

Table 3—*Mean statistics of refinancers* vs. *non-refinancers*. The table reports the mean of the considered variables for the whole sample of 146,222 FRMs, distinguishing between refinanced *vs.* non-refinanced mortgages. *Amount* is the principal of the loan (in euros) at the origination; *Maturity* is the duration of the loan at inception (in years); *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property (in percentage); *No. Guarantors* is the number of guarantors of the loan; *IRS at Origination* is the fixed base rate of the loan mortgage; *Fixed Rate at Origination* is the sum of *IRS at Origination* and the credit spread (i.e., the spread over the swap rate paid by the borrower); *Age* is the age of the borrower at the inception of the mortgage; *Income (pred.)* is the predicted monthly income of the borrower from median regression of income on borrower's occupation, age and gender (please refer to the body of the paper for details); *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Population* is the resident population in the urban area where the bank is located (by zip code); *North* (resp. *Center* and *South*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center and South) of Italy. Mean Difference (and its t-statistic) refer to the difference between refinancers and non-refinancers. ATT (and its t-statistic) represents the average treatment effect on treated, obtained through the 10 nearest neighbours (with replacement) propensity score matching methodology (variables used for matching are mortgage-specific characteristics: *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*) (Rosenbaum and Rubin, 1983; Imbens, 2004). ***, **, *, denote statistical significance at 1, 5 and 10 percent level, respectively.

	(1)	(2)	(3)
Positive Refinancing Gain	0.0015***	0.0017***	0.0012***
	(0.000)	(0.000)	(0.000)
No. of Profitable Quarters		-0.0000	
		(0.000)	
Mortgage Age			0.0019***
			(0.000)
Mortgage Age, Squared			-0.0001***
			(0.000)
Ln(Amount)	0.0031***	0.0030***	0.0034***
	(0.001)	(0.001)	(0.001)
LTV	-0.0009*	-0.0008	-0.0013**
	(0.001)	(0.001)	(0.001)
No. Guarantors	-0.0003	-0.0003	-0.0004
	(0.000)	(0.000)	(0.000)
Man	0.0007***	0.0007***	0.0007***
	(0.000)	(0.000)	(0.000)
Wealthy	-0.0012***	-0.0012***	-0.0012***
	(0.000)	(0.000)	(0.000)
Ln(Income)	-0.0008***	-0.0008***	-0.0010***
	(0.000)	(0.000)	(0.000)
Age	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)
Foreign	-0.0019***	-0.0019***	-0.0018***
	(0.000)	(0.000)	(0.000)
Graduate	0.0015***	0.0015***	0.0014***
	(0.000)	(0.000)	(0.000)
North	0.0007***	0.0007***	0.0010***
	(0.000)	(0.000)	(0.000)
Center	0.0020***	0.0020***	0.0021***
	(0.000)	(0.000)	(0.000)
Ln(Population)	-0.0004**	-0.0004**	-0.0004**
	(0.000)	(0.000)	(0.000)
Time Fixed Effects	Yes	Yes	Yes
Observations	4,453,615	4,453,615	4,453,615
Number of ID	141,081	141,081	141,081
Adj. R-Squared	0.006	0.006	0.007

Table 4—*Determinants of mortgage refinancing*. The table reports the coefficients of a linear probability model for the likelihood of an FRM being refinanced. The dependent variable is *Refinancer*, i.e. a dummy taking the value of 1 if the mortgage has been refinanced. *Positive Refinancing Gain* is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *No. of Profitable Quarters* counts the number of quarters since the mortgage was originated that there is a profitable refinancing opportunity (i.e., a positive refinancing gain); *Mortgage Age* (*Mortgage Age, Squared*) is the age (squared age) of the mortgage, in quarters, since its inception; *Ln(Amount)* is the natural logarithm of the principal of the loan at the origination; *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Ln(Income)* is the natural logarithm of the predicted monthly income of the borrower from median regression of income on borrower's occupation, age, and gender; *Age* is the age of the borrower at the inception of the mortgage; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *North* (resp. *Center*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center) of Italy; *Ln(Population)* is the natural logarithm of the resident population in the urban area where the bank is located (by zip code). Heteroskedasticity-consistent standard errors clustered at both the mortgage and quarter level are reported in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent level, respectively.

	(1)	(2)	(3)	(4)
Positive Refinancing Gain, PRG	0.0007*	0.0010***	0.0011***	0.0009**
	(0.000)	(0.000)	(0.000)	(0.000)
No. of Profitable Quarters			-0.0000	
			(0.000)	
Mortgage Age				0.0011***
				(0.000)
Mortgage Age, Squared				-0.0001***
				(0.000)
Ln(Amount)	0.0019***	0.0019***	0.0019***	0.0021***
	(0.001)	(0.001)	(0.001)	(0.001)
LTV	-0.0010	-0.0009	-0.0009	-0.0011
	(0.001)	(0.001)	(0.001)	(0.001)
No. Guarantors	-0.0003	-0.0003	-0.0003	-0.0003
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Income Awareness × PRG	0.0001			
	(0.000)			
Bank Products Awareness × PRG	0.0002			
	(0.000)			
Derivatives Awareness × PRG	-0.0001			
	(0.000)			
Fixed Income Experience × PRG		-0.0002	-0.0002	-0.0002
		(0.000)	(0.000)	(0.000)
Bank Products Experience × PRG		0.0007**	0.0007**	0.0007**
		(0.000)	(0.000)	(0.000)
Derivatives Experience × PRG		-0.0007*	-0.0007*	-0.0007*
		(0.000)	(0.000)	(0.000)
Economics Background × PRG	0.0014**	0.0014**	0.0014**	0.0014**
	(0.001)	(0.001)	(0.001)	(0.001)
Financial Expertise × PRG	-0.0007	-0.0006	-0.0006	-0.0006
	(0.001)	(0.001)	(0.001)	(0.001)
Risk Averse × PRG	-0.0001	-0.0002	-0.0002	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
Socio-Demographic Variables	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Observations	476,578	476,578	476,578	476,578
Number of ID	14,690	14,690	14,690	14,690
Adj. R-Squared	0.005	0.005	0.005	0.005

Table 5—*Determinants of mortgage refinancing with financial literacy variables*. The table reports the coefficients of a linear probability model for the likelihood of an FRM being refinanced. The dependent variable is *Refinancer*, i.e. a dummy taking the value of 1 if the mortgage has been refinanced. *Positive Refinancing Gain, PRG*, is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *No. of Profitable Quarters* counts the number of quarters since the mortgage was originated that there is a profitable refinancing opportunity (i.e., a positive refinancing gain); *Mortgage Age* (*Mortgage Age, Squared*) is the age (squared age) of the mortgage, in quarters, since its inception; *Ln(Amount)* is the natural logarithm of the principal of the loan at the origination; *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *Fixed Income Awareness*, *Bank Products Awareness*, and *Derivatives Awareness* are financial literacy variables and measure the degree of awareness (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Economics Background* is a dummy variable taking the value of 1 if the borrower has an educational background (college diploma) in a field related to finance or economics; *Financial Expertise* is a dummy variable taking the value of 1 if the borrower's current or past job is related to financial services; *Risk Averse* is a dummy variable taking the value of 1 if the borrower's profile can be described as "prudent" or "cautious" (*vs*. "balanced" and "dynamic"). Variables displaying "*× PRG*" are interacted with *Positive Refinancing Gain*, hence measuring their marginal effect on the refinancing probability conditional to a profitable refinancing opportunity being in place. Heteroskedasticity-consistent standard errors clustered at both the mortgage and quarter level are reported in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Positive Refinancing Gain, PRG	0.0009**	0.0008**	0.0011***	0.0010***	0.0010***	0.0010***	0.0008**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mortgage Age	0.0011***	0.0011***	0.0011***	0.0011***	0.0011***	0.0011***	0.0011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mortgage Age, Squared	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Amount)	0.0021***	0.0021***	0.0021***	0.0021***	0.0021***	0.0021***	0.0021***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
LTV	-0.0012*	-0.0011*	-0.0012*	-0.0012*	-0.0011*	-0.0012*	-0.0011*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
No. Guarantors	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Income Experience × PRG	0.0002						
	(0.000)						
Bank Products Experience × PRG		0.0005**					0.0005**
		(0.000)					(0.000)
Derivatives Experience × PRG			-0.0003				
			(0.000)				
Fixed Income Experience				0.0001			
				(0.000)			
Bank Products Experience					0.0004**		
					(0.000)		
Derivatives Experience						-0.0000	
						(0.000)	
Economics Background × PRG				0.0014**	0.0014**	0.0014**	
				(0.001)	(0.001)	(0.001)	
Financial Expertise × PRG				-0.0006	-0.0007	-0.0006	
				(0.001)	(0.001)	(0.001)	
Risk Averse × PRG				-0.0002	-0.0001	-0.0002	
				(0.000)	(0.000)	(0.000)	
Economics Background	0.0011**	0.0011**	0.0012**				
	(0.000)	(0.000)	(0.000)				
Financial Expertise	-0.0003	-0.0003	-0.0002				
	(0.000)	(0.000)	(0.000)				
Risk Averse	-0.0001	-0.0001	-0.0002				
	(0.000)	(0.000)	(0.000)				
Socio-Demographic Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	476,578	476,578	476,578	476,578	476,578	476,578	483,013
Number of ID	14,690	14,690	14,690	14,690	14,690	14,690	14,887
Adj. R-Squared	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Table 6—*Determinants of mortgage refinancing with financial literacy variables, robustness models*. The table reports the coefficients of a linear probability model for the likelihood of an FRM being refinanced. The dependent variable is *Refinancer*, i.e. a dummy taking the value of 1 if the mortgage has been refinanced. *Positive Refinancing Gain, PRG*, is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *Mortgage Age* (*Mortgage Age, Squared*) is the age (squared age) of the mortgage, in quarters, since its inception; *Ln(Amount)* is the natural logarithm of the principal of the loan at the origination; *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Economics Background* is a dummy variable taking the value of 1 if the borrower has an educational background (college diploma) in a field related to finance or economics; *Financial Expertise* is a dummy variable taking the value of 1 if the borrower's current or past job is related to financial services; *Risk Averse* is a dummy variable taking the value of 1 if the borrower's profile can be described as "prudent" or "cautious" (*vs.* "balanced" and "dynamic"). Variables displaying "*× PRG*" are interacted with *Positive Refinancing Gain*, hence measuring their marginal effect on the refinancing probability conditional to a profitable refinancing opportunity being in place. Heteroskedasticity-consistent standard errors clustered at both the mortgage and quarter level are reported in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent level, respectively.

Financial Literacy Variables	MiFID Subsample: Refinancers		MiFID Subsample: Non-Refinancers		Mean Difference	t-Statistic	ATT Difference	t-Statistic
	N	Mean	N	Mean				
Fixed Income Awareness	1,263	1.90	13,991	1.82	0.08	3.8 ***	0.08	2.7 ***
Bank Products Awareness	1,263	1.52	13,991	1.46	0.07	3.6 ***	0.05	1.9 *
Derivatives Awareness	1,263	0.23	13,991	0.19	0.04	2.7 ***	0.04	1.8 *
Fixed Income Experience	1,263	0.58	13,991	0.54	0.03	1.7 *	0.04	1.4
Bank Products Experience	1,263	0.64	13,991	0.56	0.08	3.8 ***	0.07	2.5 **
Derivatives Experience	1,263	0.05	13,991	0.05	0.00	0.5	0.00	0.3
Economics Background, %	1,249	13.77	13,803	8.88	4.89	4.9 ***	3.45	2.5 **
Financial Expertise, %	1,249	4.72	13,803	3.62	1.10	1.8 *	0.32	0.4
Risk Averse, %	1,263	33.89	13,991	36.76	-2.87	-2.1 **	-2.14	-1.1

Table 7—*Mean financial literacy statistics of refinancers* vs. *non-refinancers for MiFID sub-sample.* The table reports the mean of the financial literacy variables for the sub-sample of fixed-rate mortgage loans for which a MiFID questionnaire was available, distinguishing between refinanced *vs.* non-refinanced mortgages. *Fixed Income Awareness*, *Bank Products Awareness*, and *Derivatives Awareness* are financial literacy variables and measure the degree of awareness (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Economics Background* is a dummy variable taking the value of 1 if the borrower has an educational background (college diploma) in a field related to economics or finance; *Financial Expertise* is a dummy variable taking the value of 1 if the borrower's current or past job is related to financial services; *Risk Averse* is a dummy variable taking the value of 1 if the borrower's profile can be described as "prudent" or "cautious" (*vs.* "balanced" and "dynamic"). Mean Difference (and its t-statistic) for financial literature variables refer to the difference between active and passive borrowers. ATT (and its t-statistic) represents the average treatment effect on treated, obtained through the nearest neighbour (with replacement) propensity score matching methodology (variables used for matching are mortgage-specific characteristics: *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*, and socio-demographic characteristics, i.e. *Age*, *Income*, *Wealthy*, *Man*, *Graduate*, *Foreign*, *Population*, *North*, and *Center*) (Rosenbaum and Rubin, 1983; Imbens, 2000). ***, **, *, denote statistical significance at 1, 5 and 10 percent level, respectively.

	90%	**75%**	***Wealthy* = 1**
Positive Refinancing Gain	0.0012***	0.0012***	0.0013***
	(0.000)	(0.000)	(0.000)
Mortgage Age	0.0019***	0.0019***	0.0011**
	(0.000)	(0.000)	(0.000)
Mortgage Age, Squared	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)
Ln(Amount)	0.0033***	0.0031***	0.0025***
	(0.001)	(0.001)	(0.001)
LTV	-0.0012**	-0.0010**	-0.0009
	(0.001)	(0.001)	(0.001)
No. Guarantors	-0.0004	-0.0004	-0.0004
	(0.000)	(0.000)	(0.000)
Man	0.0008***	0.0007***	0.0006**
	(0.000)	(0.000)	(0.000)
Wealthy	-0.0012***	-0.0011***	
	(0.000)	(0.000)	
Ln(Income)	-0.0010***	-0.0009***	-0.0008*
	(0.000)	(0.000)	(0.000)
Age	-0.0001***	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)
Foreign	-0.0018***	-0.0017***	-0.0004
	(0.000)	(0.000)	(0.000)
Graduate	0.0015***	0.0014***	0.0011***
	(0.000)	(0.000)	(0.000)
North	0.0010***	0.0011***	0.0006**
	(0.000)	(0.000)	(0.000)
Center	0.0021***	0.0022***	0.0011***
	(0.000)	(0.000)	(0.000)
Ln(Population)	-0.0004**	-0.0003**	-0.0002**
	(0.000)	(0.000)	(0.000)
Observations	4,082,611	3,449,615	486,770
Number of ID	129,143	108,824	15,241
Adj. R-Squared	0.007	0.006	0.006

Table 8—*Determinants of mortgage refinancing excluding potentially non-refinanceable loans*. The table reports the coefficients of a linear probability model for the likelihood of an FRM being refinanced. The dependent variable is *Refinancers*, i.e. a dummy taking the value of 1 if the mortgage has been refinanced. To account for the fact that mortgages may not be equally eligible for refinancing, we exclude mortgages whose credit spread at origination is in the upper tail of the credit spread distribution during that quarter. The first two models exclude mortgages with a credit spread at origination larger than the 90th, and 75th percentile, respectively. The last model of the table simply considers the subset of mortgages for which the dummy *Wealthy* equals 1. *Positive Refinancing Gain* is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *Mortgage Age* (*Mortgage Age, Squared*) is the age (squared age) of the mortgage, in quarters, since its inception; *Ln(Amount)* is the natural logarithm of the principal of the loan at the origination; *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Ln(Income)* is the natural logarithm of the predicted monthly income of the borrower from median regression of income on borrower's occupation, age, and gender; *Age* is the age of the borrower at the inception of the mortgage; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *North* (resp. *Center*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center) of Italy; *Ln(Population)* is the natural logarithm of the resident population in the urban area where the bank is located (by zip code). Heteroskedasticity-consistent standard errors clustered at both the mortgage and quarter level are reported in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent level, respectively.

	90%	75%	*Wealthy* = 1
Positive Refinancing Gain, PRG	0.0007**	0.0006**	0.0004
	(0.000)	(0.000)	(0.000)
Mortgage Age	0.0011***	0.0010***	0.0011**
	(0.000)	(0.000)	(0.000)
Mortgage Age, Squared	-0.0001***	-0.0001***	-0.0001**
	(0.000)	(0.000)	(0.000)
Ln(Amount)	0.0020***	0.0020***	0.0021***
	(0.001)	(0.001)	(0.001)
LTV	-0.0011*	-0.0012*	-0.0015*
	(0.001)	(0.001)	(0.001)
No. Guarantors	-0.0004	-0.0004	-0.0005
	(0.000)	(0.000)	(0.000)
Fixed Income Experience × PRG	-0.0002	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)
Bank Products Experience × PRG	0.0007**	0.0008**	0.0008*
	(0.000)	(0.000)	(0.000)
Derivatives Experience × PRG	-0.0006	-0.0005	-0.0008
	(0.000)	(0.000)	(0.000)
Economics Background × PRG	0.0013*	0.0012	0.0013
	(0.001)	(0.001)	(0.001)
Financial Expertise × PRG	-0.0004	-0.0003	0.0001
	(0.001)	(0.001)	(0.001)
Risk Averse × PRG	-0.0001	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)
Socio-Demographic Variables	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Observations	430,517	368,847	154,418
Number of ID	13,257	11,362	4,784
Adj. R-Squared	0.005	0.005	0.005

Table 9—*Determinants of mortgage refinancing with financial literacy variables excluding potentially non-refinanceable loans*. The table reports the coefficients of a linear probability model for the likelihood of an FRM being refinanced. The dependent variable is *Refinancer*, i.e. a dummy taking the value of 1 if the mortgage has been refinanced. To account for the fact that mortgages may not be equally eligible for refinancing, we exclude mortgages whose credit spread at origination is in the upper tail of the credit spread distribution during that quarter. The first two models exclude mortgages with a credit spread at origination larger than the 90th, and 75th percentile, respectively. The last model of the table simply considers the subset of mortgages for which the dummy *Wealthy* equals 1. *Positive Refinancing Gain, PRG*, is a dummy taking the value of 1 if the potential refinancing gain is positive (please refer to the body of the paper for details on how the refinancing gain is computed); *Mortgage Age* (*Mortgage Age, Squared*) is the age (squared age) of the mortgage, in quarters, since its inception; *Ln(Amount)* is the natural logarithm of the principal of the loan at the origination; *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property; *No. Guarantors* is the number of guarantors of the loan; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Economics Background* is a dummy variable taking the value of 1 if the borrower has an educational background (college diploma) in a field related to finance or economics; *Financial Expertise* is a dummy variable taking the value of 1 if the borrower's current or past job is related to financial services; *Risk Averse* is a dummy variable taking the value of 1 if the borrower's profile can be described as "prudent" or "cautious" (*vs.* "balanced" and "dynamic"). Variables displaying "*× PRG*" are interacted with *Positive Refinancing Gain*, hence measuring their marginal effect on the refinancing probability conditional to a profitable refinancing opportunity being in place. Heteroskedasticity-consistent standard errors clustered at both the mortgage and quarter level are reported in parentheses. ***, **, * indicate statistical significance at 1, 5 and 10 percent level, respectively.

	Refinancers Within		Non-Refinancers		Mean Difference	t-Statistic	ATT Difference	t-Statistic
	N	Mean	N	Mean				
Mortgage Variables								
Amount, €	753	120,177	127,719	109,948	10,229	3.44 ***	.	.
Maturity, y	753	22.74	127,719	21.70	1.04	4.88 ***	.	.
LTV, %	753	0.67	127,719	0.60	0.07	10.90 ***	.	.
No. Guarantors	753	0.51	127,719	0.77	-0.26	-8.20 ***	.	.
IRS at Origination, %	753	4.32	127,719	4.50	-0.18	-11.84 ***	.	.
Fixed Rate at Origination, %	753	5.76	127,719	5.63	0.13	7.18 ***	.	.
Socio-Demographic Variables								
Age	746	37.4	126,433	39.0	-1.6	-4.81 ***	-0.9	-1.68 *
Income (pred.), €	737	1,488.4	125,156	1,486.0	2.3	0.22	9.3	0.56
Wealthy, %	714	5.04	125,540	11.18	-6.14	-7.44 ***	-2.2	-1.74 *
Man, %	746	70.38	126,429	67.56	2.81	1.68 *	0.80	0.34
Graduate, %	738	11.92	125,203	12.17	-0.24	-0.20	5.28	3.46 ***
Foreign, %	743	11.44	126,029	10.37	1.07	0.91	-6.33	-3.43 ***
Population	752	1,052,887	127,685	685,042	367,846	16.48 ***	204,851	5.94 ***
North, %	752	81.9	127,702	57.6	24.32	17.24 ***	18.35	8.06 ***
Center, %	752	6.5	127,702	14.5	-7.94	-8.77 ***	-2.66	-1.89 *
South, %	752	11.6	127,702	28.0	-16.38	-13.96 ***	-15.69	-7.75 ***

Table 10—*Mean statistics of renegotiators* vs. *non-refinancers*. The table reports the mean of the considered variables for the sample of FRMs, distinguishing between 753 mortgages refinanced within the originating bank *vs*. non-refinanced mortgages (127,719). *Amount* is the principal of the loan (in euros) at the origination; *Maturity* is the duration of the loan at inception (in years); *LTV* is the loan-to-value, i.e. the ratio between the principal of the loan and the estimated value of the real property (in percentage); *No. Guarantors* is the number of guarantors of the loan; *IRS at Origination* is the fixed base rate of the loan mortgage; *Fixed Rate at Origination* is the sum of *IRS at Origination* and the credit spread (i.e., the spread over the swap rate paid by the borrower); *Age* is the age of the borrower at the inception of the mortgage; *Income (pred.)* is the predicted monthly income of the borrower from median regression of income on borrower's occupation, age and gender (please refer to the body of the paper for details); *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Population* is the resident population in the urban area where the bank is located (by zip code); *North* (resp. *Center* and *South*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the North (resp. Center and South) of Italy. Mean Difference (and its t-statistic) refer to the difference between renegotiators and non-refinancers borrowers. ATT (and its t-statistic) represents the average treatment effect on treated, obtained through the nearest neighbour (with replacement) propensity score matching methodology (variables used for matching are mortgage-specific characteristics: *Amount*, *Maturity*, *LTV*, *No. Guarantors*, *IRS at Origination* and *Fixed Rate at Origination*) (Rosenbaum and Rubin, 1983; Imbens, 2004). ***, **, *, denote statistical significance at 1, 5 and 10 percent level, respectively.

		Awareness			Experience		
		Fixed Income	Bank Products	Derivatives	Fixed Income	Bank Products	Derivatives
Age	*> 40y*	1.86	1.48	0.20	0.58	0.59	0.05
	≤ 40y	1.79	1.44	0.19	0.50	0.53	0.05
	Difference	0.08 ***	0.04 ***	0.01	0.08 ***	0.06 ***	0.01 *
Income	*> €1,492*	1.85	1.48	0.22	0.56	0.58	0.06
	≤ €1,492	1.81	1.44	0.17	0.54	0.55	0.04
	Difference	0.04 ***	0.04 ***	0.05 ***	0.02 **	0.03 ***	0.02 ***
Wealthy	*= 1*	1.98	1.54	0.22	0.67	0.68	0.06
	= 0	1.76	1.42	0.18	0.49	0.52	0.05
	Difference	0.23 ***	0.12 ***	0.05 ***	0.19 ***	0.16 ***	0.01 *
Man	*= 1*	1.84	1.48	0.22	0.55	0.57	0.06
	= 0	1.80	1.43	0.15	0.54	0.56	0.04
	Difference	0.04 ***	0.06 ***	0.07 ***	0.01	0.01	0.02 ***
Graduate	*= 1*	1.90	1.51	0.26	0.60	0.64	0.06
	= 0	1.82	1.45	0.18	0.54	0.56	0.05
	Difference	0.08 ***	0.06 ***	0.08 ***	0.06 ***	0.08 ***	0.01 **
Foreign	*= 1*	1.60	1.30	0.16	0.44	0.46	0.05
	= 0	1.85	1.47	0.19	0.55	0.58	0.05
	Difference	-0.25 ***	-0.18 ***	-0.03 *	-0.12 ***	-0.11 ***	0.00
Centre/North	*= 1*	1.84	1.46	0.21	0.57	0.58	0.05
	= 0	1.81	1.47	0.17	0.51	0.55	0.05
	Difference	0.03 **	-0.02	0.04 ***	0.06 ***	0.03 **	0.01
Population	*> 53,740*	1.84	1.47	0.22	55.50	0.56	0.06
	≤ 53,740	1.82	1.46	0.16	53.89	0.57	0.04
	Difference	0.02 *	0.01	0.06 ***	1.61	-0.01	0.02 ***

Table 11—*Mean financial literacy statistics as a function of socio-demographic characteristics*. The table reports the mean of financial literacy variables by socio-demographic characteristics, for the sub-sample of observations for which the MIFID questionnaire was available. *Age* is the age of the borrower at the inception of the mortgage (40 years is the median of the sub-sample); *Income* is the predicted monthly income of the borrower from median regression of income on borrower's occupation, age and gender (€1,492 is the median of the sub-sample); *Wealthy* is a dummy variable taking the value of 1 if the borrower owns more than €100,000 in financial assets; *Man* is a dummy variable taking the value of 1 if the borrower's gender is male; *Graduate* is a dummy variable taking the value of 1 if the borrower has received a university degree; *Foreign* is a dummy variable taking the value of 1 if the borrower's nationality is other than Italian; *Centre/North* (resp. *South*) is a dummy variable taking the value of 1 if the bank branch is located in a region of the Centre/North (resp. South) of Italy; *Population* is the resident population in the urban area where the bank is located (by zip code) (53,740 is the median of the sub-sample); *Fixed Income Awareness*, *Bank Products Awareness*, and *Derivatives Awareness* are financial literacy variables and measure the degree of awareness (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively; *Fixed Income Experience*, *Bank Products Investment*, and *Derivatives Experience* are financial experience variables and measure the frequency of past trades (0 = none, 1 = low, 2 = medium, 3 = high) of fixed income instruments, bank products, and derivatives instruments, respectively. ***, **, *, denote statistical significance of t-tests for mean differences at 1, 5 and 10 percent level, respectively.