Italian Economic Journal
https://doi.org/10.1007/s40797-021-00172-1

RESEARCH PAPER

Risk Aversion and the Size of Desired Debt

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Received: 12 November 2020 / Accepted: 28 September 2021

Abstract

We investigate the determinants of the level of desired total, secured, and unsecured debt for a panel of Italian households over the period 1989–2016, accounting for both left censoring and sample selection. In particular, we focus on the role of households' attitudes towards risks, using both their observed behaviour in the financial market and the responses to a hypothetical lottery choice question. We find risk aversion to be a significant determinant of the desired amount of unsecured, secured, and total debt. Relatively more risk adverse households desire more debt, suggesting that Italian households may rely on debt to insure themselves against shocks.

Keywords Risk aversion · Desired indebtedness · Selection bias · Censoring · Household panel data

JEL Classification C23 · D12 · D14

1 Introduction

There are many reasons why households may decide to borrow, with one such motive being the desire to smooth consumption over time by accumulating reserves against unforeseen or anticipated changes in the future relationship between income and needs. Indeed, life-cycle and precautionary motives, together with the presence of liquidity constraints, are amongst the main components of the modern theory of consumption (see Browning and Lusardi 1996, for an early review). Its central insight is that agents try to keep the marginal utility of consumption constant over time, as summarized

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Published online: 31 October 2021

by the Euler equation. This shows that the optimal consumption path (and thus also savings and borrowing decisions) is a function of interest rates, the rate of time preferences, and often of the rate of risk aversion of the individual.[1] Unfortunately, with many utility functions, it is difficult or impossible to isolate the effect of risk aversion as a determinant of consumer behaviour; when possible, its effect remains a priori ambiguous (see e.g. Brown et al. 2013, for the case of a mean-variance utility function). In this paper, we focus on the nature of the relationship between risk aversion and borrowing decisions, which we investigate empirically. Intuitively, risk attitudes should inform on the reaction of consumers to income fluctuations (due to, for instance, changes in their health, employment, or marital status, and asset returns): on the one hand, one may expect relatively more risk averse agents to borrow more to smooth consumption in the expectation of some negative income shocks; on the other hand, one may instead expect relatively more risk averse individuals to borrow less if the negative shock could result in a reduced ability to repay the debt.

In particular, we analyse the role played by attitudes toward risk in determining the desired amount of debt; this has been studied only to a limited extent so far, possibly due to the reduced availability of risk aversion measures at a household level. Nevertheless, it can provide interesting insights to policy-makers on the mechanisms behind debt accumulation at a micro level. Our study is based on an unbalanced panel of Italian households built from the Survey on Household Income and Wealth (henceforth, SHIW) and covering the period 1989–2016. To address the well-known challenge of measuring individuals' risk preferences effectively (see e.g. Hermansson 2018), we consider two measures of risk. The first measure is objective: similarly to Magri (2007), we consider the actual allocation in a household's financial portfolio between riskier assets (like long-term bonds, shares, or mutual funds) and safer assets (like certificates of deposit and government securities). The second measure is the subjective Arrow–Pratt coefficient of absolute risk aversion, which we compute from a hypothetical lottery choice question, like in Brown et al. (2013). A comparison between the distribution of these two measures of risk aversion is used to test results against the "risk elicitation puzzle", i.e. the suggestion that attitudes towards risk may vary considerably when measured with different methods (Pedroni et al. 2017); we find these measures to be in accordance.

From an econometric point of view, evaluating the determinants of the amount of desired debt presents a challenge. Indeed, most households report an amount of actual borrowing equal to zero. Whereas for some households this could reflect a genuine desire to own zero debt, the actual level of desired debt is likely to be either negative or positive for some of them. The first group represents a classic case of left censoring: the actual level of debt is zero, whereas the level of desired debt is unknown to the researcher but known to be lower than zero. Conversely, the second group also records actual levels of debt equal to zero, but this is because the presence of financing constraints prevents these households to obtain a positive debt. This may lead to non-random sample selection. To overcome these challenge, we apply a series of different estimators to our longitudinal dataset.

[1] The optimal consumption path is a function of the coefficient of risk aversion when, for example, preferences are represented by the popular isoelastic utility function or the Epstein–Zin–Weil recursive utility.

We find evidences indicating that correcting for sample selection in the credit market is necessary. We find a positive and significant relationship between risk aversion and the size of desired debt: in particular, more risk averse households tend to desire higher levels of total, secured, and unsecured debt. This may suggest that households rely on debt to insure themselves against temporary shocks. With respect to the remaining regressors, we find a concave relationship between age and desired debt, with a peak at around 35–40 years of age, a positive and significant relationship between current income and unsecured debt, and a convex relationship between net wealth and secured debt, with a trough for agents with almost no wealth.

The remaining of this paper is organized as follows. Section 2 briefly reviews the existing literature. Sections 3 and 4 describe our econometric strategy and the data, respectively. Section 5 discusses the results. Finally, Sect. 6 concludes.

2 Previous literature

An extensive empirical economic literature on the indebtedness of households has analysed its market trend, the demand and supply of secured and unsecured debt, and the diffusion of new instruments. Here, we focus on two main areas of interest which are closely related to this paper: the determinants of the participation in the credit market and the relationship between liquidity constraints and the amount borrowed.

Several papers have investigated the effects of different socio-economic variables on debt participation and the level of desired debt. For example, Duca and Rosenthal (1991), Cox and Jappelli (1993), Gropp et al. (1996), Leece (2000), del Rio and Young (2006) and Cavalletti et al. (2020) have all found that age, wealth, income, and employment status are among the most significant determinants. As far as we know, only few papers have investigated the role of risk attitudes[2] on indebtedness at the household or investor level (e.g. Dynan and Kohn 2007; Brown et al. 2013; Nagano and Yeom 2014; Hermansson 2018); however, there are arguably various limitations with these previous studies, e.g. the lack of time-series data and relevant risk attitudes. Among these, the paper closest to ours is Brown et al. (2013), who compute a cardinal measure of the Pratt–Arrow absolute risk aversion coefficient in the Panel Survey of Income Dynamics, and find a negative and significant relationship between the level of risk aversion and the amount borrowed in both secured and unsecured debt. Differently from their paper, we use Italian data, two different proxies of risk aversion, and, more importantly, we account for the presence of credit constraints and potential self-selection.

Indeed, the existence of liquidity constraints in the credit market seem to be generally accepted. In the Italian context, Magri (2007) reports that the share of rationed households, conditional on the application for a loan, was more than 10% in the period

[2] Attitudes toward risk represent a relevant factor in several decision making processes, like those concerning financial investments and portfolio choice (Gomes and Michaelides 2005; Barasinska et al. 2012), health insurance (Anderson and Mellor 2008; Schmitz 2011; Gandelman and Hernández-Murillo 2013), migration (Jaeger et al. 2010), labour market (Ahn 2010; Dohmen et al. 2010; Dohmen and Falk 2011; Pollmann et al. 2020), education (Castillo et al. 2011; Caner and Okten 2010; De Paola and Gioia 2012; Checchi et al. 2013), and marriage (Schmidt 2008; Spivey 2010; De Paola and Gioia 2017).

1989–1998. Following Cox and Jappelli (1993) and Duca and Rosenthal (1991), she applies a two-stage Heckman's (1979) estimator to the SHIW and finds that, after accounting for credit constraints, net wealth and disposable income remain the two variables with the greatest influence on the amount of desired debt. Differently from these papers, we use the panel data estimator proposed by Semykina and Wooldridge (2010), which is robust to selection bias, allowing us to fully exploit the longitudinal structure of the dataset while studying the effect of risk aversion on both credit market participation and indebtedness.[3] Moreover, we focus on the role of risk aversion as determinant of indebtedness.

3 Econometric issues and specifications

The main purpose of the paper is to evaluate whether the amount of *desired* debt is explained by the risk attitudes of the respondent, together with other socio-economic variables. Therefore, one cannot focus on the actual amount of indebtedness, but must consider a measure of the optimal amount of money the households would want to borrow. Indeed, whereas many households report an amount of actual borrowing equal to zero, they can be split into three groups: (i) those that actually desire zero debts, (ii) those who desire a non-positive amount but are recorded as zero, (iii) and those who would like a positive amount of debt but are liquidity constrained. Whereas the first group does not present an econometric challenge, the second group is a classic case of left censoring: the desired level of debt is unobserved by the researcher, but known to be the lower than zero. Conversely, the third group could be associated with a selection issue: if the possibility to participate in the credit market is determined by some of the variables that also influence the actual amount of debt received, the resulting sample of households with positive debt is non-random. Our econometric strategy progressively tackles these issues.

We first estimate the following equation,

$$D_{it} = \beta_0 + \boldsymbol{x}_{it}\boldsymbol{\beta_1} + c_i + u_{it}, \quad (1)$$

where D_{it} is the level of actual debt (alternatively secured, unsecured, and total) of household $i = 1, \ldots, N$ in year $t = 1, \ldots, T_i$, $\boldsymbol{x}_{it}$ is a vector of household and household's head characteristics (including the risk attitudes), $\boldsymbol{\beta_1}$ is a vector of coefficients, c_i is a time invariant error which captures unobservable heterogeneity, and u_{it} is an idiosyncratic error normally distributed with mean zero and variance σ_u^2. We employ Pooled OLS, Random Effect (RE), and Correlated Random Effect (CRE) estimations, all with household-cluster robust standard errors to account for cluster heterogeneity. Both the OLS and RE estimations rely on the regressors being uncorrelated with both error terms, and the RE is more efficient if this assumption is satisfied. This is unlikely to be the case though, given the potential endogeneity with the time-invariant unob-

[3] We prefer this to other panel data estimators robust to selection bias, such as Kyriazidou (1997) and Rochina-Barrachina (1999), because it does not require any known distribution of the errors in the equations of interest but allows them to be heteroskedastic and serially correlated. Although this estimator can be employed when some of the explanatory variables are endogenous, we do not exploit this advantage.

served heterogeneity. Unfortunately, we cannot run a Fixed Effect estimation since our variable of interest is time-invariant; however, we run the CRE estimator which allows for the inclusion of time-invariant variables and to easily test for equivalence of within and between estimates. This estimator, proposed by Mundlak (1978) and generalised by Chamberlain (1982), relaxes the assumption of zero correlation between observables and unobservables, by introducing the assumption $c_i = \Psi + \bar{\boldsymbol{x}}_{\boldsymbol{i}} \boldsymbol{\beta_2} + a_i$, where $\bar{\boldsymbol{x}}_{\boldsymbol{i}}$ includes the cluster means of the time-varying variables in $\boldsymbol{x}_{it}$ (the so-called Mundlak effects).

Secondly, we account for the left censoring of the debt variable. To this aim, we specify the following model,

$$D_{it}^* = \beta_0 + \boldsymbol{x_{it}\beta_1} + c_i + u_{it} \tag{2a}$$

$$D_{it} = \begin{cases} D_{it}^*, & \text{if } D_{it}^* > 0 \\ 0, & \text{otherwise,} \end{cases} \tag{2b}$$

where D_{it}^* is the latent amount of debt and D_{it} is the observed amount of debt (left censored to zero). We first estimate model (2) through Random Effect Tobit (RET), which requires the same stringent assumption from the RE estimation of (1). Similarly, we augment the RET model with Mundlak effects, and thus estimate (2) using a Correlation Random Effect Tobit (CRTE) model.

Finally, we account for self-selection. Since we want to gauge the relationship between risk attitudes and borrowing for the entire population, and not only for those individuals who are not credit constrained, we formally specify our last model as

$$D_{it}^{**} = \beta_0 + \boldsymbol{x_{it}\beta_1} + c_i + u_{it} \tag{3a}$$

$$D_{it}^{**} = D_{it} \quad \text{if } s_{it} = 1 \quad \text{and unobserved otherwise} \tag{3b}$$

$$s_{it}^* = \boldsymbol{z_{it}\delta_1} + k_i + e_{it} \quad \text{with } s_{it} = 1 \quad \text{if } s_{it}^* > 0, \tag{3c}$$

where D_{it}^{**} is a measure of the amount of debt that individual i would like to hold in t. As stated in (3b), we observe D_{it}^{**} only if the individual enters the credit market, $s_{it} = 1$, where s_{it} denotes participation. Equation (3c) indicates that we observe participation only if the latent variable s_{it}^*, or the unobservable propensity to enter the credit market, is positive. This depends on $\boldsymbol{z_{it}}$, a vector of regressors that includes some variables from $\boldsymbol{x}_{it}$ and at least one exclusion restriction that drives selection and can be excluded from the debt equation in (3a).

The first step in estimating model (3) is to follow Mundlak (1978), Chamberlain (1982) and Wooldridge (1995), and explicitly model the correlation between the regressors and the unobserved heterogeneity of the selection equation as a linear combination of a constant term μ_0, the group-means $\bar{\boldsymbol{z}}_{\boldsymbol{i}}$ of the time-varying regressors in $\boldsymbol{z_{it}}$, and a normally distributed error term. The participation equation (3) is thus updated to

$$s_{it}^* = \mu_0 + \boldsymbol{z_{it}\delta_1} + \bar{\boldsymbol{z}}_{\boldsymbol{i}}\boldsymbol{\delta}_2 + \xi_{it}, \tag{4}$$

where $\xi_{it} = d_i + e_{it}$ is a composite error term, assumed to be independent of $\boldsymbol{z_{it}}$, and allowed to be heteroskedastic and serially correlated. Wooldridge (1995) suggests to run one probit estimation of the participation equation (4) for each year, and thus one obtains T Inverse Mills Ratios (IMRs). These are then added as explanatory variables in models (1) and (2): a Wald-test on the joint significance of the IMRs coefficients is used as a test for the presence of sample selection. If this is detected, we apply the Semykina and Wooldridge's (2010) estimator.

Two assumptions are required to implement this estimator. The first one is that u_{it} is a linear function of ξ_{it} and mean independent of $\bar{z}_i$ conditional on ξ_{it}. The second is that c_i is modelled as in Mundlak (1978) and Chamberlain (1982) as a sum of a constant, the group-means, and an error b_i. Having done these steps, the following debt equation is obtained:

$$D_{it}^{**} = \beta_0 + \boldsymbol{x_{it}\beta_1} + \boldsymbol{\bar{x}_i\beta_2} + \kappa_t\lambda_{it} + r_{it}, \tag{5}$$

where λ_{it} are the estimated IMRs from the T probit models and r_{it} is the sum of b_i and the remaining part of u_{it} after including the IMRs. We follow Semykina and Wooldridge (2010) and construct standard errors robust to heteroskedasticity and serial correlation.

4 Data and variables

4.1 Data

In this paper, we use data from the most recent 14 waves of the Survey on Household Income and Wealth (SHIW), covering the period from 1989 to 2016. The survey is conducted by the Bank of Italy every 2 years and provides information on the social, demographic, and economic characteristic of a representative sample of approximately 8000 Italian households. Since 1989, the survey contains a longitudinal component, with some households re-interviewed over time, whereas others are replaced at each wave.

In our analysis, we only consider household heads aged between 18 and 90 years[4] who appeared at least twice. After excluding individuals who did not give valid answers on the variables of interest (Appendix Table 3 provides more details about the stepwise construction of our sample), we obtain a sample of 64,743 observations, for a total of 16,882 households of which 6658 appear twice, 421 eight times, and 60 fourteen times. This is our complete sample, which we employ with the Semykina and Wooldridge's (2010) estimator. Definitions for the variable used in the estimation can be found in Appendix Table 4. Summary statistics for the entire sample are presented in Appendix Table 5.

[4] Most financial institutions have an upper limit on age when deciding whether to grant a loan. Since 2005, the Italian National Institute for Social Security allows pensioners to access salary-backed loans, where the Institute is directly responsible for repayments that are never higher than one fifth of the pension. This has enlarged the Italian market for loans to senior people, but options for those aged 90 years old and higher are basically non-existent.

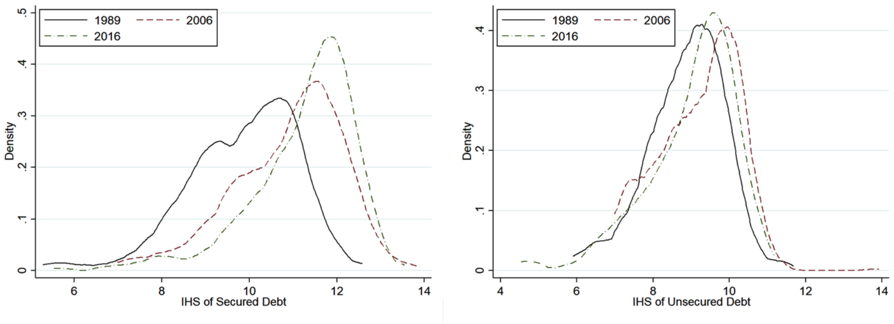
The SHIW reports also a set of questions on whether a loan request has been fully granted (94.89% of the applicants), partially granted (0.76% of the applicants), or refused (3.58% of the applicants), and on whether respondents considered the idea of applying for a loan but then changed their mind because they thought their request would be refused (2.48% of the sample). For the estimators that do not account for self-selection, we use a restricted sample where we disregard those individuals whose loan request was rejected or partially accepted, or who were afraid of asking for a loan. The size of this restricted sample decreases to 62,668 observations (16,359 households).

Appendix Table 6 presents descriptive statistics separately for households whose request for credit was fully or partially rejected and for households who did not ask for fear of being rejected. Compared to our complete sample, constrained household have some characteristics that could explain their (partial) exclusion from the credit market and their reluctance to ask for a loan. Indeed, constrained households are more likely to have pre-existing debts and have higher levels of unsecured debt, but lower income and wealth. They are on average younger and more likely to be self-employed. Perhaps as a consequence of being constrained, they are much more likely to be indebted from friends and relatives. Finally, Appendix Table 7 reports descriptive statistics for unconstrained households, separately for those with zero debt (but perhaps desired negative debt) and those with positive liabilities. Unconstrained households with zero debt are on average older and more likely to be retired, and they have on average lower income and wealth than those with positive liabilities.

4.2 Dependent variables

Our dependent variables are three measures of household indebtedness available in the SHIW: the amount of secured debt (mortgages), unsecured debt (consumer debt), and total debt of each household. Total household debt is computed as the summation of the amounts of secured and unsecured debt that each household holds. As the three debt distributions are highly skewed, we use inverse hyperbolic sine transformations (IHS) which precisely approximate the logarithmic transformation and have the advantage of being defined for zero and negative values. In this way, the regression estimates are improved: the outliers influence is damped down and, thus, heteroskedasticity is ameliorated (see Pence 2006; Georgarakos et al. 2014, for more details).

Figure 1 shows the distributions of the IHS transformation of the secured and unsecured debt for those households with positive amounts for 1989, 2006, and 2016. Noticeably, there has been a shift toward higher levels of secured debt overtime, whereas this tendency seems to have partially reversed in the last years for unsecured debt. As shown in Appendix Table 5, around 10.08% of households in our complete sample are indebted in the secured market and 10.74% in the unsecured market, for a total of 18.89% indebted households. Only considering the respondents that are indebted, the median amount of secured, unsecured, and total debt are € 26,683, € 4800, and € 10,445, respectively.



(a) Secured Debt **(b)** Unsecured Debt

Fig. 1 Distribution of IHS Secured and Unsecured debt. Positive values only. Data are elaborated by the authors from SHIW

4.3 Risk attitudes measures

The SHIW allows deriving two alternative measures of risk aversion, one based on observed behaviours and the other on a hypothetical lottery choice the individual is asked to take part in. Below, we consider each of these measures in turn. It is well known that risk preferences may change considerably when measured with different approaches (the so-called "risk elicitation puzzle"; see Pedroni et al. 2017): in Sect. 4.3.2, we compare the mean values of the distributions derived from the two alternative measures and find that they are in accordance.

4.3.1 Portfolio choices

Our first measure of risk is based on a question in which households are asked to indicate what type of investments they own. In the SHIW, these investments are grouped into two categories according to their risk class: certificates of deposit and government securities are considered "safer assets", whereas bonds, ETFs, shares, equities, and foreign securities are considered "riskier assets".

We use this information to split the households in our sample into two groups: those who own high-risk investments, and those who only own low-risk investments. The dummy variable *High-risk* takes value of one for those in the first group: in our sample, 17.32% households belong to the high-risk class and 82.68% to the low-risk class. In Appendix Table 8, we present summary statistics separately for the households in the two groups. Households owning risky assets have on average higher incomes and wealth, higher educational attainments, and are more financial literate (see Sect. 5.1) compared to the low-risk households. Furthermore, participation levels to the credit market and indebtedness levels are higher for the high-risk class, particularly for what concerns the secured credit market, where households are 5 percentage points more likely to be indebted and have, on average, a debt 82% higher than low-risk households. Interestingly, this evidence is in contrast with Becker and Shabani (2010), who observed that US households with mortgages are less likely to own stocks compared to similar households with no mortgages.

It may be possible that the actual allocation of a household financial portfolio between riskier and safer assets pertains to the same investment decision that leads to a certain level of desired debt, and thus might be explained by several characteristics of the household that also affect directly credit demand. This would raise the spectre of endogeneity when using this explanatory variable. However, whereas the actual amount or the proportion of total funds invested in the different assets is likely to be influenced by the amount of desired debt, we believe that the dichotomous decision of the household of whether to own risky assets should be less prone to this problem. Clearly, this measure of risk is simplistic; nevertheless, it should signal the risk preference of a household since it shows how it actually behaves when confronted with different levels of riskiness. Whereas we believe that this can provide a first insight into the relationship between risk aversion and the amount of desired debt, in the next section we present another proxy for a household's risk preference that should be best suited, in principle, to represent an exogenous explanatory variable for the level of debt.

4.3.2 Arrow–Pratt risk aversion

In 1995, households were asked the following question: *"We would like to ask you a hypothetical question that you should answer as if the situation were a real one. You are offered the opportunity of acquiring an asset permitting you, with the same probability, either to gain 10 million lire or to lose all the capital invested. What is the most that you would be prepared to pay for this asset?"*. The respondent can decide to answer a non-negative amount, not to answer, or to say that she does not know. A slightly different question was asked again in 2000,[5] but only to a random half of the sample. We use the answers to these questions to construct the Arrow–Pratt absolute risk aversion coefficient (Pratt 1964; Arrow 1965).[6] Indeed, the favourable outcome of 10 million lire (approximately € 5165) is equal to 16% of the average households' annual consumption; since the investment involves a relatively large risk, it allows to draw out risk attitudes (Rabin 2000).

Following Brunello (2002) and Eisenhauer and Ventura (2003), let z_i be the amount that household i declares to be willing to pay, w_i household i's endowment, and $u_i(\cdot)$ the lifetime utility function, with all values measured in million lire.[7] Since household i can gain $10 - z_i$ with probability 0.5 and lose z_i with probability 0.5, the expected utility can be expressed as

$$u_i(w_i) = \frac{1}{2}u_i(w_i - z_i + 10) + \frac{1}{2}u_i(w_i - z_i). \qquad (6)$$

[5] The phrasing of the question in 2000 is as follows: "*You are offered the opportunity of buying shares which, tomorrow, with equal probability, will be worth either 10 million or nothing. How much would you be prepared to pay to buy these shares?*"

[6] This is based on the model of expected utility, which has been the standard approach in economics to capture risk-aversion consideration. See O'Donoghue and Somerville (2018) for a review of its pros and cons.

[7] Eisenhauer and Ventura (2003) underline that one has to choose between considering the positive outcome of the postulated gamble as a gross or a net value, i.e. before or after tax. We opt for the latter.

Multiplying both sides of (6) by 2 and taking a second-order Taylor expansion of the right-hand side around w_i, we get

$$2u_i(w_i) \simeq u_i(w_i) - zu_i'(w_i) + 0.5z^2u_i''(w_i) + u_i(w_i) + (10 - z)u_i'(w_i) \\ +0.5(10 - z)^2u_i''(w_i), \tag{7}$$

where u_i' and u_i'' are the first and second derivative of the utility function. Simplifying and rearranging (7), we obtain the Arrow–Pratt measure of absolute risk aversion,

$$R_i \equiv -\frac{u_i''(w_i)}{u_i'(w_i)} \simeq \frac{10 - 2z_i}{50 + z_i^2 - 10z_i}, \tag{8}$$

which has the advantages of providing a point estimate and not requiring specific assumptions on the form of the utility function.

After dropping those individuals who report to be willing to pay more than or equal to 10 million (because these values lead to a certain loss), we compare the responses of those 516 individuals who answered this question in both 1995 and 2000: standard t-test shows that we cannot reject the null hypothesis that the difference in means is not statistically and significantly different from 0 (with a two-tailed p value of 0.195). We take these anecdotal evidences as suggesting that we can consider risk attitudes to be time-invariant in our sample, in line with Brown et al. (2013). We thus build a single absolute risk aversion measure based on the answers to the 1995 or 2000 answers (or the mean of the two answers for those who answered twice), and thus constant over the whole period considered.[8]

In our sample, we have 3348 households (17,795 observations) for whom this measure is computable: 2945 (88%) are risk averse, 300 (9%) are risk neutral, and 103 (3%) are risk loving. As shown in Appendix Table 5, the mean of the Arrow–Pratt measure in our sample is equal to 0.164. By comparing our measure of risk based on portfolio choices with the Arrow–Pratt measure, Appendix Table 8 shows that households belonging to the high-risk class have an average Arrow–Pratt coefficient (0.144) that is lower than the agents belonging to the low-risk class (0.169). This difference is significant at 1% level, with a t-test statistic of $t = 16.1$. Therefore, the two measures seem to be in accordance.

4.4 Other explanatory variables

According to the life-cycle theory, agents optimally smooth consumption over time: they borrow when young, repay debts and save for retirement when mature, and spend savings and assets when they become old. In order to account for this inverted U-shaped relationship between debt and age, we include a second order polynomial of age. Moreover, this theory suggests that the consumption and borrowing decisions are driven by permanent income: as usual in this literature, we proxy permanent income with a second order polynomial of the IHS transformation of households' net wealth.

8 Results are robust to limiting the sample to only risk averse individuals. Results are available on request.

With the purpose of accounting for the uncertainty of income, we include the level of education, a dummy for being self-employed, and the number of income earners in the household. We also include a second order polynomial of the IHS transformation of current income. Since socio-economic regional differences are particularly marked in Italy and local discrepancies may reflect specific features of the supply side which are not explicitly expressed by the variables included in the SHIW, we add two dummy variables for the geographic area, one for the Centre and one for the South.

We control for households composition through the number of dependants and a dummy for marital status. We introduce a dummy for the possession of a bank account, as a proxy for the pre-existence of a relationship with a bank that could facilitate the access to credit, and a dummy that indicates the existence of debt from friend and relatives. Finally, to account for the macroeconomic trends, year dummies are included.

4.5 Selection equation

The participation equation in (4) is estimated in the first step of the Semykina and Wooldridge's (2010) regression. The vector of explanatory variables include second-degree polynomials of age, net wealth, and current income, the level of education, the self-employment status, the number of income earners and dependants in the household, and the marital status. The exclusion restriction chosen in order to identify the model is the dimension of the municipality, as in Magri (2007). Living in a municipality with less than 20,000 inhabitants may have an influence on the entry costs and, hence, on the decision of whether to borrow or not. At the same time, this variable should not influence the level of desired debt and, as a consequence, can be omitted from the second-stage estimates.

5 Results

To facilitate comparisons from the results of the different estimations, Tables 1 and 2 report average marginal effects (AMEs) from the various regressions of total debt over the set of covariates, respectively including the measure of risk attitudes based on households' portfolio choices and the Arrow–Pratt coefficient. Across all specifications, we employ cluster robust standard errors.

For both tables, the first three columns show the results for the OLS, RE, and CRE estimations, which do not take into account that our values are left-censored and potentially subject to sample selection. Since the tests on the joint significance of the Mundlak effects reject the null hypothesis at 1% significance level in both cases (with χ^2s of 159.48 and 55.84, respectively when using the portfolio choice variable and the Arrow–Pratt coefficient), we conclude that CRE is to be preferred among the linear estimators. The fourth and fifth column show the estimates resulting from the Tobit models, which give the appropriate weight to the censored values. Once again, the models with Mundlak effects are to be preferred in both cases (the χ^2s are 221.85 and 65.79, thus rejecting the null at 1% significance levels). As explained in Sect. 3, we

Table 1 Total Debt versus the Financial Measure of Risk, AMEs

	OLS	RE	CRE	RET	CRTE	S&W
High-risk	-0.266***	-0.094*	-0.118**	-0.104**	-0.120***	-0.250***
	(0.0596)	(0.0512)	(0.0513)	(0.0449)	(0.0430)	(0.0595)
Age	-0.041***	-0.040***	-0.026***	-0.060***	-0.037***	-0.034***
	(0.0018)	(0.0017)	(0.0037)	(0.0019)	(0.0035)	(0.0038)
Current Income	0.392***	0.266***	0.094	0.381***	0.174***	0.117**
	(0.0513)	(0.0450)	(0.0578)	(0.0454)	(0.0555)	(0.0584)
Net Wealth	0.155***	0.170***	0.161***	0.148***	0.132***	0.150***
	(0.0115)	(0.0111)	(0.0167)	(0.0136)	(0.0182)	(0.0167)
College	0.112**	0.133**	0.007	0.059	-0.001	0.027
	(0.0560)	(0.0516)	(0.1073)	(0.0469)	(0.0872)	(0.1080)
Self-Employed	-0.541***	-0.420***	-0.124	-0.373***	-0.118	0.024***
	(0.0855)	(0.0732)	(0.1045)	(0.0591)	(0.0863)	(0.1062)
Retired	-0.760***	-0.589***	-0.286***	-0.363***	-0.169***	-0.216***
	(0.0611)	(0.0556)	(0.0741)	(0.0489)	(0.0596)	(0.0756)
Married	0.101**	0.121**	-0.034	0.296***	0.051	-0.049
	(0.0504)	(0.0475)	(0.0832)	(0.0540)	(0.0885)	(0.0840)
Income Earners	0.257***	0.296***	0.345***	0.273***	0.270***	0.388***
	(0.0368)	(0.0326)	(0.0472)	(0.0289)	(0.0391)	(0.0481)
Dependents	0.183***	0.187***	0.193***	0.169***	0.129***	0.232***
	(0.0248)	(0.0232)	(0.0426)	(0.0206)	(0.0481)	(0.0432)
Informal Debt	0.088	-0.156	-0.380***	0.240***	0.008	0.119
	(0.1478)	(0.1311)	(0.1414)	(0.0914)	(0.0982)	(0.1471)
Bank Account	0.627***	0.573***	0.443***	1.079***	0.731***	0.674***
	(0.0415)	(0.0396)	(0.0516)	(0.0772)	(0.0906)	(0.0413)
Center	0.220***	0.237***	0.239***	0.293***	0.289***	
	(0.0592)	(0.0573)	(0.0572)	(0.0560)	(0.0541)	
South	-0.400***	-0.421***	-0.355***	-0.408***	-0.317***	
	(0.0503)	(0.0481)	(0.0492)	(0.0585)	(0.0583)	
N	62,668					

Cluster robust standard errors are reported in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Mundlak effects (in CRE and CRTE) and year dummies included but not reported

Centre and *South* dropped in S&W because of collinearity

Table 2 Total Debt versus the Arrow–Pratt measure of risk aversion, AMEs

	OLS	RE	CRE	RET	CRTE	S&W
Arrow–Pratt	1.775***	1.246**	1.610***	1.096**	1.351***	2.037***
	(0.5245)	(0.5399)	(0.5434)	(0.5292)	(0.5176)	(0.5306)
Age	– 0.045***	– 0.042***	– 0.026***	– 0.060***	– 0.041***	– 0.033***
	(0.0039)	(0.0038)	(0.0074)	(0.0039)	(0.0070)	(0.0081)
Current income	0.402***	0.252***	0.034	0.357***	0.138	0.062
	(0.1023)	(0.0904)	(0.1087)	(0.0882)	(0.1057)	(0.1102)
Net wealth	0.135***	0.195***	0.252***	0.151***	0.214***	0.243***
	(0.0266)	(0.0265)	(0.0369)	(0.0280)	(0.0361)	(0.0365)
College	0.016	0.058	– 0.006	0.013	– 0.051	0.041
	(0.1089)	(0.1024)	(0.1901)	(0.0903)	(0.1581)	(0.1905)
Self-employed	– 0.596***	– 0.435***	– 0.157	– 0.375***	– 0.111	– 0.163
	(0.1530)	(0.1333)	(0.1737)	(0.1108)	(0.1561)	(0.1774)
Retired	– 0.726***	– 0.553***	– 0.339***	– 0.366***	– 0.223**	– 0.365***
	(0.1157)	(0.1084)	(0.1303)	(0.0930)	(0.1053)	(0.1347)
Married	0.195*	0.128	– 0.200	0.253**	– 0.174	– 0.162
	(0.1044)	(0.1004)	(0.1635)	(0.1104)	(0.1685)	(0.1673)
Income earners	0.153**	0.227***	0.302***	0.239***	0.266***	0.281***
	(0.0709)	(0.0619)	(0.0829)	(0.0544)	(0.0704)	(0.0847)
Dependents	0.114**	0.155***	0.189**	0.159***	0.136**	0.184**
	(0.0491)	(0.0461)	(0.0747)	(0.0391)	(0.0567)	(0.0768)

Table 2 continued

	OLS	RE	CRE	RET	CRTE	S&W
Informal Debt	0.493*	0.182	− 0.006	0.320*	0.143	0.472
	(0.2915)	(0.2407)	(0.2466)	(0.1716)	(0.1805)	(0.2927)
Bank account	0.627***	0.594***	0.543***	0.899***	0.785***	0.640***
	(0.0926)	(0.0894)	(0.1134)	(0.1464)	(0.1681)	(0.0940)
Center	0.324**	0.376***	0.392***	0.434***	0.437***	
	(0.1291)	(0.1299)	(0.1293)	(0.1159)	(0.1128)	
South	− 0.299***	− 0.362***	− 0.305***	− 0.300***	− 0.262**	
	(0.1019)	(0.1008)	(0.1042)	(0.1140)	(0.1149)	
N	17,278					

Cluster robust standard errors are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Mundlak effects (in CRE and CRTE) and year dummies included but not reported.
Centre and *South* dropped in S&W because of collinearity

test for the presence of selection bias following Wooldridge (1995). We always reject the null of no sample selection at 1% confidence levels. This strongly suggests that our sample is not randomly selected, thus requiring the use of the procedure proposed by Semykina and Wooldridge (2010), whose results are presented in the last columns.

Across specifications, the coefficient for the possession of risky financial instruments is strongly significant with a negative sign. In particular, the coefficient from the Semykina and Wooldridge's (2010) estimator indicates that agents with a financial portfolio including riskier assets desire on average an amount of total debt that is approximately 25% lower than agents with a low-risk portfolio; in other word, households who are less prone to invest in risky assets tend to desire more debt. Consistently, the coefficient for the Arrow–Pratt measure of risk aversion is strongly significant with a positive sign throughout all specifications. Once accounting for the scale of the Arrow Pratt measure (that ranges between − 0.2 and 0.2 with mean value 0.16 in the entire sample, as shown in Appendix Table 5), the magnitude of its coefficient is in line with the coefficient for the dummy for the possession of risky financial instruments. Our results suggest that, in our sample, households who have a lower preference for risk tend to desire higher levels of debt. This supports the idea that debt may be used by households in our sample as a safety net to insure against (or smooth consumption in reaction to) temporary negative shocks.

Appendix Table 9 presents the results separately for secured and unsecured loans, using the Arrow–Pratt coefficient as a measure of risk preferences.[9] The sign of the relationship between desired debt and risk aversion is maintained when we look at secured and unsecured debt in isolation: relatively more risk averse agents desire more unsecured and secured debt. This is in line with previous literature which found that both unsecured borrowing (through e.g. credit cards and overdrafts, see Sullivan 2008; Browning and Crossley 2009; Keys 2018) and refinancing mortgage debt (e.g. Hurst and Stafford 2004) can help individuals to smooth consumption in the event of transitory negative income shocks.

We now turn our attention to the other independent variables, where results are generally consistent across the two tables (since the sample size is smaller, there is a general increase of the standard errors when using the Arrow–Pratt measure). Both age and net wealth of the household are significant at a 1% level throughout all specifications. Age has a negative sign: when accounting for self selection, the level of desired debt decreases by approximately 3% when age increases by 1 year. Conversely, the effect of net wealth is positive and ranges between 13 and 25%. Current income is significant with a positive sign throughout most specifications but its significance decreases when selection bias is accounted for. Perhaps reflecting the characteristics of the market for debt, we find current income to have a positive relationship with desired unsecured debt and a negative relationship with secured debt; net wealth has a positive relationship with desired unsecured debt but is generally insignificant for unsecured debt. However, these effects summarize second-order polynomials: Fig. 2 shows the effects on desired debt at different levels of these variables.

[9] We present the results for OLS, CRE, and CRTE only, since the Mundlak effects are always jointly significant (the other results are available on request). We also report the results from the Semykina and Wooldridge's (2010) estimator, but it should be noted that the liquidity constrained questions are not referred to any of the two forms of credit in particular.

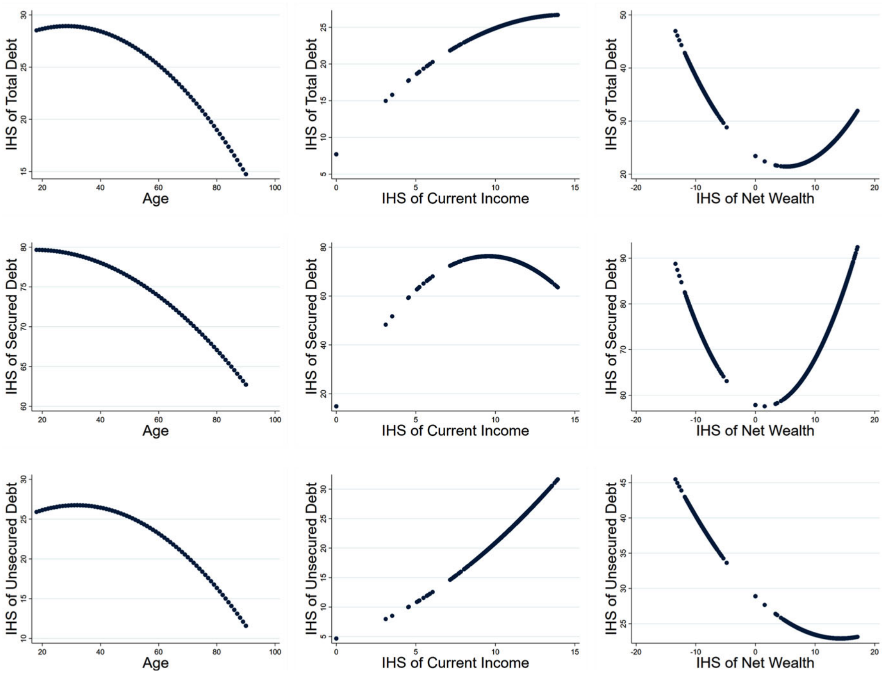


Fig. 2 Household Debt profiles. The IHS of Household Debt are predicted at the mean values of all the independent variables other than the one on the horizontal axis using the coefficients from the CRTE regressions with the Arrow–Pratt absolute risk aversion coefficient

The relationship between age and debt is concave and the size of desired debt reaches a peak for individuals aged approximately 40. Total debt increases almost linearly with income, but this hides a concave relationship with secured debt and a convex relationship with unsecured debt. Thanks to the IHS transformation that preserves the negative values, we observe that the fitted amount of desired debt is high for those who report negative or low levels of net wealth (namely, those with liabilities exceeding assets) but then decreases up until levels of IHS wealth around 6 (approximately € 210). It then starts rising very rapidly with wealth, especially for secured debt (remember that the variable is insignificant for unsecured debt). This result is in line with Duca and Rosenthal (1991), Cox and Jappelli (1993) and Magri (2007), and suggests that the wealthier an household is, the less rationed it is in the secured market, where it can provide more collateral.[10]

For what concerns the remaining regressors, the signs of the coefficients are mostly as expected, and consistent among the three types of debt. For example, both the num-

[10] However, it is important to observe that net wealth may be affected by simultaneity bias: the amount borrowed in a year influences the current level of wealth. We checked the robustness of our results to two alternative specifications, the first where we substitute the current value with the lagged value of net wealth, and the second where we remove the regressor from the analysis. In both cases, the results for the remaining explanatory variables are not affected by the change.

ber of income earners and dependants have a positive and significant effect on the amount of desired debt, suggesting that when more family members work the household is significantly less rationed, and that borrowing more may become necessary when the size of the household increases. Having a bank account positively affects the level of desired debt, perhaps reflecting the existence of a relationship between the household and the bank which could make the access to credit easier. Households in the centre of Italy seem to desire more debt than households in the north, which in turn desire more debt that households in the south. Finally, retired households desire less debt.

5.1 Adding financial literacy

Financial literacy may significantly impact the level of desired and actual debt. For example, Artavanis and Karra (2020) find that US university students with low levels of financial literacy are more likely to underestimate future student loan payments and are more vulnerable to unexpected negative shocks on their payment-to-income ratios; Lusardi and Tufano (2015) show that less knowledgeable individuals are more likely to report excessive debt loads. Since accounting for a financial literacy variable significantly reduces our sample sizes, we only added it here, where we test the robustness of our results to its inclusion.

In 2006, 2008, 2010, and 2016, the SHIW included a section testing respondents for basic financial knowledge, but the set of questions varied in each wave. The only question repeated with the same formulation is the following one concerning inflation: "*Suppose you put 1000 euros into a (no fee, tax free) savings account with a guaranteed interest rate of 1% per year. Suppose furthermore inflation stays at 2%. In one year's time will you be able to buy the same amount of goods that you could buy by spending today 1000 euros?*". We use this question to construct a dummy variable that equals 1 when the answer is correct.[11] When including this variable, our sample size reduces to 28,387 observations (but to only 3875 observations when using the Arrow–Pratt measure as a proxy for risk preferences), with approximately 3.9% of them credit constrained. Around one fourth of our observations could not identify the correct answer.

As shown in Appendix Table 10, we find evidences that financial literacy is a significant determinant of the level of total desired debt when sample selection is accounted for: in particular, being financially educated increases total debt by 31–63%, depending on which variable is used to describe risk preferences. Moreover, Appendix Table 10 confirms that our results on the correlation between risk preferences and desired debt are robust to the inclusion of the literacy regressor, as coefficients maintain the same significance levels and are approximately equivalent in terms of magnitude.

[11] To increase the number of observations, when the answer is missing we do as follows: for each households, we assign a value of zero in all the waves preceding the first 0 observed (i.e. we assume that the household did not know the answer in the preceding waves if she did not know the answer in the current wave), and a value of 1 to all the waves following the last 1 answered (i.e. we assume that the household learned the correct answer after she first answered it correctly).

Whereas the coefficients on the remaining independent variables maintain the same signs as in the original regressions, some become insignificant in the estimations associated with the Arrow–Pratt measure of risk aversion, but this can be explained by the limited number of observations.

6 Conclusions

This paper exploits a long panel of Italian households to explore the determinants of desired debt, accounting for the selection bias implied by the presence of liquidity constraints. As predicted by a well-established theoretical literature on life-cycle dynamics, we find that age and permanent income play a key role in explaining credit demand and that their significant influences are robust across a range of different samples and econometric specifications.

In this study, we focus on households' attitude towards risk, using both a measure based on observed behaviours (i.e. the riskiness of the financial portfolio held by a household) and one based on a hypothetical lottery choice question, which allows us to assign to each household an absolute risk aversion coefficient. Our findings suggest that there exists a statistically significant correlation between risk preferences and the amount of total, secured, and unsecured debt desired by the household: in particular, relatively more risk averse households desire more debt.

The results presented in this paper may be of interest to policy-makers concerned with the potential credit risk associated with the acceleration of households' indebtedness,[12] since they inform on the characteristics of those households that tend to incur high levels of debt. In this regard, an interesting direction for future research can be found in the social economic literature. Indeed, borrowing decisions may be driven not only by personal attitudes like risk preferences, but also by social influences, particularly in the unsecured credit market. Future researches could try to gauge how much of the desire for more debt can be justified by the need of catching up with peers.

Appendix

See Tables 3, 4, 5, 6, 7, 8, 9 and 10.

[12] The percentage of total households' liabilities on GDP in Italy has always been lower than the European mean. However, between 1995 and 2012 this indicator has more than doubled and, after a slowdown due to the effects of the financial crisis, has been recently recording high growth rates again. See e.g. Eurostat data available at https://ec.europa.eu/eurostat/databrowser/view/nasa_10_f_bs/default/table?lang=en.18.

Table 3 Stepwise adjustment of samples and average number of waves

	Obs.	Individ.	Waves
Complete sample	111,281	62,431	3.61
Non-negative income	110,096	61,865	3.60
At least two waves	65,152	16,921	5.39
Debt information present	65,125	16,921	5.39
Between 18–90 years old	64,751	16,882	5.40
Bank relationship information present	64,743	16,882	5.40
Of which: Unconstrained	62,668		5.40
Constrained	2075		5.23

Table 4 Variables and definitions

Variable	Label
Age	Age at date of interview
Current income	IHS transformation of disposable income (euro at 2010 prices), net of payment of taxes and social security contributions.
Net wealth	IHS transformation of real assets plus financial assets minus financial liabilities (euro at 2010 prices),
Married	1 if married, 0 otherwise
Retired	1 if the head of the household is retired
Self-employed	1 if the head of the household is self-employed
College	1 if the head of the household has attended college
Income earners	Number of income earners in the household
Dependants	Difference between number of components and income earners
Municipality	1 if the household live in a municipality with less than 20,000 inhabitants
Bank account	1 if the household has a bank account
Informal Debt	1 if the household has access to informal debt
Center	1 if the household lives in the central region of Italy
South	1 if the household lives in the southern region of Italy
Literacy	1 if the household responded correctly to a question on inflation
High-risk	1 if the household owns risky assets
Arrow–Pratt	Absolute risk aversion coefficient

Table 5 Summary statistics for the entire sample

	Count	Mean	Sd	Min	Max
Total debt (€)	64,743	4861.98	19,614.47	0.00	616,591.94
Secured debt (€)	64,743	4112.95	18,986.56	0.00	616,591.94
Unsecured debt (€)	64,743	749.03	4045.87	0.00	55,5615.38
Total debt (% of hh)	64,743	0.19	0.39	0.00	1.00
Secured debt (% of hh)	64,743	0.10	0.30	0.00	1.00
Unsecured debt (% of hh)	64,743	0.11	0.31	0.00	1.00
High-risk	64,743	0.17	0.38	0.00	1.00
Arrow–Pratt	17,795	0.16	0.08	− 0.20	0.20
Age	64,743	57.25	15.04	18.00	90.00
Current income (€)	64,743	33,075.97	25,044.38	0.00	1.15e+06
Net wealth (€)	64,743	237,319.26	413,218.56	− 7.24e+05	2.92e+07
College	64,743	0.34	0.47	0.00	1.00
Literacy	28,387	0.62	0.49	0.00	1.00
Self-employed	64,743	0.11	0.32	0.00	1.00
Retired	64,743	0.54	0.50	0.00	1.00
Married	64,743	0.68	0.47	0.00	1.00
Income earners	64,743	1.70	0.77	1.00	9.00
Dependents	64,743	1.01	1.19	0.00	10.00
Informal Debt	64,743	0.03	0.16	0.00	1.00
Bank account	64,743	0.89	0.31	0.00	1.00
Center	64,743	0.20	0.40	0.00	1.00
South	64,743	0.24	0.43	0.00	1.00
Municipality	64,743	0.27	0.44	0.00	1.00
Credit constrained	64,743	0.03	0.18	0.00	1.00

Table 6 Summary statistics for constrained sample

	Rationed		Did not ask	
	Mean	Sd	Mean	Sd
Total debt (€)	6586.20	21,515.20	4738.96	16,399.20
Secured debt (€)	4396.01	19,996.25	3313.83	15,611.59
Unsecured debt (€)	2190.19	7418.61	1425.13	4144.82
Total debt (% of hh)	0.32	0.47	0.32	0.47
Secured debt (% of hh)	0.11	0.31	0.10	0.30
Unsecured debt (% of hh)	0.24	0.42	0.25	0.43
High-risk	0.04	0.20	0.11	0.31
Arrow–Pratt	0.16	0.09	0.15	0.10
Age	49.11	12.75	49.82	13.19
Current income (€)	23,308.93	15,590.53	30,545.40	21,040.38
Net wealth (€)	123,044.44	214,477.50	165,591.50	271,729.30
College	0.24	0.43	0.33	0.47
Literacy	0.68	0.47	0.64	0.48
Self-employed	0.18	0.38	0.15	0.36
Retired	0.40	0.49	0.40	0.49
Married	0.71	0.45	0.71	0.46
Income earners	1.57	0.75	1.70	0.79
Dependents	1.59	1.43	1.32	1.29
Informal Debt	0.22	0.41	0.13	0.34
Bank account	0.84	0.37	0.88	0.32
Center	0.15	0.36	0.18	0.38
South	0.37	0.48	0.23	0.42
Municipality	0.22	0.41	0.28	0.45
Credit constrained	1.00	0.00	1.00	0.00
N	472		1,603	

Table 7 Summary statistics for unconstrained sample

	Zero Tot Debt		Positive Tot Debt	
	Mean	Sd	Mean	Sd
Total debt (€)	0.00	0.00	26,301.71	39,169.00
Secured debt (€)	0.00	0.00	22,394.06	39,493.72
Unsecured debt (€)	0.00	0.00	3907.65	8628.19
Total debt (% of hh)	0.00	0.00	1.00	0.00
Secured debt (% of hh)	0.00	0.00	0.55	0.50
Unsecured debt (% of hh)	0.00	0.00	0.56	0.50
High-risk	0.17	0.37	0.21	0.41
Arrow–Pratt	0.16	0.08	0.16	0.08
Age	59.34	15.08	49.38	11.77
Current income (€)	31,583.36	24,472.58	40,423.91	26,928.64
Net wealth (€)	236,246.17	426,809.80	256,673.94	370,414.19
College	0.31	0.46	0.46	0.50
Literacy	0.59	0.49	0.73	0.44
Self-employed	0.10	0.31	0.15	0.35
Retired	0.60	0.49	0.30	0.46
Married	0.65	0.48	0.81	0.39
Income earners	1.65	0.75	1.88	0.80
Dependents	0.92	1.16	1.37	1.21
Informal Debt	0.02	0.14	0.04	0.19
Bank account	0.87	0.33	0.96	0.19
Center	0.20	0.40	0.24	0.43
South	0.25	0.44	0.18	0.39
Municipality	0.27	0.45	0.26	0.44
Credit constrained	0.00	0.00	0.00	0.00
N	51,107		11,561	

Table 8 Summary statistics depending on portfolio choices

	Low-risk		High-risk	
	Mean	Sd	Mean	Sd
Total debt (€)	4309.32	17,446.28	7500.93	27,569.11
Secured debt (€)	3601.00	16,936.81	6557.48	26,550.27
Unsecured debt (€)	708.32	3296.55	943.45	6526.68
Total debt (% of hh)	0.18	0.39	0.22	0.42
Secured debt (% of hh)	0.09	0.29	0.14	0.34
Unsecured debt (% of hh)	0.11	0.31	0.11	0.32
High-risk	0.00	0.00	1.00	0.00
Arrow–Pratt	0.17	0.08	0.14	0.11
Age	57.46	15.36	56.26	13.36
Current income (€)	28,932.67	19,502.41	52,860.06	36,507.02
Net wealth (€)	184,453.52	286,690.01	489,750.66	718,737.41
College	0.28	0.45	0.59	0.49
Literacy	0.58	0.49	0.82	0.39
Self-employed	0.10	0.30	0.16	0.37
Retired	0.56	0.50	0.46	0.50
Married	0.66	0.47	0.76	0.43
Income earners	1.65	0.76	1.91	0.78
Dependents	1.05	1.22	0.85	0.99
Informal Debt	0.03	0.17	0.01	0.08
Bank account	0.87	0.34	0.99	0.08
Center	0.20	0.40	0.23	0.42
South	0.28	0.45	0.07	0.26
Municipality	0.27	0.45	0.26	0.44
Credit constrained	0.04	0.18	0.02	0.13
N	53,532		11,211	

Table 9 Secured and unsecured Debt versus the Arrow–Pratt measure, AMEs

	Secured Debt				Unsecured Debt			
	OLS	CRE	CRTE	S&W	OLS	CRE	CRTE	S&W
Arrow–Pratt	1.051**	0.881*	1.082*	1.266***	0.861***	0.798**	0.902*	0.934***
	(0.4699)	(0.4976)	(0.6383)	(0.4741)	(0.3214)	(0.3247)	(0.4688)	(0.3224)
Age	− 0.028***	− 0.015**	− 0.038***	− 0.183***	− 0.021***	− 0.015***	− 0.033***	− 0.017***
	(0.0035)	(0.0059)	(0.0083)	(0.0068)	(0.0025)	(0.0055)	(0.0074)	(0.0057)
Current income	0.225**	− 0.247***	− 0.330***	− 0.226**	0.224***	0.291***	0.456***	0.293***
	(0.0891)	(0.0877)	(0.1184)	(0.0810)	(0.0648)	(0.0871)	(0.1184)	(0.0872)
Net wealth	0.232***	0.248***	0.491***	0.255***	− 0.079***	0.024	− 0.028	0.009
	(0.0204)	(0.0310)	(0.0485)	(0.0303)	(0.0208)	(0.0288)	(0.0367)	(0.0285)
College	0.122	− 0.192	− 0.284*	− 0.142	− 0.059	0.148	0.157	0.174
	(0.0972)	(0.1509)	(0.1701)	(0.1526)	(0.0682)	(0.1484)	(0.1765)	(0.1499)
Self-employed	− 0.504***	− 0.061	− 0.100	− 0.0393	− 0.183*	− 0.070	− 0.049	0.084
	(0.1398)	(0.1513)	(0.1703)	(0.1525)	(0.0957)	(0.1347)	(0.1742)	(0.1381)
Retired	− 0.566***	− 0.237**	− 0.254**	− 0.255**	− 0.263***	− 0.124	− 0.108	− 0.132
	(0.0993)	(0.1035)	(0.1173)	(0.1063)	(0.0793)	(0.1026)	(0.1165)	(0.1047)
Married	0.146	− 0.170	− 0.250	− 0.172	0.045	0.006	0.096	0.019
	(0.0897)	(0.1295)	(0.1944)	(0.1321)	(0.0701)	(0.1292)	(0.1855)	(0.1331)
Income earners	0.035	0.173**	0.205***	0.148**	0.161***	0.178***	0.207***	0.179***
	(0.0590)	(0.0705)	(0.0766)	(0.0714)	(0.0459)	(0.0660)	(0.0780)	(0.0670)
Dependents	0.010	0.110	0.076	0.094	0.129***	0.127**	0.143**	0.134**
	(0.0424)	(0.0684)	(0.0617)	(0.0696)	(0.0325)	(0.0535)	(0.0633)	(0.0552)
Informal Debt	1.097***	0.765***	0.648***	1.106***	− 0.243	− 0.491**	− 0.145	− 0.272

Table 9 continued

	Secured Debt				Unsecured Debt			
	OLS	CRE	CRTE	S&W	OLS	CRE	CRTE	S&W
	(0.2580)	(0.2239)	(0.1892)	(0.2587)	(0.2159)	(0.1982)	(0.2023)	(0.2179)
Bank account	0.006	0.034	0.236	− 0.029	0.622***	0.500***	0.815***	0.670***
	(0.0685)	(0.0814)	(0.2175)	(0.0697)	(0.0746)	(0.0945)	(0.1786)	(0.0748)
Center	0.027	0.081	0.187		0.314***	0.344***	0.446***	
	(0.1153)	(0.1179)	(0.1389)		(0.0827)	(0.0827)	(0.1003)	
South	− 0.317***	− 0.288***	− 0.330**		− 0.019	− 0.033	− 0.051	
	(0.0847)	(0.0899)	(0.1476)		(0.0699)	(0.0687)	(0.1022)	
N	17,278				17,278			

Cluster robust standard errors are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Mundlak effects (in CRE and CRTE) and year dummies included but not reported

Table 10 Total Debt versus financial literacy, AMEs

	CRTE	CRTE	S&W	S&W
High-risk	− 0.131**		− 0.254***	
	(0.0651)		(0.0871)	
Arrow–Pratt		2.439**		2.530**
		(1.0715)		(1.0080)
Literacy	0.019	0.224	0.313***	0.635***
	(0.0838)	(0.2337)	(0.0596)	(0.1760)
Age	− 0.031***	− 0.031**	− 0.024***	− 0.011
	(0.0062)	(0.0160)	(0.0057)	(0.0173)
Current income	0.329***	0.081	0.228***	0.219
	(0.0915)	(0.2235)	(0.0870)	(0.2386)
Net wealth	0.075***	0.280***	0.116***	0.318***
	(0.0289)	(0.0764)	(0.0245)	(0.0724)
College	0.044	0.010	−0.087	0.139
	(0.1468)	(0.3726)	(0.1741)	(0.4694)
Self-employed	− 0.077	− 0.036	− 0.167	− 0.414
	(0.1408)	(0.3610)	(0.1642)	(0.4062)
Retired	− 0.180*	− 0.014	− 0.695***	− 0.310
	(0.0957)	(0.2123)	(0.0960)	(0.2724)
Married	− 0.034	− 0.348	− 0.120	− 0.313
	(0.1405)	(0.3476)	(0.1202)	(0.3132)
Income earners	0.196***	0.268*	0.326***	− 0.003
	(0.0621)	(0.1493)	(0.0743)	(0.1782)
Dependants	0.155***	0.135	0.271***	0.248
	(0.0517)	(0.1214)	(0.0702)	(0.1644)
Informal Debt	− 0.204	0.009	− 0.187	− 0.474
	(0.1600)	(0.4224)	(0.2071)	(0.6088)
Bank account	0.478***	0.553	0.616***	0.551***
	(0.1508)	(0.3651)	(0.0606)	(0.1676)
Centre	0.265***	− 0.005		
	(0.0817)	(0.2256)		
South	− 0.298***	− 0.305		
	(0.0923)	(0.2503)		
N	27,311	3875	27,311	3875

Cluster robust standard errors are reported in parentheses.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Mundlak effects (in CRTE) and year dummies included but not reported.
Centre and *South* dropped in S&W because of collinearity

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