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# **Which Loans do We Take? A Micro-Level Analysis of Croatian Households' Debt Participation**

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## Abstract

This paper uses a new data set in order to explore micro-level patterns of household borrowing in Croatia. By analyzing cross-section data from the *Household Finance and Consumption Survey*, conducted for the first time in Croatia in 2017, we present the structure of household debt holdings and identify several household characteristics associated with debt participation in three types of debt: secured debt, non-collateralized loans as well as overdrafts and/or credit card debt. Our results indicate that: a) households with middle aged heads tend to participate more and hold larger amounts of all three debt types, b) households with perceived credit constraints are more likely to take non-collateralized loans, and c) inability to finance consumption and willingness to take risks when making saving and investment decisions contribute to participation in overdrafts and/or credit card debt.

**Keywords:** household debt, secured vs. unsecured debt, age profiles of borrowing, credit constraints, Household Finance and Consumption Survey

**JEL:** G51, D15, G21

## Sažetak

U radu je korišten novi skup podataka kako bi se na mikrorazini istražili uzorci u zaduživanju hrvatskih kućanstava. Analiziranjem presječnih podataka iz Ankete o financijama i potrošnji kućanstava, koja je u Hrvatskoj prvi put provedena 2017., prikazana je struktura zaduženosti hrvatskih kućanstava te je utvrđeno nekoliko obilježja kućanstava kada je riječ o njihovom udjelu u tri vrste duga: osigurani krediti, neosigurani krediti te prekoračenja po računu i/ili dugovanja na osnovi kreditnih kartica. Dobiveni rezultati upućuju na to da: a) kućanstva na čijem su čelu sredovječne osobe uglavnom sudjeluju u većem broju i sa znatnijim iznosima u sve tri vrste zaduženja, b) kućanstva s vidljivim kreditnim ograničenjima češće posežu za neosiguranim kreditima i c) nemogućnost financiranja potrošnje i sklonost preuzimanju rizika pri donošenju odluka o štednji i ulaganjima pridonose oslanjanju na prekoračenja po računu i/ili dugovanju na osnovi kreditnih kartica.

**Ključne riječi:** zaduženost kućanstava, osigurani – neosigurani krediti, starosni profil pri zaduživanju, kreditna ograničenja, Anketa o financijama i potrošnji kućanstava

**JEL:** G51, D15, G21

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## 1 Introduction

Household debt is an important element of macro-financial stability within and across economies. The sensitivity of indebted households to shocks in employment, house prices and interest rates implies that the level and structure of household debt in the economy can strongly influence the dynamics of consumption, asset prices and economic growth. Indeed, some of the available research suggests that a strong rise in the household debt-to-GDP ratio, while supporting short-run economic growth, tends to precede a fall in economic output over the medium term (Mian, et al., 2017; Mian & Sufi, 2018; Jorda, et al., 2015). This makes the study of household debt a worthwhile endeavor.

The dynamics of household debt in Croatia has been marked by periods of boom and bust as well (Figure A1). As the Croatian economy went through the transition in the first half of the 1990s, one that was marked by war and inflation, household debt levels were quite low, reflecting the traditionally high homeownership, partly the legacy of the previous socialist system<sup>1</sup>. The first lending boom emerged in the years 1996-1998, followed by a wave of bank failures in 1998-1999 and a brief slowdown in lending thereafter (Kraft & Jankov, 2005). As the consolidation and restructuring of the banking system came to an end in 2000, household credit growth started to recover (Kraft, 2007). Over the most part of the 2000s, household debt grew immensely, from around 17% of GDP in 2001 to 41% in 2009. During this period, liquidity constraints on households eased, mostly under the influence of the development of the banking system and an increase in capital inflows. Moreover, strong demand for housing and consumer durables, reinforced by robust economic growth and high income expectations further stimulated growth in household borrowing (Kraft, 2007).

After the onset of the financial crisis, however, and during the subsequent recession, the vulnerabilities in the Croatian economy started to materialize. As unemployment rose and incomes fell, growth in household credit slowed down, eventually turning negative as households started to deleverage. More recently, credit growth has been recovering<sup>2</sup>. Non-collateralized cash loans are a particularly popular form of lending while housing loans seem to be catching up with a lag. Currently, around 30% of assets held by credit institutions in Croatia are in the form of household credit, with total household debt amounting to around 36% of GDP.

While it can help in analyzing macroeconomic trends, aggregate data can only tell us so much about household borrowing. Therefore, in order to study micro-level patterns

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<sup>1</sup> In 1991, 63.5% of households were homeowners, while 24% lived in socially owned housing. During the 1990s, around 75% of this latter type was privatized by their occupants on favorable terms (Bežovan, 1998).

<sup>2</sup> In the period after the crisis, the foreign debt of banks decreased and rising domestic deposits started to constitute a sufficient funding source for the supply of bank credit to the economy (Kraft & Huljak, 2018).

of household borrowing in Croatia, we use a new data source, the Household Finance and Consumption Survey, conducted for the first time in 2017 on a sample of Croatian households. The survey collects information about household finances, such as their assets and liabilities, as well as other detailed information about households' financial situations, and is expected to be carried out regularly in three-year intervals.

In this paper, we are interested in the determinants of the frequency and extent of household borrowing. We explore the relation between household characteristics and its debt holdings for three types of debt: secured debt, which is, almost exclusively, made up of housing loans, and two types of unsecured debt, namely non-collateralized loans on the one hand and overdrafts and credit card debt on the other. We study them both at the extensive margin ("Which households hold these loans?") and at the intensive margin ("How much do various households actually borrow?"). We hypothesize that the roles of household level characteristics differ notably between debt instruments, both for extensive as well as intensive margins.

In this respect, we expect age, number of children as well as variables representing income earning potential (e.g. education and labor status) to be particularly significant in explaining the patterns of household participation in secured debt. Conversely, non-collateralized loans, which in Croatia consist of general purpose cash loans, are multi-purpose, so the role of sociodemographic characteristics may be limited and credit constraints could play a role. Given that overdrafts and credit card debts are much lower in individual amounts, as well as more widely used, we expect the pattern for this type of debt holdings to have distinct features. We investigate whether the insufficiency of a household's income to cover expenses is a significant factor in explaining the holdings of these instruments and whether households willing to accept higher levels of risk when making investment decisions are more likely to hold overdrafts/credit card debt.

Compared to existing research the main contribution of our analysis is threefold. First, the novel and detailed HFCS data set provides information on households' assets and liabilities allowing us to extend the analysis of previous research on household debt in Croatia and investigate it in detail, focusing on the more recent period (2016/2017). Second, we differentiate between debt instruments in order to identify the unique features of each: secured (mortgage) debt, non-collateralized loans and overdrafts/credit card debt. Finally, our work attempts to reveal the possible importance of self-reported variables about a household's financial situation such as perceived credit constraints or the inability to finance current consumption.

Since we use a cross-section data set, however, it is important to stress the limits of our analysis. The fact that we do not follow the same individuals though time prevents us from testing the predictions of various theories of consumption, namely the life-cycle and permanent income hypotheses and their more recent refinements<sup>3</sup>. Accordingly,

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<sup>3</sup> See the next section for a brief summary of these theories and their implications.

the issue of household debt sustainability, i.e. the effects of households' borrowing decisions on their subsequent ability to repay, is also outside the reach of our analysis. Finally, only one survey wave has been carried out so far, which limits our conclusions about the financial inclusion of households. While our results do indicate a group of households not able to get affordable credit, why this is so and whether the composition of this group changes over time remains unexplained.

Our results indicate that debt participation is the highest for households with middle-aged heads, the age profile of indebted households assuming a "hump-shaped" pattern. With respect to frequency of holding debt this is especially true for credit card debt and overdrafts, while amounts are the highest for secured debt, also among the middle-aged. Perceived credit constraints seem to have a positive effect on households' likelihood of holding non-collateralized loans, possibly reflecting differences in credit affordability between mortgages and non-collateralized loans. Finally, we find that the inability to finance current consumption and the willingness to take risks when making saving and investment decisions contribute to the participation in overdrafts and/or credit card debt. Unable to get access to low-interest debt, namely mortgages, it is likely some households will use more expensive debt instruments to achieve their desired level of consumption and investment.

The rest of the paper is structured as follows. We start with an overview of the theories of consumption and saving and continue by providing a short review of the empirical literature on household debt participation. Subsequently, we turn to the descriptive characteristics of household debt participation and holdings, according to HFCS data. In the fifth section, we explain the methodology used in the econometric estimation of the determinants of debt participation as well as the amounts of debt held and provide a description of the variables. Finally, we present the results, conclude with the main findings of our analysis as well as their possible implications and suggest potential directions for future research.

## **2 Literature review**

### **2.1 Theories of consumption and saving (and their implications for borrowing)**

Over a household's life-cycle, the income and consumption of its members tend to fluctuate. While incomes tend to be lower for younger individuals and rise afterwards, they often need to consume more early on, e.g. to acquire a dwelling and start a family. In this respect, conditional on experiencing a rise in future income (or, equivalently, a drop in future consumption), a household can gain from taking on debt, spreading the



large immediate costs over the distant future. The life-cycle (LC) theory of consumption describes this phenomenon (Modigliani & Brumberg, 1954). Central to this theory is the postulate that households aim to maximize utility over their lifetimes, bearing in mind the limits given by their accumulated lifetime assets. Formally, a household can be described as maximizing a utility function that depends on the consumption levels ( $c_t$ ) in the current and all future periods ( $t=0,1,\dots,T$ ):

$$U = U(c_0, c_1, \dots, c_T) = \sum_{t=0}^T \frac{1}{(1 + \delta)^t} u_t(c_t, z_t),$$

In the second equation it is assumed that the preferences described by the lifetime utility function are *intertemporally additive* and can be represented as the sum of individual period utility functions that are increasing and concave in  $c_t$  (Deaton, 1992). Furthermore, individual period utility functions include  $z_t$ , denoting variables that influence the benefits of consumption at particular periods in the life cycle, such as a household's demographic characteristics. An individual's willingness to substitute consumption between periods is represented by the rate of time preference  $\delta$ .

The desired consumption levels are subject to the intertemporal budget constraint:

$$A_0 + \sum_{t=0}^T \frac{y_t}{(1 + r)^t} = \sum_{t=0}^T \frac{c_t}{(1 + r)^t}.$$

Lifetime resources are given by the left hand side, with  $A_0$ ,  $y_t$  and  $r$  respectively denoting initial assets, earned income at period  $t$  and the unique interest rate at which the household can invest or borrow<sup>4</sup>. In this setting, the utility maximizing household chooses a lifetime consumption profile  $(c_0, c_1, \dots, c_T)$  that maximizes its lifetime utility, i.e. at levels which imply a constant marginal utility of consumption in every period, corrected for any discounting factors (e.g. interest rate, rate of time preference) which enter the model. The role of household characteristics ( $z_t$ ) is to increase the marginal utility of consumption in a particular period, resulting in higher consumption in that period, reflecting factors such as the number and age of family members etc.

A somewhat similar, but distinct theory is the permanent income hypothesis (PIH), whereby consumption is limited by permanent, or "planned" income. Permanent income can be defined as the expected return on human and nonhuman wealth a household owns, taking into account factors such as ability, occupation and the attributes of the

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<sup>4</sup> The fact that households pay higher interest rates on loans than on their savings can be accommodated by including the excess interest rate in the lifetime consumption term on the right hand side.

economic activity of the household's earners (Friedman, 1957). According to PIH, a household plans consumption according to the permanent component of its income, and any consumption from transitory income movements will be transitory as well, implying the only way to increase permanent consumption out of transitory income is through savings. While permanent income is a similar concept to the lifetime resources from LC theory, the PIH is generally concerned with how households react to the effects of income shocks in their economic environment without trying to explicitly explain the relationship between age, saving and the creation of wealth (Deaton, 1992).

In the absence of borrowing constraints, consumption in any period is constrained only by lifetime resources (or permanent income). This implies that in periods in which income is atypically low compared to other periods, consumption will not be as low because that would be suboptimal for the household. In order to be able to fully use the lifetime available resources, it is beneficial for households to borrow, which helps them smooth consumption. For example, as they enter early adulthood and decide to form independent households, individuals' marginal utility from consuming dwellings or other durables is increased. It is worthwhile to increase debt holdings in order to acquire these assets, increasing their consumption over future periods and allowing the associated costs to be borne out of lifetime resources, only a small part of which is available at the moment of acquisition.

Households differ in their debt holdings due to differences in their lifetime budget constraints<sup>5</sup>, their patience and household sociodemographic characteristics such as age or number of family members. Furthermore, households may differ in their debt holdings if they are faced with borrowing constraints as well as uncertainty. Introduction of borrowing constraints implies that some households will not be able to borrow as much as they want, forcing them to consume suboptimally over their lifetime, particularly in periods in which they are faced with increased consumption needs and low income. Likewise, since increased uncertainty about future consumption will also increase current ("precautionary") saving (Deaton, 1998), households may differ in how they perceive uncertainty and how much of their future income they are willing to devote to debt repayments. Furthermore, in the presence of uncertainty, prudent households may avoid borrowing altogether because, although loans allow increased consumption now, they have to be repaid in the future when incomes may be very low<sup>6</sup>. Consequently, in the presence of uncertainty, prudent households will smooth their consumption less than is predicted by LC and PIH theories (Deaton, 1998).

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<sup>5</sup> Determined by education levels, income, inherited assets as well as labor market status, among others.

<sup>6</sup> This sort of reasoning, based on the extensions of LC and PIH models to account for responses of prudent as well as somewhat impatient households when future income is uncertain is a part of the Buffer-Stock Theory of Saving, whereby households aim to keep a steady wealth-to-permanent-income ratio (Carrol, 1997).

As mentioned in the introduction, direct testing of the theories of consumption presented here is not possible with cross-section data. Since we do not follow the same households through time, we are not able to evaluate individual lifetime consumption patterns, borrowing decisions or to approximate their permanent incomes. However, because it so general, the LC theory provides a useful framework for interpreting our results as it is not necessary to assume optimizing households to point to possible motives for holding (or not holding) debt. It is sufficient that households try to hold more debt in periods in which they need or want to consume more, an aspect in which many are similar, due to significance of supporting families or acquiring dwellings.

Generally, the empirical validity of the LC and PIH theories in their simpler forms is somewhat limited, with main results confirming high propensity to save out of transitory income, implying that consumption is smoother than income but failing to confirm consumption smoothing over the life cycle (Deaton, 1998). It should further be noted that irrationality is also an important part of consumer behavior, whereby e.g. consumers that exhibit self-control problems may have a higher tendency to borrow and a lower tendency to save, a decision that could leave them worse-off in the future (Benton, et al., 2007). However, since the behavior observed in typical household surveys may be very similar under LC/PIH-based theories and the theories stressing the role of irrationality and cognitive biases, distinguishing between them “remains one of the most important issues in the study of household spending behavior” (Mian & Sufi, 2014, p. 197).

## 2.2 Empirical literature on household debt participation

Recently, empirical work on household borrowing has been a part of the field of household finance that studies how “households use financial instruments in order to attain their objectives” (Campbell, 2006, p. 1553; see also Tufano, 2009; Zinman, 2015). As borrowing decisions affect a large number of households and may have strong implications for household wellbeing, investigating the factors particularly contributing to household debt holdings can be considered a meaningful starting point for the analysis of the characteristics of household finance in a particular country. While considerable emphasis within household finance is put on mistakes, i.e. financial behavior that deviates from the norms of standard finance theory, as well as on household and financial system characteristics exacerbating or mitigating these mistakes (Badarinza, et al., 2016), investigating these is not the goal of the current paper.

Particularly since the establishment of the ECB *Household Finance and Consumption Network* (HFCN) in 2006, a significant amount of empirical research has been oriented towards the analysis of household debt and related issues such as vulnerability or stress-testing, both within and across EU countries. In this short review, we focus on a subset of available research and the implications for household debt participation. One of the findings is that while household debt holdings differ within, they also differ across economies, both with respect to the number of indebted households and the levels of

debt outstanding<sup>7</sup> (Badarinza, et al., 2016).

The determinants of household debt holdings differ among EU countries as well. Bover et al. (2013) ran a set of regressions to study the differences in the determinants of debt participation among euro area countries, using a logit model to investigate extensive margin and OLS to investigate intensive margin with respect to two types of debt: secured and unsecured. They find that, for a number of countries, a household reference person (RP) belonging to ages between 35 and 44 positively predicts holding secured debt and that households with younger as well as older reference persons have a lower probability of holding secured debt, suggesting a “hump-shaped” pattern.

This pattern is slightly different for unsecured debt, with chances of holding unsecured debt for the youngest age (16-34) and the 35 to 44 cohorts being similar and falling for households with older reference persons. With respect to the amounts held, secured debt holdings are highest for households with reference persons (RPs) aged 16 to 34, with the tendency for households with RPs aged 45 or older to hold lower amounts of secured debt, while there is no clear pattern relating age to the amounts of unsecured debt holdings.

Similar results are found by other researchers. Using the data from the 2001 Survey of Consumer Finances, conducted in the US, Yilmazer and DeVaney (2005) find that the probability of holding mortgage and credit card debt is significantly associated with age in a “hump-shaped” pattern with similar results found for the amounts of debt held. Age-cohort life cycle patterns of debt participation are also exhibited by US credit card panel data (Fulford & Schuh, 2015) and British Household Panel Survey data on unsecured debt (Del-Rio & Young, 2005).

Some of the variables representing the potential of household RPs to build-up their lifetime resources, i.e. higher education, income and being employed are, for most euro area countries, positively associated with the likelihood of holding secured debt as well as the amounts of debt held (Bover, et al., 2013). On the other hand, both a high level of education and retirement predict a lower probability of holding unsecured debt. Self-employment predicts higher amounts of unsecured debt held in most countries while the effects of income and high level of education are positive only for a few countries (Bover, et al., 2013).

Conversely, Yilmazer and DeVaney (2005) report that being self-employed or retired is

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<sup>7</sup> Badarinza et al. (2016) provide results of household wealth surveys for a number of EU countries as well as for Australia, Canada and the US. Abstracting from US data, they report that the share of households holding mortgage debt ranges from 9.3% in Slovakia to 43.9% in the Netherlands. Credit card debt participation ranges from 1.4% in Italy to 27.9% in Australia, while the use of overdrafts and credit lines ranges from 0.6% in Spain to 39.9% in Canada. Similarly, they report median debt holdings ranging from 4.4 thousand 2010 USD in Slovakia to 124.3 thousand 2010 USD in the Netherlands. The share of mortgages in an average household's debt ranges from around 24% in Slovenia to 63% in the Netherlands.

negatively associated with American household participation in mortgages and credit card debt, both intensively and extensively. Furthermore, they find that having a college education is negatively associated with the probability of holding credit card debt. Del-Rio and Young (2005) find that a high level of education or being employed predict a higher probability of holding unsecured debt, with education predicting higher debt levels as well. They also report that above median income predicts higher unsecured debt participation and the amounts held by UK households.

Household size is sometimes found to contribute positively to households' borrowing decisions. Bover et al. (2013) find that the increase in the number of adults increase the chances of holding both secured and unsecured debt, with the effects on the amounts of debt held being mixed and mostly insignificant. Other research finds that an increase in the number of children is positively associated with the amounts and the probability of holding mortgages (Yilmazer & DeVaney, 2005).

With respect to unsecured debt, Del-Rio and Young (2005) find that having three or more children positively predicts debt participation, but also that the amounts held fall with the number of children. Across euro area countries, a household's RP being part of a couple predicts an increased probability of holding secured debt as does the partner's working status, while the results are mixed for unsecured debt and the amounts held (Bover, et al., 2013). Yilmazer and DeVaney (2005) find that being married increases the probability of holding mortgage and credit card debt in the US, while also positively contributing to the amount of mortgage debt held. Del-Rio and Young (2005) report a positive effect on the probability of holding unsecured debt for UK couples while there is no impact on debt amounts.

Work done by Bover et al. (2013) provides a systematic overview of debt participation determinants across most countries of the euro zone. However, it is important to note that none of the results reported in Bover et al. (2013) are significant for every country, most likely reflecting differences in credit market institutions and other country characteristics but also possible differences in survey data coverage and quality.

While the described general tendencies are useful in summarizing findings on household debt participation across countries, they certainly do not represent the only patterns possible. Many of these may be subject to country-specific histories of credit market development. The finding that the results of debt participation analyses exhibit a degree of heterogeneity is also supported by comparing their results with other research (Del-Rio & Young, 2005; Yilmazer & DeVaney, 2005). Therefore, when interpreting the results provided in this paper, we should bear in mind the specificities of Croatian credit markets and other economic developments when comparing them to other research. Accordingly, in the rest of this chapter we focus on the contributions from the domestic literature.

In the available domestic research, an obstacle in identifying and characterizing

indebted households in Croatia has been the lack of detailed household level financial data. The only available data comes from the Household Budget Survey (HBS) within which the coverage of debt related variables is somewhat limited, and most likely not regularly collected<sup>8</sup>. This has resulted in the literature focusing on the characteristics of indebted households as well as the implications for financial stability in Croatia being limited. However, among the available domestic research, notable exceptions are Herceg and Šošić (2011) and Herceg and Nestić (2014) with the former providing an analysis of household debt participation directly related to our work.

Herceg and Šošić (2011) use household level data from the HBS for the years 2005 and 2008. They employ a quantile regression to find household characteristics predicting indebtedness for the two periods and a Machado-Mata decomposition to distinguish whether changes in household aggregate indebtedness between 2005 and 2008 could be attributed to improved household characteristics (i.e. creditworthiness), to banks adopting more lenient lending policies or an increased household propensity to borrow (reflecting overly optimistic expectations about their future debt servicing capacity). Out of 27% increase in aggregate household indebtedness, Herceg and Šošić (2011) find that 6% could be attributed to improved household characteristics, implying lenient credit standards and/or overly optimistic household borrowing in that period.

With respect to the probability of households holding debt, they find that income and medium education level positively predict debt participation. They also find that the “hump-shaped” age profile of debt participation may have shifted between 2005 and 2008 towards higher participation of households with heads belonging to older age groups<sup>9</sup>. With respect to the amounts held, Herceg and Šošić (2011) report results indicating that households with heads between 30 and 39 years hold the highest amounts of debt and that higher income and education tend to predict higher debt holdings.

### 3 Data: The Household Finance and Consumption Survey<sup>10</sup>

In 2017, Croatia participated for the first time in the Household Finance and Consumption Survey (HFCS), a survey which has been regularly conducted in the euro area and some other EU countries. Since its start in 2006, three waves of HFCS have

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<sup>8</sup> The results of HBS published on the webpage of Croatian Bureau of Statistics ([www.dzs.hr](http://www.dzs.hr)) do not include any debt related data, but information in available research (Herceg & Nestić, 2014) shows that after 2010 no data on household debt is available, apart from data related to the status of the ownership of household main residence.

<sup>9</sup> They find that for 2005 the probability of holding debt is the highest for households whose heads are between 30 and 39 years old, while in 2008 this is true for households whose heads are between 40 and 49 years old.

<sup>10</sup> Detailed information about HFCS methodology as well as the main results of the survey are available in Jemrić & Vrbanc (2020).



been carried out so far. The data gathered within HFCS contain detailed information on household finances, including various forms of real and financial assets, private businesses, income from various sources, different forms of liability and debt service as well as consumption and other information, such as demographics and attitudes.

The survey for Croatia was conducted in the first half of 2017, with the data on flows reflecting the state of affairs during 2016 and stocks referring to the end of 2016. The whole sample includes observations on 1357 households which have been multiply imputed in order to replace the missing data on key variables, consequently providing five versions (i.e. “implicates”) of each observation, to be taken into account when calculating the variance of summary statistics and model estimates. Personal variables, such as age, education or labour status are represented through the household’s reference person (RP), identification of whom is based on the Canberra definition, which defines the RP through several criteria such as being married, having children, having the highest income or being the eldest (United Nations, 2011).

Concerning debt, the survey provides details on mortgage debt, which we equate with housing loans, because a housing loan in Croatia typically (almost exclusively) includes real estate as collateral, while general-purpose loans approved with mortgages constitute only a small part (around 1%) of total credit to households in Croatia. Unsecured debt is represented by non-collateralized loans, containing somewhat less detail, such as loan purpose, as well as credit card debt and overdrafts for which the outstanding amounts are available. Finally, the survey contains questions about household attitudes with respect to investment decision making and the economic constraints households face. Willingness to take risks, perception of the credit constraints faced by the household and the self-reported ability to cover consumption expenditures by current income are all included in the subsequent analysis.

## 4 Descriptive statistics on household debt participation

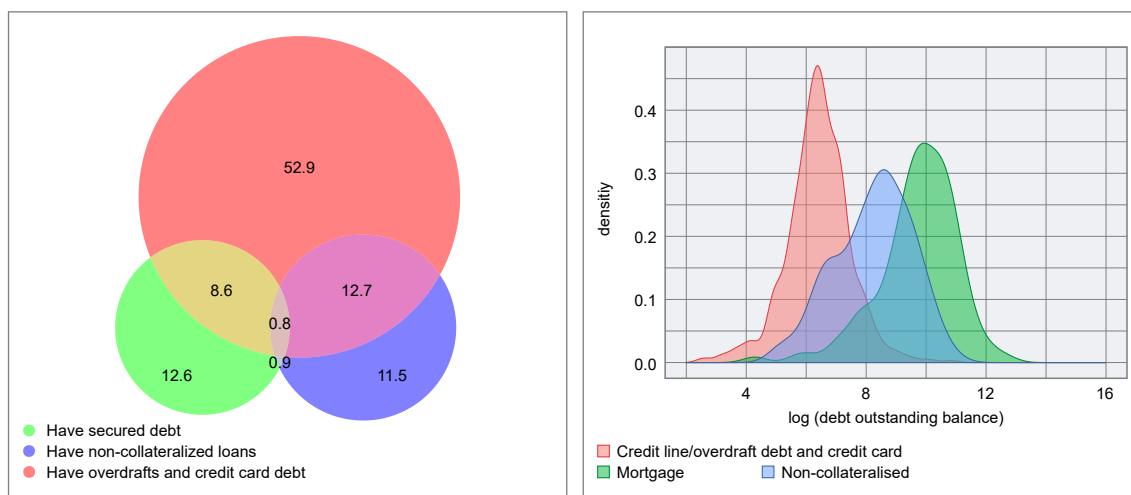
Before turning to econometric analysis we investigate the descriptive patterns present in the survey data itself. We focus on the shares of households holding different debt instruments as well as on the distributions of outstanding debt amounts. In this respect, we identify several *micro-level* stylized facts about household debt in Croatia, according to HFCS data.

First, the three debt instruments differ with respect to the share of households holding them. Participation in secured debt is 9%, reflecting the traditionally high home-ownership in Croatia: 85.3%, according to HFCS data, and 90%, according to EU-SILC data (Eurostat, 2020). Furthermore, only recently has credit-financed home acquisition become more prominent with the liberalization of the credit market at the beginning of 2000s, resulting in a modest share of households holding these loans.

Somewhat higher participation is present with respect to non-collateralized loans, amounting to 10.2%, which is lower than expected. This is because the growth of general purpose cash loans in 2017-2019, identified by non-collateralized loans in the survey, is not covered by our data. Finally, overdrafts and credit card debt are more widespread, with 29.7% of households using these instruments. Out of all indebted households in the sample, around 75% have overdrafts/credit card debt, and the likelihood of holding the other two debt instruments is higher if a household has overdrafts/credit card debt (Figure 1, left, Appendix Table A1). Conversely, co-participation in secured and non-collateralized loans is much lower with most participating households holding only one of these instruments.

Second, the three debt types differ in the density distribution of the outstanding amounts. The typical amounts of debt outstanding are expectedly the highest for mortgages and the lowest for overdrafts and credit card debt, reflecting differences in the purpose and maturity of these loans (Figure 1, right). Furthermore, it is worthwhile noting that the amounts of non-collateralized loan holdings typically take the largest range of values, some of them having the characteristics of overdrafts/credit card debt while others are, in this respect, more similar to secured loans. This most likely reflects the variation in the purpose of these loans, which is elaborated later on.

**Figure 1 Euler diagram of indebted households (left) and the distribution of outstanding debt amounts (right) by debt instrument**

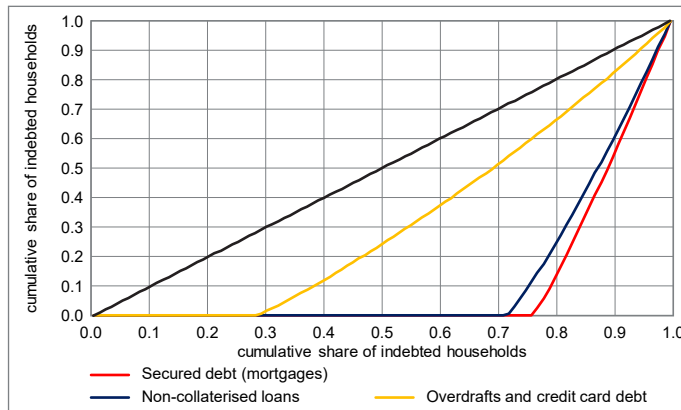


Note: The numbers in the left figure refer to the shares of households holding a particular combination of debt instruments (in percentage terms, out of all indebted households).

Source: HFCS, authors' calculations.



**Figure 2 Empirical cumulative distributions (Lorenz curves) of the outstanding amounts of different debt instruments, conditional on having debt**

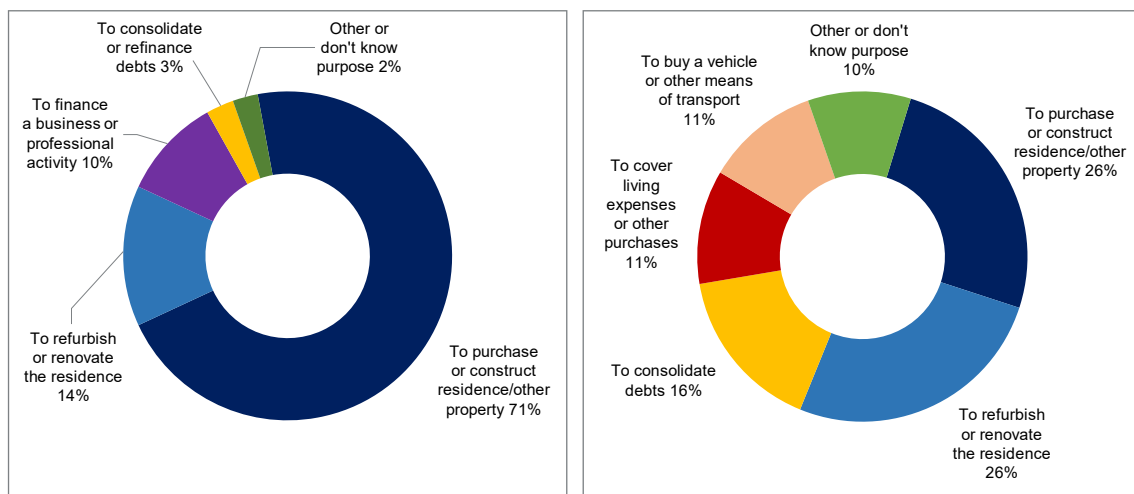


Source: HFCS, authors' calculations.

Third, the outstanding debt amounts are unevenly distributed among indebted households (Figure 2). This is particularly true for mortgages and non-collateralized loans, the distribution of which is only slightly less uneven. On the other hand, the distribution of overdrafts and credit card debt is somewhat more equal due to their more widespread use and lower median amounts. While the highly uneven distribution of non-collateralized loans may be surprising, the distribution of secured debt reflects the high home-ownership rate in Croatia.

Finally, the distribution of outstanding debt amounts according to loan purpose reported by households reveals the multi-purpose nature of non-collateralized loans (Figure 3).

**Figure 3 Distribution of outstanding debt amounts with respect to reported loan purpose for secured debt (left) and non-collateralized loans (right)**



Source: HFCS, authors' calculations.

While 85% of outstanding mortgages are used for housing-related purposes (i.e. either renovating or purchasing/constructing the residence), non-collateralized loans are used for many more purposes. Around half of these loans are used for housing-related purposes, others for consumption (covering living expenses, buying a vehicle) or even for debt consolidation. In the econometric estimation, we explicitly control for these purposes.

The distribution of debt participation and the median amounts, conditional on household socioeconomic characteristics, are shown in Table A1 of the Appendix. Here we make a few observations concerning the age of the household reference person. Households with reference persons aged between 30 and 55 tend to have a higher participation rate for secured debt, a reflection of their housing demand being greater than that of other age groups. The share of households holding non-collateralized loans is the highest for households with RPs belonging to the 30-40 age group and falls for households with older RPs.

The only clear “hump-shaped” age profile of participation is present for overdrafts and credit card debt. A reason for this is the presence of sharp movements in the share of households holding secured debt across different age groups which may be a consequence of the slowdown in mortgage lending during the 2010s, which distorted the “hump-shaped” age profile of debt participation, due to changes in macroeconomic environment and tightening of credit constraints. On the other hand, median amounts of outstanding secured debt do exhibit a clear “hump-shaped” pattern, with younger households holding higher amounts of debt. This is expected, because although younger may participate somewhat less than older households, the larger share of debt is still yet to be repaid by these households.

## 5 Econometric Analysis: Methodological background and variables used

The first part of our analysis consists of a probability model specification in order to find the socioeconomic and other characteristics associated with higher or lower probability of an average household holding a particular debt instrument (extensive margin). In the second part we use a tobit model to investigate the effects these characteristics have on the amounts of debt held (intensive margin).

In order to explore the association of various household characteristics or other factors with the fact that a household holds debt, we use the limited dependent variable model of a probit type. The dependent variable, termed debt participation, is binary and takes the value of 1 if the household holds a particular type of debt and zero otherwise. The probit model approach uses the assumption that the probability of a household holding

debt can be modelled as a latent variable that follows a standard cumulative normal distribution function (Wooldridge, 2002):

$$Pr(\text{Has debt} = 1|X) = G(\beta X), \quad z = \beta X$$

$$G(z) = \phi(z) = \int_{-\infty}^z \varphi(v)dv, \quad \varphi(z) = (2\pi)^{-1} \exp\left(-\frac{z^2}{2}\right)$$

Accordingly, we model the probability of a household being indebted as a function of socioeconomic and other characteristics  $X$ . We run five regressions, for each of the data implicates, the results of which are then combined, using “Rubin’s rules” in order to get to the final estimate (Phillips Montsalto & Yuh, 1998). We present the results using average marginal, or “partial”, effects of the independent variables (Greene, 2012) whereby the marginal effects for the continuous independent variables are interpreted through a unit increase of the independent variable, while the marginal effects for discrete independent variables are interpreted with respect to the omitted categories.

Subsequently, we turn to the analysis of the amounts of debt held for each type of debt (intensive margin). Since only a small fraction of households hold secured debt as well as non-collateralized loans, analyzing the characteristics contributing to the amounts of debt held only for households holding these types of debt would have to be done on very small samples and would introduce selection bias. Instead, we use a tobit model which is applicable to the situation where the dependent variable is continuous but only weakly positive, often taking zero values. Since some households choose, or are forced, to hold zero amounts of debt, this kind of outcome can be called a “corner solution outcome”, although the term “censored regression model” is more standard in the literature (Wooldridge, 2002).

The tobit model is defined in the usual way, i.e. the amount of debt held is a function of socioeconomic and other characteristics  $X$ <sup>11</sup>. However, modelling the amount of debt a household holds is constrained by the fact that a household cannot hold negative amounts of debt. Therefore, the standard censored tobit model is defined as (Wooldridge, 2002):

$$Debt^* = \beta X + u, \quad u \sim N(0, \sigma^2)$$

$$Debt = \max(0, Debt^*)$$

<sup>11</sup> As dependent variables we take the logarithm of the amounts of debt held for each type of debt. In order to avoid the logarithm being undefined, we transform the zero values of debt into 1’s.

Specifically, we are interested in the expected value of the amount of debt held, given that a household holds debt, i.e.  $E(Debt|X, Debt > 0)$ . Since debt is constrained from the below at zero, the relationship between this value and the vector of coefficients  $\beta$  is not linear. Using the fact that  $u$  is normally distributed, marginal effects conditional on having debt can be derived as (Wooldridge, 2002):

$$\frac{\partial E(Debt|X, Debt > 0)}{\partial \beta_j} = \beta_j \theta \left( \frac{\beta X}{\sigma} \right)^{12}$$

The adjustment factor is defined as  $\theta \left( \frac{\beta X}{\sigma} \right) = \left\{ 1 - \lambda \left( \frac{\beta X}{\sigma} \right) \left[ \frac{\beta X}{\sigma} + \lambda \left( \frac{\beta X}{\sigma} \right) \right] \right\}$ , where

$\lambda \left( \frac{\beta X}{\sigma} \right) \equiv \frac{\varphi \left( \frac{\beta X}{\sigma} \right)}{\Phi \left( \frac{\beta X}{\sigma} \right)}$  is the inverse Mills ratio. Generally, standard probit and tobit

models have common elements, relying on standard normal distribution and using maximum likelihood estimation. The results of probit and tobit estimations are given in the Tables 1 and 2 and are commented on in the next section. Before reporting the results, we turn to the description of the covariates used in the models.

We define a similar set of variables for both probit and tobit specifications. These can be divided into socioeconomic characteristics, indebtedness characteristics and self-reported attitudes or other household characteristics. Among socioeconomic characteristics, we include age, number of dependent children, education and labor status of the household reference person (RP) as well as household income and assets. We model age as a continuous variable and include age squared in order to estimate the non-linear effect on the dependent variables. In order to capture the demography of the household more completely, we include the number of dependent children, where a dependent child is defined as a person aged 24 or younger, and outside of the labor force.

The variables describing households' lifetime earning potential are included next. Education takes the value of 1 if the household RP has a tertiary education, as opposed to having primary or secondary education. Furthermore, we include two variables capturing the labor market status of the household RP: whether the RP is employed, including employees and the self-employed, and whether he or she is retired. The labor market status variables are interpreted against the omitted categories: being unemployed or outside of the labor force. We describe the current income through

<sup>12</sup> In the case of binary variables, the marginal effects are computed as the difference between  $E(Debt|X, Debt > 0)$  for  $x_j=1$  and  $E(Debt|X, Debt > 0)$  for  $x_j=0$ .

three binary variables referring to whether the household belongs to the 3rd, the 4th or the 5th income quintile. We exclude both the 1st and the 2nd income quintiles because the descriptive statistics on debt holdings provided in Table A1 suggest there is little variation between the two.

With respect to assets, we include logarithms of real and financial assets<sup>13</sup>. However, the direction of causality between real wealth and mortgage debt is not clear cut: the value of a household's main residence property (HMR) constitutes a significant part of its real assets, so when taking a housing loan (i.e. a mortgage) a household increases its real assets. In order to capture the possible influence household wealth has on the likelihood of holding a mortgage, we therefore exclude real assets from the respective estimation equation. However, we include a dummy variable describing the way a household acquired its main residence property (HMR), taking the value of 1 if it was inherited or received as a gift. Since inheritance of an HMR is a useful predictor of a household's net assets (Kunovac, 2020), we believe this variable provides a reliable "proxy" for household real assets, especially in the context of the causal influence on the decision to take out a housing loan as well as the amount taken.

Household indebtedness characteristics are captured by dummy variables describing whether a household has other debt instruments. In this respect, we include dummies for each of the three types of debt, omitting the one for which we are estimating the probability of participation. We follow a similar logic in the tobit specifications, but we include logarithms of the amounts of debt held for each instrument instead. However, as noted earlier, non-collateralized loans are multi-purpose, and we ask whether the purpose of the non-collateralized loan a household holds is related to participation in other debt instruments. In this respect, instead of including a dummy for non-collateralized loans, we include four dummies, each describing whether a household holds a non-collateralized loan with a specific purpose. If the declared purpose is to purchase, construct or refurbish the residence we define this as a housing related purpose. Furthermore, we include the purpose of debt consolidation, as well as a consumption purpose (covering living expenses, buying a vehicle) while all other purposes are grouped together (see Figure 3 in the previous section).

We also define three variables reflecting self-reported attitudes and other household characteristics. We include a binary variable for perceived credit constraints, based on whether the household believes it would be able to take out a loan. Subsequently, we include a variable capturing a household's ability to finance consumption. It is based on the self-reported relation between the household's expenses and its income, and takes the value of 1 if the household reported having expenses higher than income and zero otherwise. Furthermore, households were asked to what extent they were ready to take

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<sup>13</sup> Similar to taking the logarithms of the debt variables, we transform the zero values of real and financial assets into 1's before taking logarithms.

financial risks when saving or making investments with four possible answers, ranging from “no risks” to “substantial risks”. We define a risk-related binary variable, taking the value of 1 if the household reported a willingness to take at least “average” risks and zero if it reported not being ready to take any risks<sup>14</sup>. An interaction term between expenses exceeding income and the risk taking variables is also used. We believe this interaction term helps identify risk-averse households faced with insufficient income to cover their expenses, implying their overspending is not a consequence of risky behavior. Conversely, households which tend to take at least average risks when making investment decisions but also overspend may reveal that they are imprudent to a certain degree, because their willingness to take risks is not justified by their financial situation. The exact wording of the questions underlying these variables is provided in Table A2 of the Appendix.

Finally, we control for regional variation. Households in our sample are divided into four regions: the City of Zagreb, North-West Croatia, the Adriatic region as well as “East” Croatia, covering a large area east of Zagreb<sup>15</sup>. Therefore, we define three binary variables, omitting the City of Zagreb, to be used as a reference.

## 6 Results

### 6.1 Main regression results

The results of the estimations of household debt participation determinants as well as the determinants of the amounts of debt held are reported in Tables 1 and 2 respectively. We proceed by commenting on the results related to the probability of holding each of the three debt instruments and subsequently turn to the results of the estimations of the amounts of debt held, conditional on holding debt.

Concerning household demographic characteristics, the probabilities of holding each type of debt are significantly associated with age in a non-linear “hump-shaped” pattern. We use a simple linear extrapolation of the estimated coefficients on age and age squared to illustrate the differences in the implied age profiles of participation for the three debt types (Figure A2). It seems that the “hump-shaped” age profile of debt participation is most pronounced for overdrafts and credit card debt while age

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<sup>14</sup> We define the risk taking variable in this way, because most of the households in our sample (n=1021) reported they are not willing to take any risks when saving and making investments. Making the cut-off at a different level of self-reported risk affinity was also not feasible because answers implying higher levels of household risk affinity are scarce in our sample, with only 48 households reporting “above average” or “substantial risks”.

<sup>15</sup> More details on the stratification of the household sample by region are available in Jemrić and Vrbanc (2020).

impacts on mortgages seem somewhat weaker. This is most likely a consequence of the fact that holding a secured debt is associated with discrete long term decisions and implies weaker age profile effects if the borrowers are credit constrained, either because they are not creditworthy or if credit is not broadly available at particular moments<sup>16</sup>. Furthermore, precisely because these are long-term decisions, the differences in the lifetime available resources/permanent incomes between generations are also likely to distort the “hump-shaped” age profile of secured debt participation, dampening the age effects.

On the other hand, overdrafts and credit card debt holdings are a result of continuous short-term decision making and relaxed bank credit standards compared to mortgages, so these instruments are more widely available to households. Finally, the likelihood of holding non-collateralized loans exhibits the least noticeable age profile pattern. This is likely because the use of these loans is somewhat novel in the Croatian credit market and because they are multi-purpose, implying various motives for holding these loans, some of which may be unrelated to the consumption planning implied by the age of the household's RP.

Among other demographic variables, the number of dependent children increases the demand for housing and as such constitutes a motive for holding secured debt, with a marginal effect on the likelihood of holding a mortgage estimated at 1.6%. Conversely, the characteristics of the partner of a household RP yield no significant results, as shown in the next section (see Tables A3 and A4).

The effects of the variables representing a household's lifetime available resources are mixed across the three debt instruments. Income is significant only to the extent that households belonging to the 5th quintile of the income distribution are more likely to hold secured debt as well as non-collateralized loans with the marginal effects being quite strong, 6.2% and 10.2%, respectively. Likewise, it seems high education of the household's RP is strongly predictive only of the participation in secured debt, while the effects on unsecured debt instruments are absent.

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<sup>16</sup> The comparatively large negative value of the estimated coefficient associated with perceived credit constraints for secured debt is in line with this argument.

**Table 1 Results of the estimation of debt participation determinants by debt instrument**

	Secured (mortgage) debt		Non-collateralized loans		Overdrafts and credit card debt	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Has secured debt			-4.83*	2.74	7.87*	4.37
Has overdrafts/credit card debt	3.16*	1.70	9.25***	1.70		
Age	1.352***	0.45	0.807*	0.46	1.465**	0.61
Age2	-0.014***	0.00	-0.011**	0.00	-0.015***	0.01
Income quintile 3	1.75	2.34	4.11	2.57	0.78	3.98
Income quintile 4	2.39	2.44	5.76**	2.64	2.82	4.06
Income quintile 5	6.16**	2.44	10.22***	2.72	-7.34	5.37
No. of dependent children	1.61**	0.78	-0.35	0.88	0.66	1.55
Education – high	6.93***	1.85	-1.32	2.33	2.86	3.48
RP employed	2.83	3.13	4.18	3.68	14**	6.20
RP retired	2.59	3.40	7.38*	3.94	11.09*	6.38
Way of acquiring property – gift/inherited	-6.9***	1.91	-1.81	1.93	-3.52	3.24
Perceived credit constraints	-7.05*	3.82	6.47**	2.99	6.15	5.13
Risk attitude – take average risks	2.74	1.78	4.2**	1.97	9.71***	3.45
Expenses above income	6.23***	2.35	4.45*	2.67	13.42***	3.84
Take average risks * Expenses above income	-11.21**	5.19	-7.86	5.18	-4.14	7.86
Financial assets (log)	0.17	0.23	0.12	0.26	-0.25	0.48
Real assets (log)			0.31	0.40	-0.91	0.56
Purpose of non-collateralized loans: consolidate debt	-5.61	5.86			30.58***	8.41
Purpose of non-collateralized loans: housing related	-5.68*	3.26			14.92***	5.34
Purpose of non-collateralized loans: consumption	-2.54	3.33			11.81**	5.25
Purpose of non-collateralized loans: other	0.12	5.19			13.84	9.43
Region: East	4.79*	2.50	11.83***	2.84	6.67*	3.97
Region: North-west	1.99	2.84	3.73	3.22	8.91**	4.26
Region: Adriatic	1.9	2.65	1.54	3.13	2.72	4.06
Observation	1357		1357		1357	
Chi2	135.2***		136.5***		158.9***	
Pseudo R2	0.159		0.164		0.097	
Log likelihood	-356.4		-416.5		-739.9	
Akaike inf. crit.	760.7		877		1529.7	

Notes: The table reports average marginal effects on the probability of a household holding debt, estimated using a probit regression and multiplied by 100.

dy/dx – marginal effect, SE – standard error, \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

Conversely, labor market status predicts a higher likelihood of holding overdrafts and credit card debt for households with employed RPs, with the retired being more likely to hold both kinds of unsecured debt. The absence of the effect of employment variables on the probability of holding mortgages is most likely because these reflect current labor market status of the households' RPs and not the labor market status at mortgage origination.



With respect to assets, we find that households that acquired their real estate property either through inheritance or as a gift, are, as expected, much less likely to hold secured debt, with the average marginal effect being quite strong, -6.9%. On the other hand, there are no effects of the values of real and financial assets on debt participation.

Household perceptions and attitudes seem to play a non-negligible role in predicting the likelihood of holding debt. In this respect, a negative marginal effect on secured debt is associated with households that have not applied for credit because they believe the application would be refused. Interestingly, these households also seem to be more likely to hold non-collateralized loans, possibly because these are more affordable than mortgages.

Variables reflecting average or above average risk affinity and the insufficiency of income to cover last year's expenses give a few insights. Households reporting both risk affinity and insufficient income to cover expenses are much less likely to hold mortgage debt (average marginal effect is -11.2%). This is possibly because, in providing these answers, households reveal their lower creditworthiness. On the other hand, households reporting either but not both of the mentioned answers are more likely to hold debt, with households reporting expenses higher than income having a greater probability of holding mortgages as well as overdrafts/credit card debt and households reporting average or above average risk affinity participating more in both kinds of unsecured debt.

Since mortgages imply high debt service costs, the positive marginal effect associated with expenses above income variable most likely reflects reverse causality. Some households have insufficient income to cover expenses precisely because of high debt service costs of mortgages. Conversely, households may need to use overdrafts and credit card debt because their income is insufficient to cover expenses. While servicing unsecured debt associated with comparatively high interest rates contributes to the size of the expenses as well, we believe that the way in which these instruments are used (i.e. to finance smaller purchases) implies the role of reverse causality is limited when trying to understand the underlying cause of this type of borrowing. In either case, the average marginal effect is quite strong, amounting to 13.4%, almost as high as for households with employed RPs.

With respect to regional variation, we find households in East Croatia are much more likely to hold all three kinds of debt, with the effect being particularly strong and robust for non-collateralized loans. Other results indicate overdrafts and credit cards are mostly used in the North-West. These results hold for the debt amounts as well.

As was shown in the descriptive statistics, households sometimes use more than one debt instrument, a phenomenon which may be called co-participation. Households that have non-collateralized loans are also more likely to hold overdrafts and credit card debt. This effect is particularly pronounced for households holding non-collateralized

loans used to consolidate debt, most likely overdrafts and credit card debt, and somewhat less for households that use these loans for purposes related to housing. Furthermore, households using non-collateralized loans for housing-related purposes seem to be somewhat less likely to hold mortgages, however this effect is only marginally significant.

This co-participation pattern seems to be present when estimating the determinants of the outstanding debt amounts as well. Households holding higher amounts of overdrafts/credit card debt also tend to hold higher amounts of non-collateralized loans, especially those that are aimed at debt consolidation or are housing-related. Regarding debt consolidation, it is most likely that households use non-collateralized loans to repay the more expensive overdrafts/credit card debt.

Table 2 Results of the estimation of debt amount determinants by debt instrument

	Secured (mortgage) debt		Non-collateralized loans		Overdrafts and credit card debt	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Secured debt (log)			-0.04	0.0328823	0.04	0.029
Overdrafts/credit card debt (log)	0.07	0.041	0.15***	0.0300204		
Age	0.199***	0.073	0.115**	0.0561111	0.098**	0.040
Age2	-0.002***	0.001	-0.002***	0.0005504	-0.001***	0.000
Income quintile 3	0.2	0.390	0.48	0.3024914	0.02	0.242
Income quintile 4	0.38	0.401	0.56*	0.3153327	0.15	0.254
Income quintile 5	0.91**	0.407	1.16***	0.3266629	-0.42	0.346
No. of dependent children	0.25*	0.128	-0.04	0.1033584	0.03	0.098
Education – high	1***	0.310	-0.18	0.2760107	0.16	0.225
RP employed	0.47	0.512	0.56	0.4370523	0.87**	0.399
RP retired	0.25	0.557	1.01**	0.4681042	0.68	0.421
Way of acquiring property – gift/inherited	-1.02***	0.318	-0.12	0.2258964	-0.26	0.210
Percieved credit constraints	-1.01	0.625	0.76**	0.3564618	0.25	0.318
Risk attitude – take average risks	0.38	0.294	0.46**	0.2326055	0.63***	0.226
Expenses above income	0.78**	0.397	0.56*	0.3120785	0.82***	0.243
Take average risks * Expenses above income	-1.51*	0.858	-0.91	0.6041129	-0.27	0.475
Financial assets (log)	0.03	0.037	0.02	0.0301109	-0.01	0.031
Real assets (log)			0.03	0.0476517	-0.05	0.036
Purpose of non-collateralized loans: consolidate debt (log)	-0.09	0.103			0.18***	0.053
Purpose of non-collateralized loans: housing related (log)	-0.1	0.064			0.1**	0.039
Purpose of non-collateralized loans: consumption (log)	-0.03	0.065			0.09**	0.039
Purpose of non-collateralized loans: other (log)	0.03	0.107			0.1	0.074
Region: East	0.84**	0.415	1.49***	0.3501695	0.49*	0.255
Region: North-west	0.34	0.468	0.58	0.3847097	0.55**	0.274
Region: Adriatic	0.18	0.440	0.15	0.3778693	0.19	0.262
/sigma	15.69***		12.10***		7.86***	
Observation	1357		1357		1357	
Number of uncensored observations	121		159		396	
Number of left-censored observations	1236		1198		961	
Chi <sup>2</sup>	121.9***		169.7***		151.8***	
Pseudo R <sup>2</sup>	0.077		0.088		0.040	
Log likelihood	-731		-882		-1821	
Akaike inf. crit.	1512		1809		3694	

Notes: The table reports average marginal effects on the amount of debt a household holds, conditional on holding debt and estimated using a standard tobit censored model.

dy/dx – marginal effect, SE – standard error, \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

Continuing with the analysis of the extensive margin, marginal effects of the covariates on the amounts of debt held are fairly similar to the marginal effects on the likelihood of being indebted, due to the specificities of the tobit methodology. However, we can identify a few important differences. First, while the effects of age as well as the number of dependent children, representing household demographics, continue to hold true, the structure of the age effects is different. As for the probability of holding debt, we use a simple linear extrapolation of the marginal effects of age on the (log) amounts of debt held (Figure A3). We find that the “hump-shaped” age profile of outstanding debt amounts is most prominent for mortgages, which is expected and reflects the data provided in Table A1. While secured debt participation age profile pattern may be distorted by factors such as credit constraints or credit crunches, these may not necessarily be as noticeable when observing debt amounts, because these are very high compared to unsecured debt and take almost a lifetime to repay.

The potential of households to accumulate lifetime resources, represented by income, assets, education and labor market status, has limited effects on outstanding debt amounts. Belonging to the 5th quintile of the income distribution predicts higher debt holdings for secured debt and non-collateralized loans, with the marginal effect particularly strong for the latter, implying an increase of 1.16 in the logarithm of the value of outstanding debt. As strong is the effect of high education on secured debt holdings, while the effect for households with employed RPs on their overdrafts/credit card debt holdings is a bit lower (0.87). Households that acquired their real estate property through inheritance or as a gift, tend to hold less secured debt, possibly reflecting the fact that their financing needs are lower when buying new property or when renovating/refurbishing the existing one.

Households whose expenses were higher than income hold more secured debt as well as more overdrafts/credit card debt. We believe the rationale for mortgages is similar to that for the likelihood to hold debt: households faced with more outstanding debt have higher debt service costs, which increases the likelihood that a household holding a mortgage will earn insufficient income to cover expenses.

Conversely, the outstanding amounts associated with overdrafts/credit card debt are much lower, which makes it more likely that these households hold more debt precisely because they are faced with insufficient income. The effects of the two variables indicating strong negative selection with respect to secured debt participation, namely perceived credit constraints and the interaction of risk affinity with expenses above income, seem to be absent or less robust for the outstanding amounts of secured debt, a result we believe is reasonable because the effect on the outstanding amount is conditional on debt participation. Nevertheless, households that report being credit constrained tend to hold higher amounts of non-collateralized debt.

## 6.2 Robustness analysis

Before turning to the discussion of the implications of the results presented, we perform a short evaluation of their robustness by enhancing the specifications of the models with auxiliary variables, namely the characteristics the RP's partner, and an interaction term (see Tables A3 and A4). The couple variable takes the value of 1 if the reference person is a part of a couple while two additional binary variables represent whether the partner has higher education or whether the partner is employed. In order to check the robustness of the effect associated with perceived credit constraints, we introduce an interaction term, indicating low income households (i.e. belonging to the 1st and 2nd income quintiles) which perceive themselves as not being able to take out a loan.

The results of the main regressions remain largely unchanged: neither the signs nor the sizes of the most of the effects shift significantly. However, the increase in the variability of some of the estimated effects gives rise to a few notable differences. It seems the effect of the number of dependent children on mortgage debt holdings is no longer significant. In addition, the effects of belonging to the 5th income quintile and having expenses higher than income on secured debt amounts are somewhat weaker when additional variables are included. Finally, the insignificance of the interaction term between perceived credit constraints and lower income quintiles implies that households perceiving themselves as credit constrained are not necessarily in the lower end of the income distribution in our sample.

## 7 Conclusion

In the present work, we have used the data from the 2017 *Household Finance and Consumption Survey* to describe the characteristics of household debt holdings in Croatia and the main household characteristics particularly related to these holdings. We have done so by distinguishing three debt instruments: secured, or mortgage, debt, non-collateralized loans and overdrafts/credit card debt, all of which are qualitatively different in their typical amounts, maturity and accessibility in terms of stringency of credit standards.

According to the results of the HFCS data analysis, several conclusions about household debt participation in Croatia can be reached. First, both descriptive and regression analyses suggest a “hump-shaped” age profile of debt participation, suggesting households with middle-aged heads are more likely to hold debt as well as to hold higher debt amounts. This debt participation age profile is most prominent for overdrafts and credit card debt, most likely due to their wider availability and the short-term implications of the decisions as whether to hold these debt instruments.

Second, our results might have some implications for the financial inclusion of Croatian

households, whereby a group of credit-constrained households may not have access to affordable, low-interest, credit instruments, such as mortgages. Some of the estimated effects are in line with this argument. For example, households that perceive themselves as credit constrained are more likely to use non-collateralized loans, possibly instead of mortgages. This may indicate that access to mortgages is limited for most households or that perceived uncertainty about the future ability to repay these loans is high enough to prompt more prudent households to avoid holding these loans altogether, regardless of their current ability to repay.

Possible lack of access to affordable finance may further be illustrated by the participation patterns of households faced with expenses higher than their current income. Some of these households hold mortgage debt. We suspect this as a possible source of inability to cover expenses because of the comparatively high debt service amounts associated with these loans. On the other hand, a large group of these households holds overdrafts/credit card debt. Assuming the direction of causality for this effect is reversed (as opposed to mortgages), this may imply that households lacking income to finance their current consumption use more expensive debt instruments. In this respect, it is further likely that some households use non-collateralized loans to consolidate overdrafts/credit card debt. However, the strong and positive effect associated with the use of non-collateralized loans for debt consolidation on overdrafts/credit card debt holdings indicates the effort to consolidate debt fails for most of these households, as they end up holding non-negligible amounts of both debt instruments.

A related finding is that households that use non-collateralized loans for housing related purposes tend to participate more in overdrafts/credit card debt and somewhat less in mortgages. We believe these findings allow for the possibility that households use unsecured debt instruments to (imperfectly) substitute for mortgages. This claim is based on the fact that a non-negligible share of non-collateralized loans was used for a housing related purpose as well as the fact that some households do not have access to mortgages. However, more evidence is needed to support this claim and provide further details; it is most likely that the negative correlation between participation in mortgages and non-collateralized loans is influenced by purposes other than buying real estate. Since most households are outright homeowners and homeowners are less likely to hold mortgages, when some of them use non-collateralized loans to refurbish/renovate it negatively affects co-participation in these debt instruments.

Some of the results of secured debt participation, however, point to groups of households more likely, and able, to hold mortgages. Besides their availability to households belonging to the upper end of the income distribution, households whose RP is highly educated are also more likely to use and have access to secured debt. On the other hand, education has no effects on unsecured debt participation. Income, however, contributes to participation in non-collateralized loans while households with employed RPs are more likely to use credit cards or overdrafts.

Finally, risk affinity may be an important factor in the willingness of households to use more expensive, unsecured debt instruments. As noted in the results, households that report taking average or above average risks when making investment decisions are also more likely to participate in non-collateralized loans and overdrafts/credit card debt. To the extent that in answering this question households reveal their willingness to invest or consume, it is possible they may also be more likely to use credit finance. In the presence of liquidity constraints, these households may also need to use more expensive debt instruments in order to achieve a desired level of investment or consumption.

In conclusion, as our analysis points to a potentially vulnerable group of households without access to affordable financing conditions, future research could be devoted to household vulnerability, i.e. a situation where a household holds very high amounts of debt in relation to its income or assets, resulting in debt overhang, forcing the household to make strong consumption cuts in downturns and implying other risks to financial stability. This kind of analysis could be supplemented by a stress-testing exercise which could reveal how many and which households are at risk of becoming vulnerable. We believe the present work may be seen as providing an introduction to such research, because it estimates the factors contributing to household borrowing, some of which may be associated with excessive debt taking or over-indebtedness.

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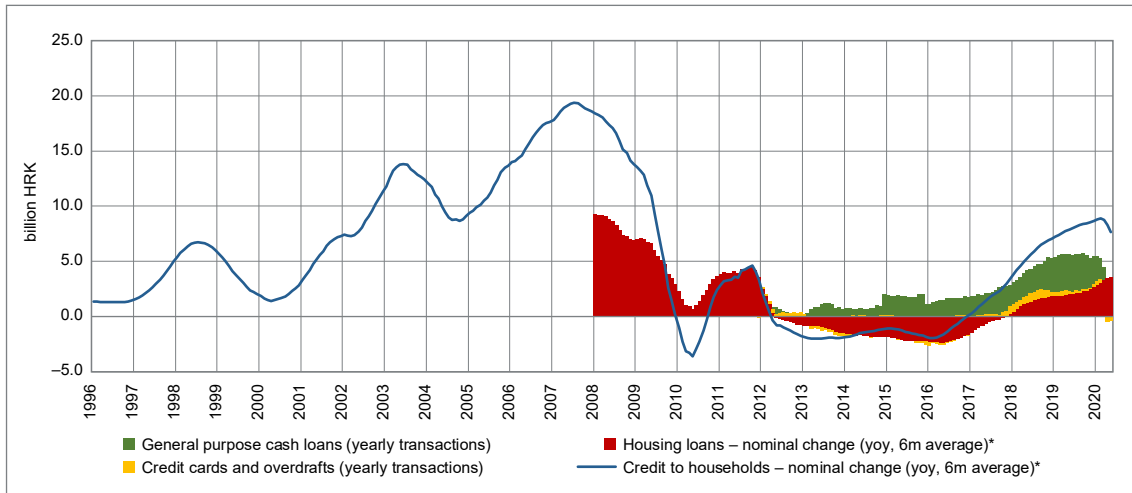
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## 9 Appendix

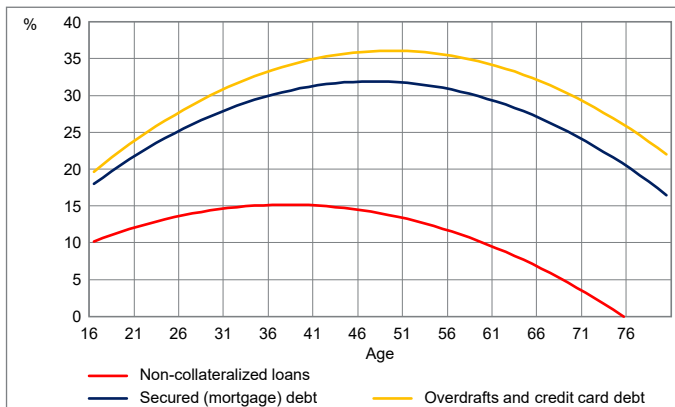
**Figure A1 Dynamics of household debt held by credit institutions in Croatia**



Notes: \*Since December 2011, 6 month average of yearly nominal change for household credit and housing loans series has been replaced with transactions. Transactions with credit institutions exclude revaluations, write-offs and other changes in volume.

Source: Croatian National Bank, authors' calculations.

**Figure A2 Marginal probabilities of holding either type of debt implied by the regression coefficients on age and age squared**



**Figure A3 Marginal outstanding debt amounts (in logarithms) implied by the regression coefficients on age and age squared**

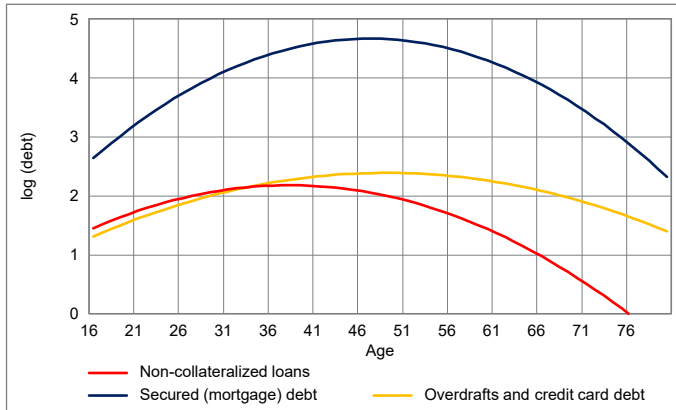


Table A1 Characteristics of indebted households with respect to debt type

Variable	Category	Secured (mortgage) debt			Non-collateralized loans			Overdrafts and credit card debt		
		n (sample)	Participation*	Median	n (sample)	Participation*	Median	n (sample)	Participation*	Median
TOTAL	TOTAL	128	9.0%	19,889	163	10.2%	4,500	400	29.7%	817
Age of RP	16-30	0	0.0%	NA	7	10.8%	10,286	10	20.9%	715
	31-35	12	18.5%	47,207	9	19.3%	11,016	19	38.9%	1,236
	36-40	13	13.6%	50,936	20	16.0%	2,600	46	44.1%	813
	41-45	18	19.9%	28,781	21	13.9%	5,200	50	43.3%	1,214
	46-50	26	15.1%	19,735	23	11.6%	5,817	48	35.5%	651
	51-55	22	14.6%	14,622	24	12.3%	5,192	52	31.6%	1,019
	56-60	17	8.0%	14,859	29	14.9%	3,376	53	28.3%	649
	61+	20	2.7%	2,558	30	4.4%	1,292	121	21.3%	677
Number of dependent children	0	53	5.4%	14,839	76	7.2%	3,156	230	25.7%	671
	1	32	13.9%	18,313	40	19.6%	4,994	70	37.0%	1,132
	2	28	17.5%	30,262	32	14.5%	4,826	63	33.3%	912
	3+	15	14.5%	34,352	15	9.8%	15,073	37	44.3%	1,428
Education	Low	1	1.0%	2,600	2	2.5%	9,027	15	20.6%	1,400
	Middle	85	8.2%	18,976	134	10.9%	4,500	312	29.9%	880
	High	42	16.5%	23,251	27	10.3%	5,058	73	32.8%	649
Employment status of RP	Employee	81	14.0%	25,293	99	14.6%	5,096	204	36.7%	911
	Self-employed	10	22.6%	13,501	9	19.8%	5,853	24	43.5%	905
	Unemployed	8	7.6%	24,946	6	4.8%	1,946	23	25.4%	1,239
	Retired	29	3.6%	5,374	47	6.1%	2,828	145	23.5%	664
	Other	0	0.0%	NA	2	2.4%	602	4	7.6%	970
Way of acquiring property	Purchased	61	21.8%	24,258	28	6.1%	4,321	91	30.4%	671
	Own construction	47	8.5%	15,211	66	11.5%	3,628	142	28.4%	900
	Inherited	17	4.4%	19,640	34	9.0%	5,592	78	22.8%	940
	Gift	1	1.8%	19,539	6	9.7%	6,549	20	54.5%	1,019
	50% purchased or constructed	1	2.5%	5,200	7	20.1%	3,032	8	22.0%	769
	Renter	1	0.4%	17,073	22	15.2%	4,482	59	37.9%	703
Has secured debt	Doesn't have	0	0.0%	NA	145	10.5%	4,353	346	28.6%	823
	Has secured debt	128	100.0%	19,889	18	7.2%	5,064	53	41.1%	848
Has overdrafts/credit card debt	Doesn't have	75	7.6%	28,278	72	7.0%	3,290	0	0.0%	NA
	Has overdrafts/credit card debt	53	12.5%	14,282	91	18.0%	4,916	400	100.0%	817
Has non-collateralized loans	Doesn't have	110	9.3%	19,867	0	0.0%	NA	309	27.1%	808
	Has non-collateralized loans	18	6.4%	21,446	163	100.0%	4,500	91	52.2%	906

## Appendix

Variable	Category	Secured (mortgage) debt			Non-collateralized loans			Overdrafts and credit card debt		
		n (sample)	Participation*	Median	n (sample)	Participation*	Median	n (sample)	Participation*	Median
Has a non-collateralized loan with purpose: Consolidate debt	No	126	9.1%	19,932	136	9.0%	4,225	380	29.0%	789
	Yes	2	7.1%	25,382	27	100.0%	5,459	20	80.0%	1,300
Has a non-collateralized loan with purpose: Housing related	No	121	9.1%	19,848	94	6.1%	3,172	362	28.8%	818
	Yes	7	8.4%	35,544	69	100.0%	5,663	38	50.1%	722
Has a non-collateralized loan with purpose: Consumption	No	120	9.2%	19,903	98	6.7%	4,538	365	29.1%	806
	Yes	8	4.0%	15,446	65	100.0%	4,137	35	46.1%	1,060
Has a non-collateralized loan with purpose: Other	No	125	9.1%	19,898	138	8.8%	5,000	387	29.3%	818
	Yes	3	5.0%	21,214	25	100.0%	1,490	12	52.0%	1,083
Not applying for credit due to perceived credit constraints	No	124	9.3%	19,814	146	9.3%	4,500	366	28.2%	906
	Yes	4	6.1%	23,361	17	21.0%	4,498	34	48.1%	447
Willing to take at least average risks when making investment decisions	No	79	7.9%	20,000	99	8.5%	4,645	265	25.7%	786
	Yes	49	12.8%	20,460	64	15.7%	4,408	135	42.3%	893
Expenses above income	No	106	8.5%	20,318	134	10.1%	4,290	318	27.5%	902
	Yes	22	12.0%	9,993	29	11.2%	5,240	82	42.6%	587
Income quintile	1st	13	4.4%	21,601	12	4.2%	2,691	62	22.4%	1,036
	2nd	11	3.4%	2,586	20	4.4%	2,649	72	24.3%	557
	3rd	24	8.2%	19,078	34	10.5%	2,958	85	32.6%	654
	4th	31	11.5%	19,908	42	13.8%	3,233	102	40.1%	792
	5th	48	17.5%	25,328	55	18.1%	5,963	79	29.5%	1,253
Region	Adriatic	31	8.8%	20,145	27	6.9%	4,000	95	25.3%	650
	City of Zagreb	15	8.5%	24,669	14	9.3%	4,247	46	28.3%	763
	East	61	9.8%	18,595	95	15.9%	3,263	176	32.2%	1,207
	North-West	21	9.0%	15,654	27	9.1%	5,069	82	35.3%	812

Notes: RP – Reference person, Source: HFCS, authors' calculations.

\*Percentage of the household group (row) holding the debt instrument (column). Median refers to outstanding median amounts in Euros.

Table A2 Question wording

Variable name	HFCS variable code	HFCS variable name	Question	Answers	Comment
Percieved credit constraints	HC1400	not applying for credit due to perceived credit constraints	In the last three years, did you (or another member of your household) consider applying for a loan or credit but then decided not to, thinking that the application would be rejected?	1 – Yes 2 – No	coded 1 for "1 – Yes"
Risk attitude – take average risks	HD1800	investment attitudes	Which of the following statements comes closest to describing the amount of financial risk that you (and your husband/wife/partner) are willing to take when you save or make investments?	1 – Take substantial financial risks expecting to earn substantial returns 2 – Take above average financial risks expecting to earn above average returns 3 – Take average financial risks expecting to earn average returns 4 – Not willing to take any financial risk	coded 0 for "4 – Not willing to take any financial risk" and 1 otherwise
Expenses above income	HI0600	last 12 month expenses were below/above income	Again aside from any purchases of assets, over the last 12 months would you say that your (household's) regular expenses were higher than your (household's) income, just about the same as your (household's) income or that (you/your household) spent less than (your/its) income?	1 – Expenses exceeded income 2 – Expenses about the same as income 3 – Expenses less than income	coded 1 for "1 – Expenses exceeded income" and 0 otherwise
Way of acquiring property – gift/inherited	HB0600	way of acquiring property	How (did you/your household) acquire the (part of the) residence (you own/your household owns): did you purchase it, did you construct it yourself, did you inherit it or did you receive it as a gift?	1 – Purchased 2 – Own construction 3 – Inherited 4 – Gift 5 – 50% PURCHASED OR CONSTRUCTED/50% INHERITED OR RECEIVED AS A GIFT [SILENT]	coded 1 for "3 – Inherited" and "4 – Gift" and 0 otherwise
Purpose of non-collateralized loans	HC050\$x	non-collateralised loan \$x: purpose of the loan	Why did you take on this loan? Please start with the most important purpose.	1 – To purchase or construct the HMR 2 – To purchase other real estate 3 – To refurbish or renovate the residence 4 – To buy a vehicle or other means of transport 5 – To finance a business or professional activity 6 – To consolidate debts 7 – For education purposes 8 – To cover living expenses or other purchases 10 – To support relatives and friends 9 – Other (specify)	Consolidate debt: 6 Housing: 1,2,3 Consumption related: 4,5,8 Other: 7,9,10

**Table A3 Results of the estimation of debt participation determinants by debt instrument – robustness analysis**

	Secured (mortgage) debt		Non-collateralized loans		Overdrafts and credit card debt	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Has secured debt			-4.76*	2.74	7.91*	4.34
Has overdrafts/credit card debt	3.22*	1.68	9.31***	1.71		
Age	1.343***	0.46	0.835*	0.46	1.326**	0.63
Age2	-0.014***	0.00	-0.011**	0.00	-0.014**	0.01
Income quintile 3	1.63	2.38	3.6	2.68	0.19	4.11
Income quintile 4	2.26	2.50	4.81*	2.78	2.1	4.26
Income quintile 5	5.76**	2.57	9.15***	2.92	-8.12	6.05
No. of dependent children	1.35	0.83	-0.45	0.93	0.25	1.60
Education – high	6.44***	1.94	-1.33	2.45	3.14	3.40
RP employed	2.79	3.15	3.99	3.69	14.14**	6.14
RP retired	2.54	3.41	7.36*	3.94	11.05	6.42
Way of acquiring property – gift/inherited	-6.88***	1.92	-1.83	1.92	-3.37	3.24
Perceived credit constraints	-7.78*	4.45	9.11***	3.37	4.78	5.85
Risk attitude – take average risks	2.56	1.78	4.36**	1.97	9.69**	3.57
Expenses above income	6.1**	2.36	4.78*	2.67	13.11***	3.85
Take average risks * Expenses above income	-11.51**	5.20	-7.78	5.19	-4.46	7.86
Financial assets (log)	0.15	0.23	0.15	0.26	-0.23	0.50
Real assets (log)			0.32	0.40	-0.98	0.59
Purpose of non-collateralized loans: consolidate debt	-5.16	5.84			30.78***	8.38
Purpose of non-collateralized loans: housing related	-5.41*	3.27			14.72***	5.35
Purpose of non-collateralized loans: consumption	-2.24	3.28			12.1**	5.26
Purpose of non-collateralized loans: other	0.71	5.15			14.45	9.42
Couple	2.23	2.16	-1.11	2.25	3.81	3.32
Partner working	-0.98	2.02	1.91	2.25	-0.41	4.15
Partner education – high	3.05	2.45	-1.93	3.34	-1.55	6.06
Credit constrained perceived * 1st/2nd income quintile	4.07	8.37	-12.1	7.67	5.14	12.21
Region: East	4.67*	2.51	12.03***	2.87	6.1	3.99
Region: North-west	1.95	2.86	3.86	3.25	8.45**	4.30
Region: Adriatic	1.61	2.65	1.71	3.14	2.3	4.06
Observation	1357		1357		1357	
Chi <sup>2</sup>	138.4***		167.5***		172.6***	
Pseudo R <sup>2</sup>	0.163		0.168		0.099	
Log likelihood	-354.8		-414.5		-738.1	
Akaike inf. crit.	765.5		880.9		1534.2	

Notes: The table reports average marginal effects on the probability of a household holding debt, estimated using a probit regression and multiplied by 100.

dy/dx – marginal effect, SE – standard error, \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01

**Table A4 Results of the estimation of debt amount determinants by debt instrument – robustness analysis**

	Secured (mortgage) debt		Non-collateralized loans		Overdrafts and credit card debt	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
Secured debt (log)			-0.04	0.033	0.04	0.028
Overdrafts/credit card debt (log)	0.07*	0.040	0.15***	0.030		
Age	0.196***	0.075	0.117**	0.056	0.09**	0.042
Age2	-0.002***	0.001	-0.002***	0.001	-0.001**	0.000
Income quintile 3	0.18	0.396	0.44	0.314	-0.02	0.251
Income quintile 4	0.36	0.410	0.45	0.332	0.11	0.266
Income quintile 5	0.83*	0.426	1.03***	0.347	-0.47	0.390
No. of dependent children	0.19	0.135	-0.05	0.109	0	0.101
Education – high	0.92***	0.323	-0.19	0.288	0.18	0.218
RP employed	0.45	0.512	0.51	0.437	0.88**	0.394
RP retired	0.24	0.558	0.99**	0.467	0.68	0.424
Way of acquiring property – gift/inherited	-1.02***	0.317	-0.13	0.225	-0.25	0.210
Perceived credit constraints	-1.14	0.725	1.05***	0.402	0.19	0.367
Risk attitude – take average risks	0.36	0.292	0.47**	0.233	0.63**	0.234
Expenses above income	0.75*	0.398	0.59*	0.313	0.8***	0.243
Take average risks * Expenses above income	-1.56*	0.856	-0.89	0.604	-0.29	0.476
Financial assets (log)	0.03	0.037	0.02	0.030	-0.01	0.031
Real assets (log)			0.03	0.048	-0.06	0.038
Purpose of non-collateralized loans: consolidate debt (log)	-0.08	0.102			0.18***	0.053
Purpose of non-collateralized loans: housing related (log)	-0.09	0.064			0.1**	0.039
Purpose of non-collateralized loans: consumption (log)	-0.02	0.063			0.09**	0.039
Purpose of non-collateralized loans: other (log)	0.05	0.106			0.11	0.075
Couple	0.43	0.358	-0.17	0.265	0.25	0.216
Partner working	-0.16	0.331	0.32	0.265	-0.06	0.263
Partner education – high	0.52	0.401	-0.26	0.396	-0.07	0.391
Credit constrained perceived * 1st/2nd income quintile	0.68	1.375	-1.32	0.899	0.27	0.744
Region: East	0.81*	0.415	1.51***	0.353	0.46*	0.256
Region: North-west	0.32	0.468	0.6	0.387	0.53*	0.277
Region: Adriatic	0.12	0.439	0.17	0.379	0.16	0.261
/sigma		15.63***		12.03***		7.80***
Observation		1,357		1,357		1,357
Number of uncensored observations		121		159		396
Number of left-censored observations		1236		1198		961
Chi <sup>2</sup>		125.7***		174.2**		163.9***
Pseudo R <sup>2</sup>		0.0794		0.0901		0.0432
Log likelihood		-729		-879		-1,815
Akaike inf. crit.		1,515.9		1,813		3,692

Notes: The table reports average marginal effects on the amount of debt a household holds, conditional on holding debt and estimated using a standard tobit censored model.

dy/dx – marginal effect, SE – standard error, \* p < 0.1; \*\* p < 0.05; \*\*\* p < 0.01



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