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# ARE INDEBTED HOUSEHOLDS POORER?

*EVIDENCE FROM SLOVAKIA*

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WORKING  
PAPER

2/2015



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March 2015

ISSN 1337-5830

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# ARE INDEBTED HOUSEHOLDS POORER? *EVIDENCE FROM SLOVAKIA*

Working paper NBS<sup>1</sup>

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## Abstract

This paper analyses the impact of household indebtedness on household net wealth, using Slovak data from the first wave of the Household Finance and Consumption Survey. We find two different effects of household indebtedness on wealth – a highly negative impact of non-mortgage debt and a neutral effect of mortgage debt. Furthermore, we find that households living in bigger municipalities and more developed regions are both wealthier and more indebted. Finally, we ascertain that household wealth is mainly determined by income, home ownership, inheritance, household composition, the characteristics of household head, and regional demographic and economic conditions.

JEL classification: D14, G21, R20

Key words: household net wealth, mortgage and non-mortgage debt, regional analysis

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<sup>1</sup> We would like to thank Martin Šuster (NBS), Pavel Gertler (NBS), Petr Jakubík (EIOPA), an anonymous referee from the Household Finance and Consumption Network (HFCN) and participants of the HFCN meeting in Lisbon, the conference on “The Inequality and Poverty in the European Union and Slovakia” in Košice, research seminars at the National Bank of Slovakia and the Czech National Bank, Bratislava Economic Meeting, and the Summer School of Slovak Economists for their helpful comments. Any remaining errors are ours.

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# 1. INTRODUCTION

Slovakia exhibits interesting patterns of wealth, income and debt relationships. To understand their developments we need to look at recent economic history, which dates back to 1989 – the year of the famous Velvet Revolution that caused a fall of communist regime in former Czechoslovakia. Since then Slovakia has undergone huge political and social changes, transforming from a centrally-planned to an open-market economy. During this period Slovak households have experienced a remarkable transition from a very limited private ownership and almost perfect equality to a competitive market economy and significant wealth redistribution. The living standards of Slovak households have generally improved mainly thanks to the ongoing convergence process between transitional and advanced economies in Europe. New credit markets have facilitated borrowing to households and provided additional financial resources to allow investments and to finance extra consumption needs. Since 2000 the net financial assets per capita have increased in Eastern Europe on average by almost 12% per year.<sup>4</sup> Likewise, household debt has also been increasing quickly over the last two decades, especially in the Central-Eastern European countries. In Slovakia, the household-debt-to-income ratio quadrupled over the past decade, increasing from approximately 9% in 2002 to 45% in 2012.<sup>5</sup> Štefanides and Arady (2013) explain this fast expansion by a combination of supply and demand factors. On the supply side, they argue that the privatization of the largest banks in early 2000's by strong foreign retail banking groups enabled utilizing the consumer and mortgage lending potential in the country. On the demand side, it was fast income growth and a decline in interest rates that contributed to the credit boom. The observed common trend in the growth of private debt and wealth motivates us to analyse how household indebtedness influences household net wealth.

Due to different characteristics of loans, we distinguish between *mortgage* and *non-mortgage debt*.<sup>6</sup> Consumer loans have been increasing faster than mortgage loans in Slovakia due to their greater flexibility and low principal amounts (see Rychtárik and Ličák, 2006). Indeed in 2010, 20% of Slovak households were exposed to non-mortgage debt, while the penetration of mortgage debt was less than 10% of households. In terms of debt volumes, however, over 80% of total household debt was concentrated in mortgage debt, while only 20% accounted for non-mortgage debt (see Messner and Zavadil, 2014, Table 3.1 and 3.2).

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<sup>4</sup> Growth was faster before the crisis and dropped below 10% between 2007 and 2011; see Brandmeir et al. (2012).

<sup>5</sup> Source: Eurostat database, available online at <http://appsso.eurostat.ec.europa.eu>.

<sup>6</sup> *Mortgage debt* refers to a collateralised debt that serves households mainly to purchase their housing residence. Newly purchased homes (properties) are then used as collateral. Mortgage debt typically involves a large sum of money over a long period of time. On the other hand, *non-mortgage debt* is a non-collateralised debt that serves to buy consumable goods and services. It usually involves small amounts of money to overcome short-term liquidity shortages.



In comparison to other countries, the participation of Slovak households in mortgage market is one of the lowest in Europe. The reason is a structural change that dates back to early 1990's, when many households were offered to purchase their main residence (previously state-owned flats), priced well under the market-clearing level. Thus, Slovak households currently have a very high home-ownership rate and a relatively low debt. Compared to the euro-area average main-residence ownership at 60% and a 23% penetration of mortgage debt, these shares are 90% and 10%, respectively, in Slovakia (see HFCN, 2013b, Table 2.1 and 3.1).

To account for this structural change in the housing market, we will distinguish *total wealth* from *financial wealth* that is unaffected by real-estate ownership and has been accumulated mainly after the communist era (the exact definitions are given in Section 3). We will also introduce a dummy variable in our model that will denote whether a household acquired its main residence before 1990, i.e. during communism when no credit market existed yet, or thereafter.<sup>7</sup>

The main goal of this paper is to determine the impact of household indebtedness on household net wealth. This is an important topic that may reveal some patterns that could be helpful for the guidance of economic policies affecting household welfare. The results of our analysis could also be useful for designing household stress testing exercises, a frequently used tool for the assessment of financial stability.<sup>8</sup> Some recent studies, e.g. Albacete and Lindner (2013) or Cavalletti et al. (2014), found that households with non-mortgage debt are more financially vulnerable. We would like to determine the impact of both mortgage and non-mortgage debt on household net wealth, which is closely related to household financial vulnerability.

For the purpose of our analysis we use data from the Eurosystem Household Finance and Consumption Survey (HFCS) that collects harmonized data on household assets, liabilities, income and consumption in almost all euro area countries.<sup>9</sup> The results from the first wave of the survey, based on a univariate analysis, suggest that household net wealth is mainly determined by income, home ownership, household composition and some key characteristics of the household reference person, such as age, work status and education

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<sup>7</sup> In fact, during communism it was possible to obtain real estate basically only by self-construction (for houses) or by an allocation from the state, a state-owned company or a cooperative (for flats). Some flats could have been interchanged or transferred to other persons (subject to certain conditions). The real estate market was established in Slovakia only in 1990's, i.e. after the fall of communism.

<sup>8</sup> Several papers have recently studied household debt sustainability in various countries, for example in the euro area (Ampudia et al., 2014), Italy (Cavalletti et al., 2014), Slovakia (Fessler et al., 2014), the Czech Republic (Galuščák et al., 2014), Austria (Albacete and Lindner, 2013), Norway (Solheim and Vatne, 2013), Spain (IMF, 2012), Portugal (Costa and Farinha, 2012) and Croatia (Sugawara and Zaluendo, 2011).

<sup>9</sup> More information about the Eurosystem Household Finance and Consumption Survey (HFCS) is available at [http://www.ecb.europa.eu/home/html/researcher\\_hfcn.en.html](http://www.ecb.europa.eu/home/html/researcher_hfcn.en.html).



(see HFCN, 2013b, Chapter 4). We will verify these relations by a multivariate analysis enriched with other important characteristics.

The determinants of household wealth have been widely discussed in the literature. A good summary of the relevant theoretical and empirical literature on this topic is provided by Semyonov and Lewin-Epstein (2013), who examine the determination of wealth among older households from a cross-national comparative perspective. They use data from sixteen national samples and find that in all countries household wealth is accumulated through two major mechanisms: labour market income and intergenerational transfers. The importance of inheritance is further confirmed by Fessler and Schürz (2014), who find that households that received intergenerational wealth transfers have considerably higher net wealth than comparable households that did not receive any wealth transfers. Revoltella and Mucci (2005) claim that the relevance of inheritance is still quite low in new EU countries, where “being rich” seems to be more a matter of flows rather than of stocks. In other words, the rich are those earning high incomes, thus being able to save. Besides income and inheritance, household structure is also an important determinant of household wealth, as shown by Fessler, Lindner and Segalla (2014) on European data, and by Scholz and Seshadri (2009) on USA data.

Concerning household debt, Barrell et al. (2009) examine the determinants of household indebtedness in new EU member states and find that a desired debt-to-income ratio rises with GDP per capita and real house prices, and declines with the real interest rate. This is also confirmed by Chmelar (2013), who studies the consequences of the recent economic and sovereign debt crisis on household liabilities. He claims that the major growth in demand for and supply of household credit has generated an increase in household debt, which, on one side, contributed to growth rates during the pre-crisis period, but, on the other side, helped inflate asset bubbles in some countries. Beer and Schürz (2007) examine the risk of an increased level of household debt on financial stability in Austria. They show that debt does not constitute a threat to financial stability in their country, since it is mostly concentrated among affluent and high-income households. Bover et al. (2014) analyse the role of individual household characteristics and the impact of institutional factors on household debt in euro-area countries. They find that the patterns of secured and unsecured debt outcomes vary markedly across countries, and that longer repossession periods make mortgages less accessible and more expensive for low-income households.

The main focus of this paper is the assessment of the impact of household indebtedness on household net wealth. Such an analysis requires an instrumental variable approach since the indicator of household indebtedness is obviously an endogenous variable in a model of household wealth. For this purpose we will apply a three-step instrumental-variable estimator that in the first step estimates the probability of having (non-)mortgage debt, which is then used as an instrument for the indicator of debt in a model of household net wealth. This approach allows us to analyse the determinants of household indebtedness and wealth at the same time.



Another important contribution of this paper is that it performs the first in-depth analysis of the Slovak HFCS data, taking into account the historical background of the housing market in Slovakia, which is, due to the structural changes followed by the fall of communist regime, substantially different from any other euro-area country participating in the first wave of the HFCS.<sup>10</sup> Moreover, we combine the Slovak HFCS data with the demographic and economic data on the Slovak regions that exhibit significant diversity and different convergence patterns, thanks to which we can assess the impact of regional characteristics on household wealth. Although our analysis is based on the data of one particular country, we believe that the main results are applicable also to other countries (not necessarily post-communist ones), since our findings are broadly in line with those of the previous literature.

Our analysis shows that household indebtedness has two different effects on household net wealth. While non-mortgage debt has a highly negative impact on wealth, the effect of mortgage debt is neutral (insignificantly positive). This result confirms the fact that households with non-mortgage debt are more financially vulnerable (as shown by Albacete and Lindner, 2013, or Cavalletti et al., 2014). Furthermore, we find that households living in bigger municipalities and more developed regions are both wealthier and more indebted, which supports the convergence pattern discussed earlier. Finally, we confirm the findings of the previous literature that household wealth is mainly determined by income, home ownership, inheritance, household composition, the main characteristics of the household head, and by demographic and economic conditions of the region where households live.

The rest of this paper is organised as follows. The next section describes the data that we use in our analysis. In Section 3 we introduce a model for the analysis of household net wealth. In the fourth section, we present the results and describe a typical indebted and wealthy household in Slovakia. The last section summarizes the key findings. The Appendix provides more detailed information on the used variables and the estimation results of alternative models that check the robustness of our findings.

## 2. DATA

The main source of our data is the first wave of the Eurosystem Household Finance and Consumption Survey (HFCS) that provides detailed information on household assets, liabilities, income and consumption in almost all euro-area countries.<sup>11</sup> Given that we are also interested in the impact of regional characteristics on household indebtedness and wealth, we use only the data from Slovakia, which we supplement with the data on Slovak regions that are not part of the Eurosystem HFCS dataset (see Table 1).

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<sup>10</sup> The following countries participated in the first wave of the HFCS: Belgium, Germany, Greece, Spain, France, Italy, Cyprus, Luxembourg, Malta, Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland. From them only Slovakia was a part of the communist block ruled by the Soviet Union.

<sup>11</sup> Detailed results from the first Eurosystem HFCS wave are described in HFCN (2013b).



Slovak HFCS data were collected in the last quarter of 2010. The sample consists of 2,057 households that are proportionally distributed across all Slovak regions. To further enhance the data representativeness at the regional level, households were attributed weights that were calibrated to population totals in each region. Therefore, all results presented in this paper are based on weighted regressions.<sup>12</sup>

Missing data of the key economic variables were imputed by assigning five plausible values (so called *implicates*) to each missing value based on the information collected from other households in a way to preserve the distribution of and the relationship between variables. Therefore, the final coefficients presented in this paper were calculated as an average of the estimated coefficients over all five implicates. Standard errors were calculated with the Rao-Wu rescaling bootstrap method using 1,000 replicate weights.<sup>13</sup>

For the purpose of our analysis we will use a wide range of *explanatory variables* (denoted by  $X_i$  in the next section), which we split for convenience into the following three groups:

1. Household characteristics: household total income, the way of acquiring the household main residence (HMR), and the household composition (number of adults and children);
2. Characteristics of the reference person (RP)<sup>14</sup>: age, working status and education;
3. Regional characteristics: the size of municipality, regional GDP per capita, unemployment rate, the population and area of the region, and average living area of residences in the region.

Besides that we will also use the following three *instrumental variables* (denoted by  $Z_i$  in the next section): i) income expectations, ii) savings-to-income ratio and iii) the indicator of whether the HMR was acquired after 1990. All these variables are described in Table 8 in Annex.

For each *categorical variable*, namely the way of acquiring the HMR, income expectations, all variables characterising the household's RP, and the size of municipality, we choose a *reference group* (RG) that represents a typical household in Slovakia. Our RG household purchased its HMR, has neutral income expectations, lives in a big city (with more than 100,000 inhabitants<sup>15</sup>), its reference person is middle aged (between 35 and 44 years old),

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<sup>12</sup> More information about the Slovak HFCS, including the sampling design, the calibration of weights, and the descriptive analysis of the data can be found in Senaj and Zavadil (2012).

<sup>13</sup> More information on the methodology of the HFCS data collection, processing, editing and imputing as well as on the calculation of standard errors using replicate weights can be found in HFCN (2013a).

<sup>14</sup> The household reference person (RP) is chosen according to the international standards of the so-called Canberra Group, which uses the following sequential steps to determine a unique reference person in the household: 1.) a lone parent with dependent children or one of the partners in a registered or de facto marriage (with or without dependent children); 2.) the person with the highest income; 3.) the eldest person.

<sup>15</sup> Note that in Slovakia there are only two big cities with more than 100,000 inhabitants – the capital city of Bratislava, and Košice.





employed and achieved secondary education. We will compare all other types of households to this RG household.

The regional characteristics that are presented in Table 1 (apart from the size of municipality, which is collected at the household level) were taken from the Regional Statistics Database of the Statistical Office of the Slovak Republic. As we can see, Slovakia is divided into eight regions, which differ substantially in demographic and economic terms. The most densely populated and economically developed region consists of the capital city of Bratislava and its surrounding. Also the neighbouring region of Trnava is more densely populated and has a higher GDP per capita than the national average. On the other side, regions in the central and eastern part of Slovakia, such as Banská Bystrica, Prešov and Košice, suffer from low economic activity, which is reflected in a high unemployment rate and a low GDP per capita. We will use these regional differences to identify the impact of regional characteristics on household indebtedness and wealth. A detailed analysis of the differences in household wealth across Slovak regions is provided by Messner and Zavadil (2014).

**Table 1 – Basic characteristics of Slovak regions**

Region	Statistical Office Data from 2010					
	Population total	Area (km <sup>2</sup> )	Population density	Regional GDP per capita* (EUR)	Unemployment rate (%)	Average residential area (m <sup>2</sup> )
Bratislava	628,686	2,053	306.3	43,100	6.1	73.4
Trnava	563,081	4,146	135.8	20,100	12.0	67.6
Trenčín	598,819	4,502	133.0	15,800	10.2	67.3
Nitra	704,752	6,344	111.1	14,800	15.4	77.9
Žilina	698,274	6,809	102.6	15,800	14.5	66.2
Banská Bystrica	652,218	9,454	69.0	13,200	18.6	71.8
Prešov	809,443	8,973	90.2	10,100	18.6	76.4
Košice	780,000	6,755	115.5	14,100	18.3	72.3
<b>Slovak Republic</b>	<b>5,435,273</b>	<b>49,036</b>	<b>110.8</b>	<b>17,900</b>	<b>14.4</b>	<b>71.5</b>

Source: Statistical Office of the Slovak republic – Regional Statistics Database, available on-line at [http://px-web.statistics.sk/PXWebSlovak/index\\_en.htm](http://px-web.statistics.sk/PXWebSlovak/index_en.htm)

\* at current prices

### 3. MODEL

We model separately two different types of household wealth – *total net wealth*, defined as the difference between total assets and total liabilities, and *financial net wealth*, defined as the sum of all financial assets (i.e. deposits, mutual funds, bonds, shares, non-self-



employment business wealth and managed accounts) net of non-mortgage debt. Since net wealth can also be negative, we do not apply any logarithmic transformation.

Let  $i = 1, \dots, N$  denote households. We will estimate the model for both total and financial net wealth independently, using the following equation:

$$W_i = \alpha + \beta X_i + \gamma D_i + \varepsilon_i, \quad (W)$$

where  $W_i$  is net wealth (either total or financial, depending on the context) of a household  $i$ ,  $X_i$  is a set of its exogenous characteristics (including the regional ones),  $D_i$  is the indicator of whether the household  $i$  has a debt ( $D_i = 1$ ) or not ( $D_i = 0$ ), and  $\varepsilon_i$  is a zero-mean error.

We distinguish mortgage and non-mortgage debt since these two types of debt have a completely different purpose and structure. *Mortgage debt* involves only loans that are collateralised by real estate and serve mainly for house purchases. *Non-mortgage debt* includes any kind of non-collateralised loan, such as credit line / overdraft, credit card debt, consumer loan, etc. While mortgages usually involve high principal amounts with long maturities and relatively low interest rates, non-mortgage loans are mostly short-term debts with low amounts and higher interest rates.

Household indebtedness and wealth are interconnected by nature since wealthy households can afford to take on more debt. Therefore, we expect the debt indicator  $D_i$  (for both mortgage and non-mortgage debt) to be endogenous in the above-mentioned wealth model ( $W$ ), which we will verify by Durbin-Wu-Hausman test in the next section. Hence, we cannot estimate this model by a standard OLS method, because the estimated coefficients would be biased. The underlying endogeneity problem can be resolved by using a *three-step instrumental-variable (IV) approach* proposed by Wooldridge (2002, Procedure 18.1), who suggests estimating first the binary response model of the endogenous variable by maximum likelihood, obtaining the fitted probabilities, and then estimating the main model by a standard IV method using the fitted probabilities as an instrument.

In our case, the three-step IV estimator will consist of the following three steps: First we model the incidence of debt (independently for mortgage and non-mortgage debt) by a probit model, which takes the following form:

$$\Pr(D_i = 1 | X_i, Z_i) = \Phi(a + bX_i + cZ_i + u_i), \quad (D)$$

where  $Z_i$  is a set of *indirect* instrumental variables,  $u_i$  is a standard normal error, and  $\Phi$  is the cumulative distribution function of the standard normal distribution. In the first step, we estimate this model by maximum likelihood and obtain the fitted probabilities  $\hat{D}_i = \Phi(\hat{a} + \hat{b}X_i + \hat{c}Z_i)$ . Then, in the second step, we estimate an auxiliary model

$$D_i = d + eX_i + f\hat{D}_i + v_i \quad (A)$$



by OLS and obtain predicted values  $\tilde{D}_i = \hat{a} + \hat{e}X_i + \hat{f}\hat{D}_i$ . Finally, in the third step, we substitute  $D_i$  with the predicted values  $\tilde{D}_i$  in the wealth model ( $W$ ) and estimate it by OLS.

Standard errors are calculated by the Rao-Wu rescaling bootstrap method (see e.g. HFCN, 2013a, Chapter 7), using 1,000 replicate weights. Since the applied method is a three stage estimation procedure, the indicators of the estimated probability of having loans are random variables and thus there is uncertainty attached to these measures. Since the uncertainty originating from estimating these indicators has to be accounted for in the estimated model – especially in the calculation of the standard errors – the replicate weights are applied to the whole procedure and not only step by step. This means that the standard errors in the first stage are calculated only based on the estimation of the probit model ( $D$ ), the standard errors in the second stage are calculated based on the sequential estimation of the probit model ( $D$ ) followed by the estimation of the auxiliary model ( $A$ ), and the standard errors in the third stage are calculated based on the sequential estimation of all three models ( $D$ ), ( $A$ ) and ( $W$ ).

Under the assumption that errors  $\varepsilon_i$  are homoscedastic, the three-step IV estimator is asymptotically efficient (see Wooldridge, 2002, page 623). This estimator, however, does not allow us to test the validity of instruments  $Z_i$  because these are not directly used in the IV estimation (the endogenous variable  $D_i$  is instrumented only by one instrument – its predicted value  $\hat{D}_i$  from the probit model, so there are no extra degrees of freedom). Since in our analysis we will use more instruments (namely three) than the number of endogenous variables (two – the indicator of mortgage and of non-mortgage debt), we can perform the Sargan test for over-identifying restrictions that enables us to verify the validity of our instruments. For this purpose we will need to re-estimate the model by a standard *two-stage least squares (2SLS) method*. This involves in the first step to linearly project  $D_i$  on all exogenous variables  $X_i$  and instruments  $Z_i$  by estimating the model  $D_i = g + hX_i + kZ_i + w_i$  by OLS and predicting the values  $\check{D}_i = \hat{g} + \hat{h}X_i + \hat{k}Z_i$ . In the second step we estimate the wealth model ( $W$ ) by OLS, using these predicted values  $\check{D}_i$  instead of  $D_i$ .

To perform the Sargan test, we regress the estimated errors  $\hat{\varepsilon}_i$  from the 2SLS estimation on all exogenous variables  $X_i$  and instruments  $Z_i$ . The Sargan test statistic is then calculated as the coefficient of determination ( $R^2$ ) from this regression, multiplied by the number of observations  $N$ . Given that we use multiply imputed data with five implicates, we calculate the final Sargan statistic as the average of the Sargan statistics over all five implicates. The Sargan test statistic is asymptotically distributed as a  $\chi^2$  with the degree of freedom equal to the number of over-identifying restrictions, which is the difference between the number of instruments and the number of endogenous variables. In our case, the degree of freedom is one, since we have three instruments and two endogenous variables.

As we have already mentioned in the previous section, we will use the following three *instrumental variables* (denoted by  $Z_i$ ): income expectations, savings-to-income ratio and the



indicator of whether the HMR was acquired after 1990. Let us now justify the selection of these instruments. In the next section we will verify their validity by the Sargan test.

In our model, a variable is a valid instrument if it is important for the household decision of whether to take out a loan, but it does not directly influence household net wealth. Therefore, we selected our instruments in a way that they would predict well the incidence of debt, but would have likely a neutral effect on wealth. Indeed, the estimated coefficients of the three selected instrumental variables are highly significant in the debt model ( $D$ ), but insignificant in the wealth model  $W_i = p + qX_i + rZ_i + t_i$ , i.e. when regressed together with other exogenous variables on household wealth.<sup>16</sup> Besides this statistical evidence, we also have an economic interpretation of why the selected instruments should be valid.

Future income expectations naturally influence current household consumption behaviour. Households with positive income expectations should be more willing to take out a loan to satisfy their current consumption needs. On the other hand, households with negative income expectations should make more precautionary savings and thus avoid taking on extra debt. Future income expectations should, however, have no impact on current household wealth since both rich and poor households can have either optimistic or pessimistic expectations about their future income.

A similar argument holds for the savings-to-income ratio, which can be of any size for both high- and low-income households, since it depends mainly on consumption and saving attitudes of household members rather than on the magnitude of their income. Therefore its impact on household net wealth is indeterminate, whereas its effect on the household decision whether to take on debt is evident since households with ample savings (relative to their income) will be less likely to take out consumer loans.

Finally, the fact whether a household acquired its HMR before 1990, when no credit market existed yet, or thereafter, strongly determines its participation in the debt market. On the other hand, this fact should not influence household current net wealth when we control for other household characteristics. The households that acquired their HMR after 1990 are probably younger, but not necessarily richer or poorer than the households that acquired their HMR before 1990, mainly after conditioning on the age of the RP and the way of the HMR acquisition.

## 4. RESULTS

Now we will discuss the estimation results of the three-step IV procedure presented in the previous section. We begin with the probit model ( $D$ ) for household mortgage and non-mortgage debt that is estimated by maximum likelihood method. Then we proceed with the

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<sup>16</sup> The estimation results are available from the authors upon request.

estimation of the auxiliary model ( $A$ ) by OLS. The results of this intermediate step are not discussed in the paper, but are reported for completeness in Table 7 in Appendix.<sup>17</sup> Finally, we estimate the main model ( $W$ ) for household total and financial net wealth, in which we substitute the indicators of indebtedness  $D_i$  with the predicted values  $\hat{D}_i$  from the previous model ( $A$ ). The obtained results are discussed in detail in the second part of this section. The last part is devoted to robustness checks.

Before presenting the main results of the paper, we will verify the correctness of the selected estimation approach by several statistical tests. First we will test the endogeneity of the indicator of indebtedness for both mortgage and non-mortgage debt by the Durbin-Wu-Hausman test. Then we will verify the validity of the selected instruments by the Sargan test.

**Table 2 – Results of the Durbin-Wu-Hausman test of endogeneity (p-values)**

Model ( $W$ )	Indicator $D_i$ for		Joint test for both indicators
	mortgage debt	non-mortgage debt	
Total net wealth	0.100	0.000	0.000
Financial net wealth	0.429	0.000	0.000

Table 2 presents the results of the Durbin-Wu-Hausman test that strongly rejects the exogeneity of the indicator for non-mortgage debt in both wealth models. The exogeneity of the indicator for mortgage debt is rejected at 10% level in the total-net-wealth model and not rejected at any conventional level in the financial-net-wealth model. Hence, it seems that at least in the latter model we could treat the indicator for mortgage debt as an exogenous variable. We prefer, however, to treat both indicators equally as endogenous variables, since household wealth predetermines the capability of households to take on any type of debt, whether mortgage or non-mortgage. The Durbin-Wu-Hausman test applied jointly to both debt indicators strongly rejects the null, which justifies our decision to treat both indicators as endogenous variables.<sup>18</sup>

Finally, we performed the Sargan test to verify the validity of our instruments. The test did not reject the null of the correct model specification and the validity of instruments at any conventional level; the p-value of the test was 0.101 for the total-wealth model and 0.312

<sup>17</sup> The estimation results of the auxiliary model ( $A$ ) are not very informative for our analysis. The only significant coefficient is that of the predicted probability  $\hat{D}$  obtained from the probit model ( $D$ ). In the mortgage-debt model, there is one additional coefficient that is significant at 5% level – the indicator for households that do not own their HMR. All other coefficients are insignificant.

<sup>18</sup> As a robustness check we re-estimated both wealth models with the indicator of mortgage debt as an exogenous variable and the indicator of non-mortgage debt as an endogenous variable. The results did not differ too much from those presented in this paper (when both debt indicators are treated as endogenous variables). The estimated coefficient for mortgage-debt indicator is insignificant, while the estimated coefficient for the probability of non-mortgage debt is highly significant with roughly the same magnitude as in Table 5. The results are available from the authors upon request.



for the financial-wealth model. Thus, it seems that our model is correctly specified and the selected instruments are valid.

#### 4.1. DETERMINANTS OF HOUSEHOLD INDEBTEDNESS

Table 3 reports the estimated coefficients of the probit model ( $D$ ) for both mortgage and non-mortgage debt. The first section of the table reports the estimates for household characteristics, starting with the instrumental variables. The results confirm that the household decision whether to take out a loan is influenced by its income expectations. Households expecting their income to rise more than prices are more willing to take out a mortgage, but less willing to take on a non-mortgage debt. Also the accumulation of savings decreases the probability of non-mortgage debt since savings are liquid assets that facilitate purchases of non-durable goods without any necessity to take out a loan. On the other hand, savings have no impact on the household decision to take out a mortgage since the purchase of real estate usually cannot be financed only from savings. Finally, as expected, the households that acquired their HMR after 1990 are much more likely to be indebted, since the emergence of credit market allowed households to take out loans.

Surprisingly, income has no impact on household indebtedness in Slovakia. Intuitively, we would expect higher income to increase the probability of having (at least mortgage) debt due to better creditworthiness. This is the case in most euro-area countries as can be seen e.g. in Bover et al. (2014, Figure 2), where the estimated odds-ratios for income in the logit regression for the incidence of mortgage debt is above one for all countries in the sample but Slovakia. The analysis of Messner and Zavadil (2014, Chart 3.1) shows that the debt participation of Slovak households exhibits an unusual hump-shaped relationship with regard to income, suggesting that debt is taken mainly by middle-income households. This clearly non-monotonic relationship between income and the incidence of debt is apparently the reason behind the insignificant coefficients of income in both probit models.<sup>19</sup>

To account for inheritances we also introduced a variable that describes the way, in which households acquired their main residence (HMR). Unsurprisingly, the probability of having a mortgage decreases significantly when the household inherited its HMR, obtained it as a gift or does not own the HMR (i.e. is a renter or a free user), compared to the reference group of households that purchased their HMR. On the other hand, the way of acquiring the HMR does not influence the household decision to take on non-mortgage debt.

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<sup>19</sup> To capture this non-monotonic relationship, we tried various different model specifications. First we introduced log of income also with its quadratic form, but the estimated coefficients were highly insignificant. Then we tried to use income as it is (i.e. without a logarithmic transformation) together with its square, but the estimated coefficients were even less significant than before. Finally, we tried to introduce income as a categorical variable denoting five income quintiles, but the estimated coefficients were again not significant. Therefore we decided to use only the logarithm of income, since it was able to explain household total and financial net wealth in the best way.



**Table 3 – Determinants of mortgage and non-mortgage debt**

	Mortgage debt coefficient	(p-value)	Non-mortgage debt coefficient	(p-value)
<b>Household characteristics</b>				
<b>Income expectations (RG = Neutral)</b>				
Pessimistic	0.049	(0.677)	0.032	(0.758)
Optimistic	0.346**	(0.033)	-0.345**	(0.030)
<b>Savings to income ratio</b>	-0.194	(0.208)	-0.809***	(0.000)
<b>HMR acquired after 1990</b>	1.074***	(0.000)	0.285**	(0.021)
<b>Log(income)</b>	0.005	(0.965)	0.041	(0.642)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	0.147	(0.409)	-0.117	(0.416)
Inheritance	-1.038***	(0.000)	0.021	(0.890)
Gift	-0.779**	(0.017)	0.073	(0.794)
Does not own HMR	-1.913***	(0.000)	-0.009	(0.949)
<b>Number of adult members (16+ years)</b>	-0.116*	(0.073)	0.163**	(0.013)
<b>Number of children in household</b>	0.127*	(0.058)	-0.104	(0.116)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	-0.129	(0.793)	-0.156	(0.546)
25 – 34 years	0.328**	(0.014)	0.063	(0.661)
45 – 54 years	-0.366**	(0.015)	-0.004	(0.978)
55+ years	-0.494**	(0.015)	-0.326*	(0.054)
<b>Working status (RG = Employed)</b>				
Self-employed	0.172	(0.246)	0.150	(0.244)
Unemployed	0.165	(0.763)	0.420	(0.442)
Retired	-1.134**	(0.028)	-0.358*	(0.076)
Other not working	-0.325	(0.578)	0.007	(0.981)
<b>Education (RG = Secondary)</b>				
Primary	-0.398	(0.618)	-0.650**	(0.032)
Tertiary	0.070	(0.557)	-0.074	(0.550)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	-0.315	(0.121)	-0.490**	(0.016)
2,001 – 20,000	-0.082	(0.674)	-0.522***	(0.008)
less than 2,000	0.079	(0.732)	-0.437*	(0.054)
<b>GDP per capita (in 1,000 EUR)</b>	0.067*	(0.058)	0.231***	(0.000)
<b>Unemployment rate (in %)</b>	-0.266**	(0.047)	-0.806***	(0.000)
<b>Log(population)</b>	0.551	(0.557)	2.171***	(0.003)
<b>Area (1,000 km<sup>2</sup>)</b>	0.246*	(0.060)	0.888***	(0.000)
<b>Average living area of residences (in m<sup>2</sup>)</b>	0.043*	(0.058)	0.107***	(0.000)
Constant	-13.572	(0.309)	-44.068***	(0.000)

Abbreviations: RG = reference group, HMR = household main residence.

Significance: \* = 10%, \*\* = 5%, \*\*\* = 1%.



As we can see, the household structure also influences household indebtedness. Households with more adults are less exposed to mortgage debt (since they represent multigenerational households), but have a higher chance of non-mortgage debt. On the other hand, households with more children are more likely to have a mortgage, but less likely to have a non-mortgage loan (the latter result is, however, not significant).

The second panel of Table 3 shows the impact of household head characteristics on the incidence of household debt. Looking at the age of reference person we observe a typical hump-shaped profile for mortgage debt, suggesting that middle-aged households are more likely to take out a mortgage than young or old households. On the other hand, the incidence of non-mortgage debt is almost constant (i.e. with no significant differences) among all age groups of households, except for the oldest one (with the reference person 55+ years old), where it is significantly lower. The working status and education of the reference person has a limited impact on the probability of debt. The only significant results are that the households with a retired reference person are less likely to be indebted, and the households with a primary educated reference person are less likely to have non-mortgage debt.

Concerning the regional characteristics, the size of municipality has no impact on the incidence of mortgage debt, but non-mortgage debt is much more prevalent in big cities. This is caused by a higher concentration of companies supplying credit as well as by a more stimulated demand coming from a constant pressure of shop windows and commercials. Also households in more developed regions (with a higher GDP per capita and lower unemployment) are more indebted. Likewise, demographic characteristics of the region influence household indebtedness, especially the incidence of non-mortgage debt, which is more prevalent in larger and more populated regions with larger residences.

A summary of the above-mentioned results is provided in Table 4 that describes a prototype of indebted household in Slovakia. A typical indebted household acquired its HMR after 1990, has a reference person that is not retired, and lives in a large region with a high GDP per capita, low unemployment and larger residences. These are the factors that influence the incidence of both mortgage and non-mortgage debt. A typical household with only mortgage debt has positive income expectations, purchased or self-constructed its HMR, consists of fewer adults and more children, and its reference person is rather young (aged between 25 and 34 years). On the other hand, a typical household with only non-mortgage debt has neutral or negative income expectations, has few savings (relative to the total income), consists of more adults, its reference person is below 55 years old and has at least secondary education, and lives in a big city in a more populated region.



**Table 4 – Description of a typical indebted household in Slovakia**

MORTGAGE DEBT	NON-MORTGAGE DEBT
<b><i>A typical indebted household ...</i></b>	
has positive income expectations	has neutral or negative income expectations
purchased or self-constructed its main residence	has few savings (relative to income)
acquired its main residence after 1990	
consists of fewer adults and more children	consists of more adults
<b><i>... has a reference person that ...</i></b>	
is between 25 – 34 years old	is below 55 years old
is not retired	
	has at least secondary education
<b><i>... and lives in ...</i></b>	
	a big municipality
a region with high GDP per capita	
a region with low unemployment	
	a more populated region
a large region	
a region with larger residences	

## 4.2. DETERMINANTS OF HOUSEHOLD WEALTH

The results of the three-step IV estimation of the wealth model ( $W$ ) for both total and financial net wealth are presented in Table 5. The first two rows show the impact of household indebtedness on wealth. We can see that while the occurrence of mortgage debt has a positive, though insignificant, effect on net wealth, the occurrence of non-mortgage debt has a significantly negative impact on both total and financial net wealth. The estimated coefficients suggest that a 1% higher probability of non-mortgage debt decreases household total net wealth by EUR 1,700 and financial net wealth by EUR 700.

Other important determinants of household net wealth are total income and the possession of the household main residence (HMR). Households that do not own their HMR are significantly poorer than the owners. Even among the owners there are significant differences in wealth; the households that self-constructed or inherited their HMR are much richer than the households that purchased it. On the other hand, the households that self-constructed their HMR have lower financial net wealth, probably because the self-construction of HMR requires heavier financing from household savings.

The household composition also affects wealth. While a higher number of adults increases household wealth, the effect of children is opposite (though insignificant for total wealth). This result is quite intuitive regarding that child upbringing and education is costly and



therefore consumes household liquid assets. On the other hand, adults help accumulate financial assets by receiving regular income.

**Table 5 – Determinants of total and financial net wealth**

	Total net wealth		Financial net wealth	
	coefficient	(p-value)	coefficient	(p-value)
<b>Household characteristics</b>				
<b>Probability of mortgage debt (in %)</b>	362	(0.154)	1,078	(0.715)
<b>Probability of non-mortgage debt (in %)</b>	-1,692***	(0.000)	-700***	(0.000)
<b>Log(income)</b>	18,731***	(0.000)	3,512***	(0.001)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	46,131***	(0.000)	-4,113***	(0.006)
Inheritance	20,595***	(0.000)	-1,278	(0.156)
Gift	4,774	(0.581)	2,884	(0.405)
Does not own HMR	-47,729***	(0.000)	134	(0.901)
<b>Number of adult members (16+ years)</b>	11,481***	(0.000)	3,440***	(0.000)
<b>Number of children in household</b>	-4,199	(0.174)	-1,905***	(0.001)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	-15,468*	(0.078)	-3,877*	(0.051)
25 – 34 years	-15,625**	(0.019)	715	(0.462)
45 – 54 years	-5,172	(0.460)	-491	(0.659)
55+ years	-3,750	(0.663)	-5,515***	(0.002)
<b>Working status (RG = Employed)</b>				
Self-employed	55,092***	(0.000)	8,448***	(0.000)
Unemployed	77,717***	(0.008)	11,738***	(0.001)
Retired	-17,192**	(0.014)	-2,781*	(0.082)
Other not working	4,602	(0.622)	1,426	(0.326)
<b>Education (RG = Secondary)</b>				
Primary	-19,657**	(0.024)	-8,530***	(0.000)
Tertiary	18,931***	(0.003)	-1,345	(0.251)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	-31,211***	(0.000)	-5,233***	(0.000)
2,001 – 20,000	-49,099***	(0.000)	-6,824***	(0.000)
less than 2,000	-59,957***	(0.000)	-5,011***	(0.002)
<b>GDP per capita (in 1,000 EUR)</b>	9,066***	(0.000)	3,401***	(0.000)
<b>Unemployment rate (in %)</b>	-28,717***	(0.000)	-11,830***	(0.000)
<b>Log(population)</b>	149,628***	(0.000)	38,191***	(0.007)
<b>Area (1,000 km<sup>2</sup>)</b>	27,922***	(0.000)	12,726***	(0.000)
<b>Average living area of residences (in m<sup>2</sup>)</b>	969	(0.271)	1,297***	(0.000)
Constant	-2,351,325***	(0.000)	-707,103***	(0.002)

Abbreviations: HMR = household main residence, RG = reference group.

Significance: \* = 10%, \*\* = 5%, \*\*\* = 1%.



Next we observe that young households are poorer than other households. While total net wealth does not decrease among older households (compared to the middle-aged ones), financial net wealth exhibits a typical hump-shaped pattern over the age of the RP. This relates to consumption smoothing over the life cycle – while young households just begin to accumulate financial assets, old households spend them to compensate for a reduction in their income.

The work status of RP also affects household wealth. Self-employed households are significantly richer than the employed ones, since entrepreneurs have usually higher income than employees, which allows them to accumulate more assets. Moreover, entrepreneurs experience a higher income volatility, which motivates them to build up bigger precautionary savings. Surprisingly, the estimated coefficient for households with unemployed RP is significantly positive, suggesting at the first sight that unemployed households should be wealthier than employed ones. We verified this conjecture in our data and discovered that this is not true.<sup>20</sup> The estimated coefficient for the indicator of unemployed RP, when introduced as the only explanatory variable in the model, is negative. It changes its sign from negative to significantly positive when we add income as another explanatory variable in the model. Hence, we have to interpret the estimated result conditionally on income: if two households – one employed and the other unemployed – have the same income, then the unemployed household must be richer than the employed one, because it must have income from some additional capital that the employed household does not own. Finally, households with a retired RP have significantly lower net wealth than households with an employed RP. Besides the already-mentioned life-cycle consumption smoothing, this result may be related also to inter-generational transfers. In Slovakia it is quite common that elderly parents give a part of their property to their adult children to help them become independent.

Table 5 also demonstrates that households with a more educated RP are wealthier. One could argue that it is because wealthier households can afford better education, but this is not the case in Slovakia, where education has since long been provided mostly free of charge, and thus affordable for almost everyone.

Households living in smaller towns and villages are significantly less wealthy, which is caused mainly by higher property prices and better employment opportunities in large cities. This is also reflected in the estimation of other regional coefficients. Households are wealthier in larger and more populated regions with a higher GDP per capital, lower unemployment and larger residences.

Most of the presented findings may be summarized as follows. Since more educated households reside in larger agglomerations that are more developed and have lower

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<sup>20</sup> The average total (resp. financial) net wealth of unemployed households is below EUR 50,000 (resp. around EUR 1,300), while it is above EUR 60,000 (resp. around EUR 4,400) for employed ones.

unemployment, households living there are rewarded with higher income. Moreover, due to the Slovak specifics of the very high HMR ownership, higher real estate prices in bigger cities and more developed regions made these households also wealthier.

A conclusive summary of the above-mentioned results is provided in Table 6 that describes a prototype of wealthy household in Slovakia. A typical wealthy household does not have any non-mortgage debt, has high income and consist of more adults; its RP is middle-aged, self-employed, not retired, and well educated. Such a household lives in a big municipality in a large or highly populated region with a high GDP per capita and low unemployment. These factors influence both total and financial net wealth. Concerning only total net wealth, wealthier households own their HMR, which they did not purchase, but rather self-constructed or inherited; their RP is at least 35 years old and has tertiary education. Finally, households with high financial net wealth did not self-construct their HMR, consist of few children and live in a region with larger residences.

**Table 6 – Description of a typical wealthy household in Slovakia**

TOTAL NET WEALTH	FINANCIAL NET WEALTH
<b><i>A typical wealthy household ...</i></b>	
does not have non-mortgage debt	
has high income	
owns its main residence that was self-constructed or inherited	did not self-construct its main residence
consists of more adults	
	consists of few children
<b><i>... has a reference person that ...</i></b>	
is 35+ years old	is middle-aged
is self-employed, not retired	
has tertiary education	has at least secondary education
<b><i>... and lives in ...</i></b>	
a big municipality	
a region with high GDP per capita	
a region with low unemployment	
a large or highly populated region	
	a region with larger residences

### 4.3. ROBUSTNESS CHECKS

To verify the validity of our results we performed two robustness checks. In the first one we re-estimated the wealth model ( $W$ ) using the standard 2SLS method, as described in Section 3. The results are provided in Table 9 in Annex. We can see that the estimated coefficients are similar to those obtained by the three-step IV procedure presented in Table 5, but are,



as expected due to a lower efficiency of the estimator, less significant. Especially the estimated coefficients for regional variables in the financial-wealth model are not significant anymore, but all have the same signs as before. The only significant difference in the results between the two approaches is the impact of the age of RP on financial net wealth. In Table 9 (compared to Table 5) we do not observe anymore a typical hump-shaped pattern over the age of RP, related to consumption smoothing over the life cycle. The results exhibit a similar pattern like in the total-wealth model, in which wealth is smaller among young households, reaches its maximum for middle-aged households and does not decrease for old households. Anyway, the main results of the paper, such as the negative impact of non-mortgage debt and the neutral impact of mortgage debt on household wealth, as well as the positive impact of good economic conditions in the region on household indebtedness and wealth, remain valid.

In the second robustness check we modified the definition of indebted households. Now for the mortgage debt we take only households that have an HMR mortgage (thus we ignore loans that are collateralised by other properties than the HMR), and we exclude credit line / overdraft debt from the definition of non-mortgage debt. The new indicators for the modified definition of mortgage and non-mortgage debt remain endogenous in the wealth model ( $W$ ).<sup>21</sup> Moreover, the validity of the selected instruments is even more supported by the Sargan test than before.<sup>22</sup>

The new results for the debt model ( $D$ ) are presented in Table 10 in Appendix. We can see that the estimated coefficients are similar with the previous ones, given in Table 3. All of them have the same sign except for a couple of coefficients that are highly insignificant. Some coefficients are now less significant, especially in the non-mortgage-debt model, but this is normal since we reduced the population of indebted households.<sup>23</sup>

Table 11 in Appendix shows the results of the three-step IV estimation of the wealth model ( $W$ ) using the modified definition of indebted households. We can see again that the estimated coefficients are similar with the previous ones (given in Table 5), i.e. they have the same signs (except for a couple of highly insignificant coefficients) and comparable magnitudes. Some coefficients are now even more significant. In the financial-wealth model there are two coefficients that are not significant anymore, though they have the same sign as before: the indicator for the households that self-constructed their HMR and the indicator

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<sup>21</sup> The Durbin-Wu-Hausman test rejects the exogeneity again only for the indicator of non-mortgage debt (with the p-value of 0.000) in both wealth models. For the indicator of HMR mortgage debt the p-value is 0.170 in the total-wealth model and 0.158 in the financial-wealth model. However, the joint test strongly rejects the exogeneity of both debt indicators with the p-value of 0.000 in both wealth models.

<sup>22</sup> The validity of the selected instruments is not rejected with the p-value of 0.260 in the total-wealth model and with the p-value of 0.469 in the financial-wealth model.

<sup>23</sup> Before we had around 10% of households with mortgage debt and 20% of households with non-mortgage debt; now we have only 9% of households with HMR mortgage debt and 16% of households with non-mortgage debt excluding credit line / overdraft.



for the households that live in a municipality with the number of inhabitants between 20,001 and 100,000. This, however, does not change the interpretation of our main results.

Hence, the robustness checks that we performed confirm the validity of the main results of this paper.

## 5. CONCLUSION

We found two effects of household indebtedness on household net wealth – a highly negative effect of non-mortgage debt, and a neutral effect of mortgage debt. We explain this finding by the fact that while the mortgage debt involves a long-term investment that leads to the ownership of a (valuable) property, non-mortgage debt only covers short-term liquidity shortage to finance goods and services that satisfy immediate consumption needs, but do not contribute to household wealth. Moreover, some types of non-mortgage debt, such as credit-card debt or instalment loans, can have a detrimental impact on household finances due to elevated interest rates. Hence, our results support the findings of the previous literature that non-mortgage debt increases the financial vulnerability of households. Households should therefore be prudent in taking out (unnecessary) consumer loans.

We did not find any significant effect of mortgage debt on household net wealth. Our results, however, show that the households who own their main residence (HMR) are significantly wealthier than the households who rent their home residence, even when the HMR ownership is financed by a mortgage. Thus, it seems that taking out a mortgage to purchase a home residence is a good long-term investment.

Furthermore, our results confirm the findings of the previous empirical literature that household wealth is mainly determined by income, home ownership, inheritance, household composition and the characteristics of household head.

We also provide evidence that the demographic and economic characteristics of the region where households live also influence household indebtedness and wealth. We found that households living in big cities, situated in larger and more populated regions with a higher GDP per capita and lower unemployment, are not only wealthier, but also more indebted. This confirms the fact that higher net wealth tends to be associated with more debt and leverage.



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## ANNEX

Table 7 – Estimation of the auxiliary model (A)

	Mortgage debt coefficient (p-value)		Non-mortgage debt coefficient (p-value)	
<b>Household characteristics</b>				
<b>Fitted probability <math>\hat{D}</math> from the probit model (D)</b>	1.206***	(0.000)	1.068***	(0.000)
<b>Log(income)</b>	-0.001	(0.944)	-0.002	(0.921)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	0.087	(0.653)	0.005	(0.858)
Inheritance	0.200	(0.240)	0.001	(0.988)
Gift	0.024	(0.443)	-0.001	(0.986)
Does not own HMR	0.041**	(0.027)	-0.000	(0.990)
<b>Number of adult members (16+ years)</b>	0.005	(0.507)	-0.005	(0.774)
<b>Number of children in household</b>	-0.005	(0.674)	0.003	(0.872)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	0.009	(0.795)	0.007	(0.921)
25 – 34 years	-0.012	(0.675)	-0.004	(0.916)
45 – 54 years	0.017	(0.490)	0.005	(0.898)
55+ years	0.021	(0.365)	0.010	(0.801)
<b>Working status (RG = Employed)</b>				
Self-employed	-0.010	(0.706)	-0.003	(0.938)
Unemployed	0.004	(0.943)	-0.010	(0.951)
Retired	0.015	(0.371)	0.002	(0.944)
Other not working	0.010	(0.715)	0.001	(0.982)
<b>Education (RG = Secondary)</b>				
Primary	0.007	(0.603)	0.009	(0.796)
Tertiary	-0.003	(0.875)	-0.001	(0.962)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	0.007	(0.761)	0.007	(0.846)
2,001 – 20,000	0.005	(0.815)	0.012	(0.768)
less than 2,000	-0.006	(0.823)	0.011	(0.807)
<b>GDP per capita (in 1,000 EUR)</b>	0.003	(0.473)	-0.003	(0.693)
<b>Unemployment rate (in %)</b>	0.010	(0.529)	0.011	(0.718)
<b>Log(population)</b>	-0.018	(0.870)	-0.059	(0.746)
<b>Area (1,000 km<sup>2</sup>)</b>	-0.012	(0.399)	-0.013	(0.668)
<b>Average living area of residences (in m<sup>2</sup>)</b>	-0.001	(0.671)	-0.001	(0.850)
Constant	0.356	(0.821)	0.952	(0.723)

Abbreviations: RG = reference group, HMR = household main residence.

Significance: \* = 10%, \*\* = 5%, \*\*\* = 1%.



## Table 8 – Description of all variables used in the analysis

### *Household characteristics*

**Total net wealth:** household's total assets minus total liabilities – continuous variable.

**Financial net wealth:** all financial assets (deposits, mutual funds, bonds, shares, non-self-employment business wealth and managed accounts) net of non-mortgage debt – continuous variable.

**Mortgage debt:** indicates whether the household has a loan that is collateralised by household's property (usually a mortgage loan to borrow money to purchase a property) – dummy variable

**Non-mortgage debt:** indicates whether the household has a loan that is not collateralised by any household's property, such as credit line / overdraft, credit card debt or consumer loans – dummy variable

**Income:** total household annual gross income in EUR – continuous variable used in logarithmic form.

**Way of acquiring the household main residence (HMR):** indicates whether the household owns its HMR and whether it was purchased, self-constructed, inherited or received as a gift – categorical variable.

**Number of adult members (16+ years):** number of adult household members that are at least 16 years old – count variable.

**Number of children in household:** number of dependent children that are less than 16 years old – count variable.

**Income expectations:** self-reported expectations of whether the household income will increase more than the price level (optimistic expectations), less than the price level (pessimistic expectations), or equally as the price level (neutral expectations) – categorical variable.

**Savings-to-income ratio:** a measure of household financial liquidity that relates total household savings to the total household gross annual income – continuous variable. Savings are calculated as the sum of all deposits in current or savings accounts of all household members. Only positive balances are taken into account, i.e. savings equal zero in the case of a negative balance.

**HMR acquired after 1990:** indicates whether the household acquired its HMR after the year 1990, i.e. after the fall of communism – dummy variable.

### *Characteristics of the household reference person*

**Age:** age of the reference person split into the following five age groups: 16 – 24 years, 25 – 34 years, 35 – 44 years, 45 – 54 years and 55+ years old – categorical variable.

**Working status:** employed, self-employed, unemployed, retired and other not working – categorical variable.

**Education:** highest educational attainment of the reference person: primary or no education, secondary and tertiary education – categorical variable.

### *Regional characteristics*

**Size of municipality:** the number of inhabitants of the municipality, where the household lives, split into the following four groups: less than 2,000, 2,001 – 20,000, 20,001 – 100,000, more than 100,000 inhabitants – categorical variable.

**GDP per capita:** regional GDP per capita at current prices (in 1,000 EUR) – continuous variable.

**Unemployment rate:** unemployment rate in the region (in %) – continuous variable.

**Population:** the total number of inhabitants in the region – count variable used in logarithmic form.

**Area:** surface area of the region (in 1,000 km<sup>2</sup>) – continuous variable.

**Average living area of residences:** average surface of residences located in the region (in m<sup>2</sup>) – continuous variable.



**Table 9 – Determinants of total and financial net wealth estimated by 2SLS procedure**

	Total net wealth		Financial net wealth	
	coefficient	(p-value)	coefficient	(p-value)
<b>Household characteristics</b>				
<b>Probability of mortgage debt (in %)</b>	760	(0.189)	293	(0.145)
<b>Probability of non-mortgage debt (in %)</b>	-1,608**	(0.029)	-387*	(0.072)
<b>Log(income)</b>	18,189***	(0.001)	2,608**	(0.012)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	48,051***	(0.000)	-979	(0.580)
Inheritance	26,385***	(0.006)	3,104	(0.259)
Gift	9,838	(0.355)	7,084	(0.108)
Does not own HMR	-39,355***	(0.004)	6,190	(0.152)
<b>Number of adult members (16+ years)</b>	12,203***	(0.003)	3,148**	(0.032)
<b>Number of children in household</b>	-5,391	(0.173)	-2,401**	(0.044)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	-15,422	(0.113)	-3,183*	(0.094)
25 – 34 years	-19,381**	(0.011)	-2,708**	(0.019)
45 – 54 years	-1,412	(0.873)	2,697	(0.212)
55+ years	2,030	(0.858)	643	(0.710)
<b>Working status (RG = Employed)</b>				
Self-employed	52,610***	(0.000)	5,879***	(0.010)
Unemployed	77,677**	(0.014)	9,704*	(0.085)
Retired	-15,189**	(0.043)	-593	(0.743)
Other not working	5,992	(0.581)	1,730	(0.454)
<b>Education (RG = Secondary)</b>				
Primary	-18,173*	(0.072)	-6,200***	(0.008)
Tertiary	18,763**	(0.013)	-510	(0.836)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	-28,675**	(0.014)	-1,448	(0.585)
2,001 – 20,000	-47,743***	(0.000)	-3,963	(0.257)
less than 2,000	-59,637***	(0.000)	-3,129	(0.363)
<b>GDP per capita (in 1,000 EUR)</b>	8,129**	(0.048)	1,813	(0.259)
<b>Unemployment rate (in %)</b>	-25,329*	(0.082)	-6,116	(0.283)
<b>Log(population)</b>	137,816**	(0.014)	18,668	(0.417)
<b>Area (1,000 km<sup>2</sup>)</b>	24,611	(0.113)	6,939	(0.248)
<b>Average living area of residence (in m<sup>2</sup>)</b>	550	(0.742)	593	(0.295)
Constant	-2,147,867**	(0.024)	-362,481	(0.355)

Abbreviations: RG = reference group, HMR = household main residence.

Significance: \* = 10%, \*\* = 5%, \*\*\* = 1%.



**Table 10 – Determinants of HMR mortgage and non-mortgage debt without overdraft**

	HMR mortgage debt		Non-mortgage debt without overdraft	
	coefficient	(p-value)	coefficient	(p-value)
<b>Household characteristics</b>				
<b>Income expectations (RG = Neutral)</b>				
Pessimistic	0.060	(0.617)	0.056	(0.587)
Optimistic	0.325*	(0.053)	-0.313*	(0.054)
<b>Savings to income ratio</b>	-0.231	(0.206)	-0.758***	(0.000)
<b>HMR acquired after 1990</b>	1.136***	(0.000)	0.219*	(0.094)
<b>Log(income)</b>	-0.008	(0.942)	0.030	(0.738)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	0.168	(0.354)	0.024	(0.872)
Inheritance	-1.106***	(0.000)	0.058	(0.712)
Gift	-0.747**	(0.022)	0.101	(0.713)
Does not own HMR <sup>#</sup>	<i>omitted</i>		0.010	(0.942)
<b>Number of adult members (16+ years)</b>	-0.118*	(0.078)	0.148**	(0.025)
<b>Number of children in household</b>	0.136*	(0.052)	-0.085	(0.222)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	-0.029	(0.958)	-0.276	(0.322)
25 – 34 years	0.315**	(0.021)	0.059	(0.686)
45 – 54 years	-0.323**	(0.034)	0.073	(0.594)
55+ years	-0.434**	(0.035)	-0.260	(0.139)
<b>Working status (RG = Employed)</b>				
Self-employed	0.153	(0.317)	0.177	(0.198)
Unemployed	0.139	(0.831)	0.533	(0.343)
Retired	-1.164**	(0.027)	-0.404*	(0.069)
Other not working	-0.329	(0.578)	-0.101	(0.778)
<b>Education (RG = Secondary)</b>				
Primary	-0.402	(0.626)	-0.581*	(0.088)
Tertiary	0.086	(0.481)	-0.056	(0.656)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	-0.391*	(0.062)	-0.260	(0.228)
2,001 – 20,000	-0.102	(0.617)	-0.378*	(0.072)
less than 2,000	0.085	(0.722)	-0.377	(0.115)
<b>GDP per capita (in 1,000 EUR)</b>	0.067*	(0.075)	0.219***	(0.000)
<b>Unemployment rate (in %)</b>	-0.263*	(0.062)	-0.765***	(0.000)
<b>Log(population)</b>	0.122	(0.901)	2.510***	(0.001)
<b>Area (1,000 km<sup>2</sup>)</b>	0.254*	(0.066)	0.832***	(0.000)
<b>Average living area of residences (in m<sup>2</sup>)</b>	0.043*	(0.067)	0.094***	(0.000)
Constant	-7.808	(0.576)	-47.528***	(0.000)

<sup>#</sup> This indicator predicts the outcome perfectly, since the households that do not own their HMR cannot have an HMR mortgage debt. It was, therefore, omitted from the model.

*Abbreviations:* RG = reference group, HMR = household main residence.

*Significance:* \* = 10%, \*\* = 5%, \*\*\* = 1%.



**Table 11 – Determinants of total and financial net wealth using the modified definition of indebted households (robustness check)**

	Total net wealth		Financial net wealth	
	coefficient	(p-value)	coefficient	(p-value)
<b>Household characteristics</b>				
<b>Probability of HMR mortgage debt (in %)</b>	268	(0.273)	-27	(0.354)
<b>Probability of non-mortgage debt without overdraft (in %)</b>	-2,022***	(0.000)	-880***	(0.000)
<b>Log(income)</b>	18,911***	(0.000)	3,609***	(0.000)
<b>Way of acquisition of the HMR (RG = Purchased)</b>				
Self-construction	51,317***	(0.000)	-1,997	(0.123)
Inheritance	21,203***	(0.000)	-664	(0.468)
Gift	4,862	(0.577)	3,259	(0.341)
Does not own HMR	-49,513***	(0.000)	-112	(0.921)
<b>Number of adult members (16+ years)</b>	10,869***	(0.000)	3,373***	(0.000)
<b>Number of children in household</b>	-3,314	(0.280)	-1,654***	(0.002)
<b>Characteristics of the household reference person</b>				
<b>Age (RG = 35 – 44 years)</b>				
16 – 24 years	-21,931**	(0.016)	-6,661***	(0.000)
25 – 34 years	-15,034**	(0.022)	789	(0.425)
45 – 54 years	-1,776	(0.803)	1,277	(0.285)
55+ years	-2,422	(0.781)	-4,904***	(0.005)
<b>Working status (RG = Employed)</b>				
Self-employed	57,526***	(0.000)	9,438***	(0.000)
Unemployed	86,957***	(0.003)	16,218***	(0.000)
Retired	-18,177***	(0.010)	-3,282**	(0.037)
Other not working	42	(0.997)	-350	(0.858)
<b>Education (RG = Secondary)</b>				
Primary	-18,078**	(0.039)	-8,054***	(0.000)
Tertiary	24,214***	(0.000)	720	(0.489)
<b>Regional characteristics</b>				
<b>Size of municipality (RG = 100,000+ inhabitants)</b>				
20,001 – 100,000	-22,631***	(0.008)	-1,979	(0.132)
2,001 – 20,000	-43,774***	(0.000)	-4,988***	(0.001)
less than 2,000	-58,003***	(0.000)	-4,639***	(0.005)
<b>GDP per capita (in 1,000 EUR)</b>	9,421***	(0.000)	3,743***	(0.000)
<b>Unemployment rate (in %)</b>	-30,129***	(0.000)	-13,113***	(0.000)
<b>Log(population)</b>	179,928***	(0.000)	53,040***	(0.002)
<b>Area (1,000 km<sup>2</sup>)</b>	28,642***	(0.000)	13,757***	(0.000)
<b>Average living area of residences (in m<sup>2</sup>)</b>	648	(0.452)	1,239***	(0.000)
Constant	-2,749,015***	(0.000)	-913,137***	(0.001)

Abbreviations: RG = reference group, HMR = household main residence.

Significance: \* = 10%, \*\* = 5%, \*\*\* = 1%.