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Working Paper Series
2/2014

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ISBN 978-9949-493-30-2
Eesti Pank. Working Paper Series, ISSN 1406-7161; 2

Distinguishing the Components of Household Financial Wealth: the Impact of Liabilities on Assets in Euro Area Countries

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Abstract

The paper investigates the interdependence of household financial liabilities and assets, with special focus on the impact of liabilities on households' holdings of financial assets. The paper uses the new ECB Household Finance and Consumption Survey from 2009–2010 covering euro area countries. The paper estimates a system of equations for households' financial liabilities and assets, taking account of endogeneity and selection bias. The results indicate that higher household liabilities are related to lower holdings of financial assets. The findings are consistent with the hypothesis that wider use of credit leads to lower savings. The paper highlights that the distinction between the components of households' wealth provides additional insights into households' financial behaviour.

JEL Codes: D14, E21, D12

Keywords: household debt, household wealth, financial assets, liabilities, financial vulnerability

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The views expressed are those of the author and do not necessarily represent the official views of Eesti Pank.

* The research was done when the author was a visiting researcher at Eesti Pank. The author author would like to thank the participants in seminars at Eesti Pank and Tallinn University of Technology, EMS 2014, IISES 9th Academic Conference, as well as Karsten Staehr, Tairi Rõõm and Jaanika Meriküll for their valuable comments. The results published and the related observations and analysis may not correspond to the results or analysis of the data producers.

Non-technical summary

A standard approach for describing the finances of a household is to use net wealth, where a household's liabilities are deducted from its assets. However, the components of net wealth, i.e. financial liabilities, financial assets and real assets, are very heterogeneous across households. This means that households with the same value of net wealth may have different levels of assets and liabilities. Furthermore, the components of net wealth may be interdependent, meaning that households may consider their indebtedness when they make decisions about their financial assets, and the balance of liabilities may depend on the balance of financial assets.

The penetration of debt and the volumes of debt have increased in developed countries over the last three decades and the fastest growth has occurred since 2000. In light of these developments, there has been limited discussion about whether and how indebtedness affects the behaviour of households beyond their borrowing decisions. There are numerous studies which deal with household borrowing and the financial vulnerability of indebted households but there are fewer studies which take a holistic view and analyse financial assets and liabilities jointly.

There is a hypothesis that the availability of credit reduces the need for precautionary savings as income shocks can be smoothed by borrowing, meaning fewer assets are needed for self-insurance against consumption risk. On the other hand, indebtedness increases the financial vulnerability of households, especially during the period of credit tightening when it is difficult for households to borrow to smooth negative shocks. Therefore during times of financial crisis, indebted households need to keep higher levels of savings for precautionary reasons.

The paper uses data from the recently introduced Household Finance and Consumption Survey HFCS. The paper uses the data of 13 euro area countries from the first wave of the HFCS, which was carried out in 2009–2010. The data relate to the period when households had experienced the main economic shocks of the recession and had presumably adjusted their finances to these major shocks. The paper investigates whether and how the liabilities and financial assets of households are related.

The estimations show that households' liabilities impact their financial assets negatively while no significant effect was found from financial assets on liabilities. The negative relationship between liabilities and financial assets remains after controls for other debt related variables are included. The results are confirmed by a large number of robustness tests.

The results suggest that increasing volumes of household debt are related to lower incentives to keep financial assets, which also applies during a recession. The extent to which lower buffer stocks affect the financial vulnerability of households depends on the ability of the households to insure themselves against financial and consumption risks in other ways. According to the HFCS, the choice by indebted households to insure themselves against negative shocks by additional borrowing or by receiving financial assistance from relatives is not evidently different from that of households without debt. The negative relationship between liabilities and financial assets may therefore increase the financial vulnerability of indebted households as they have fewer resources available when they are hit by a negative shock.

In addition to the direct negative effect of liabilities on financial assets, there is an indirect positive effect for households that wish to deleverage. According to the HFCS, about half of indebted households are saving to pay back debt in euro area countries. The estimations show that indebted households who save to pay back their debt have fewer liabilities and more financial assets than indebted households that are not saving, all else being equal. As the motivation for deleveraging is related to the economic downturn, these results apply specifically to the time of the recession.

The paper provides evidence for the interdependence between financial assets and liabilities. In the light of the increased indebtedness of households it is particularly important to understand how households' liabilities affect their other financial decisions.

Contents

1. Introduction

This paper studies the interdependence of households' financial assets and liabilities in European countries. Most studies treat household liabilities as negative assets and relate households' decisions to their net wealth. However, the components of net wealth, i.e. financial liabilities, financial assets and real assets are very heterogeneous across households. Net wealth of 10,000 euros may denote that a household has assets worth 10,000 euros and no liabilities, but it may equally well denote that a household has liabilities of 100,000 euros and assets of 110,000 euros. Carroll et al. (2013) highlight in their study of the marginal propensity to consume across different net wealth balance that the assumption of similar consumption behaviour among households with the same net wealth but different wealth components is implausible. This paper raises another question, namely whether households consider their indebtedness when they make decisions about their financial assets.

The implication of household indebtedness for household behaviour is an important topic as household debt volumes have increased markedly in developed countries over the last three decades. The largest changes occurred in the 2000s not only in the USA but also in Europe, where the household sector's debt to disposable income has increased from 70 per cent in 1999 to 95 per cent in 2008 (Lojschova et al. (2011)).

There is a long list of research about household borrowing and the financial vulnerability of indebted households, but there has been less discussion about whether and how indebtedness affects the behaviour of households beyond their borrowing decisions. Moore and Palumbo (2010) document how greater debt on household balance sheets increased the financial stress in the household sector around the onset of the 2008–2009 recession. The indebtedness has implications for the consumption behaviour of households as well as for their choices regarding financial assets. The paper investigates whether and how households' liabilities affect their holdings of financial assets.

According to conventional consumption theory, households keep buffer stocks to insure against consumption risk. In the buffer stock models the precautionary saving increases with income uncertainty and higher risk aversion. The study of Carroll et al. (2012) shows analytically that more flexible credit markets decrease the motivation for precautionary saving. If households are able to borrow when they suffer a negative income shock, they reduce the target level of their buffer stock, meaning they decrease their financial asset position.

On the other hand, consumption smoothing through borrowing is hampered during an economic downturn when the banking sector is

tightening the credit conditions. On top of that, debt servicing may become an unsustainable burden after income or wealth shocks and may lead to financial instability for the indebted households (Barba and Pivetti (2009)). In this case, indebted households would need higher buffer stocks in the face of credit tightening and consumption risk during a recession. There is a lack of empirical evidence on the effect of indebtedness on households' financial asset holdings in the middle of a recession.

This paper sheds more light on the relationship between liabilities and financial asset holdings. The paper uses data from the recently introduced Household Finance and Consumption Survey HFCS (ECB (2013a), ECB (2013b)). The paper uses the first wave of the HFCS, which was implemented in 2009–2010 in 15 euro area countries. As the survey methodology was similar in all the countries, common estimations can be implemented for the whole euro area. The survey results reflect the situation of the households after the main economic shocks of the recession, i.e. after the adjustments of household finances to these major shocks.

The paper contributes to the academic literature in several ways. First, the linkage between the different components of financial balance sheet of households is little explored in the literature. Most of the studies focus on determinants of financial liabilities, determinants of financial assets or determinants of net wealth, but different wealth components are not investigated jointly. Most of the determinants of liabilities and assets are the same, but the effect on borrowing and saving might be different. This study is the first to present results from simultaneous estimations.

Second, the paper provides evidence for the interdependence between financial assets and liabilities which is not taken into account in most studies. In the light of the increased indebtedness of households it is important to understand how indebtedness affects decisions about the holdings of financial assets.

Third, there are few studies that investigate financial behaviour in the whole set of euro area countries as there has been a lack of appropriate micro data. The recently introduced Household Finance and Consumption Survey widens the range of financial behaviour of European households that can be examined. The current paper is among the first to exploit this opportunity.

The rest of the paper proceeds as follows: Section 2 provides a brief overview of the theoretical and empirical literature. Section 3 comprises the hypothesis and the model to be estimated. Section 4 introduces the dataset and delivers the main features of the variables of main interest. Section 5 provides the results and Section 6 summarises the empirical findings.

2. The literature linking households' borrowing and saving decisions

The literature on the financial decisions of households can be divided into several separate areas: one focuses on topics related to household debt, such as developments in credit markets, household borrowing decisions and the financial vulnerability of households due to indebtedness, and another focuses on topics related to households' saving decisions, such as determinants of savings and asset accumulation. Households' financial liabilities and assets are not investigated jointly in the majority of studies, although several studies use net wealth as an important determinant of the different financial decisions taken by households.

There are a few studies which investigate the effect on household financial assets of relaxing credit market constraints and easier borrowing conditions. The effect can be positive, meaning that a wide choice of credit instruments may encourage people to finance their equity holdings by borrowing, which will result in them having more financial assets. This hypothesis has not been investigated thoroughly. Davis et al. (2006) note that a wedge between the cost of borrowing and the risk-free investment return argues against leveraged equity holdings. On the contrary, their model shows that households do not exploit their borrowing capacity to increase their financial position.

There is another hypothesis that has received broader scrutiny. Several studies examine the interaction between financial deregulation and household saving rates. Bayoumi (1993) finds a negative relationship between financial deregulation and the saving rate in the UK in the 1970–1980s. Japelli and Pagano (1994) present a model that shows how financial deregulation, i.e. lowering of liquidity constraints, lowers household saving rates. They find empirical evidence in favour of this hypothesis using cross-sectional data from the OECD countries.

The topic has regained attention recently. Carroll et al. (2012) use a model derived by Carroll and Toche (2009) to explain how a relaxation of credit constraints affects household saving negatively. The mechanism works through the decrease in precautionary savings, which brings the target wealth of households to a lower level. As households can insure their consumption risk using credit markets, they can hold lower buffer stocks than when borrowing is not available. Carroll et al. (2012) use aggregate data for the USA to show that increased access to credit in the US from the 1980s until 2007 contributed significantly to the decline of the saving rate. However, this effect has not been investigated at the household level.

The studies of Debelle (2004), Girouard et al. (2006) and Barba and Pivetti (2009) highlight that the sensitivity of households to negative shocks has increased due to the increased leverage of their balance sheets. Japelli et al. (2013) argue that household indebtedness is related to the increased financial fragility of households. Mian and Sufi (2010) have found a negative relationship between the growth of household debt in the period before the global financial crisis and consumption during the recession that followed the crisis. They suggest that indebted households are more sensitive to house price declines.

The indebtedness also impacts the financial asset holdings of households; since indebtedness increases the sensitivity to negative shocks, households need to keep higher levels of savings for precautionary reasons. The model of Challe and Ragot (2012) predicts that households facing higher income risk accumulate more precautionary wealth; however, they do not investigate the sources which might increase the sensitivity to income risk. Carroll et al. (2012) show that the aggregate household saving rate increased in 2008–2011 due to increased income uncertainty, collapsing household wealth and tighter credit markets.

The literature cited above suggests that there is a linkage between household liabilities and assets. However, there is lack of studies which investigate this relationship in detail. Several macroeconomic models which explain aggregate developments in household savings and consumption incorporate two types of agents, borrowers and savers (see among others Nakajima (2012), Challe and Ragot (2012)). The first do not have any savings but only liabilities and the second do not borrow but own financial assets. Looking at the individual balance sheets, it appears that a single household holds both liabilities and assets at the same time (Tudela and Young (2005), ECB (2013b)).

The standard way to describe the financial position of households is net wealth, where liabilities are deducted from assets. If a household has more liabilities than assets, its net wealth is negative. The literature investigates the relationship between *net* wealth and household debt or savings, see among others Magri (2007), Crook (2001), Arrondel et al. (2013), Costa and Farniha (2012). There are studies which distinguish the effect of different wealth components on consumption (see the recent studies of Carroll et al. (2011), De Bonis and Silvestrini (2012), Sierminska and Takhtamanova (2012), Dynan (2012)) but the interdependence of wealth components is underexplored.

The studies of Brown and Taylor (2008) and Brown et al. (2013) disentangle net wealth and investigate each wealth component separately. Brown and Taylor (2008) examine the determinants of household debt and assets;

the latter includes the value of the house, which is real asset, in addition to the financial assets. They use the British Household Panel Survey (BHPS), the German Socio-Economic Panel (GSEP) and the Panel Study of Income Dynamics (PSID) to explore the determinants for liabilities and assets. They suggest that decision making about (financial) assets and liabilities is interdependent and therefore these should be modelled jointly.

The interdependence of liabilities and assets is examined in Brown et al. (2013) using PSID, as financial assets are included in the model for liabilities and the other way around. They find the balance of financial assets is negatively related to total debt but the balance of liabilities is positively related to financial assets, although the effect is economically marginal. They treat financial assets and debt as censored variables but do not consider the variables to be endogenous.

With net wealth alone, important information is lost as the composition of net wealth from liabilities, financial assets and real assets varies substantially across households. Households with very different levels of liabilities and assets may report the same level of net wealth. The effect of different wealth components on households' decisions can be different. On top of that, the different wealth components may affect the decisions related to other wealth components. This is a relevant topic as the structure of household wealth has changed due to wider usage of credit. It is important to understand how households' indebtedness affects their decisions about financial asset holdings.

This review indicates a need for a better understanding of the interlinkages between the assets and liabilities of households and in particular the effect of indebtedness on the savings or financial asset position during the crisis. On the one hand households need fewer savings after the deregulation of financial markets; on the other hand, indebted households need more savings to insure them against additional risks during a crisis. The net effect during the crisis is ambiguous, although the first effect may be expected to be stronger than the second.

3. The methodology

3.1. A model for estimating the interdependence of financial liabilities and financial assets

As there is no structural model for examining the interdependence of financial assets and liabilities, the paper relies on the empirical models which are used to investigate household borrowing and saving behaviour.

Decisions about the holdings of financial assets and liabilities are made in a household at the same time but the drivers might be different. There is some empirical evidence that households treat debt differently than savings, therefore the determinants of financial assets and liabilities might diverge (Meissner (2013)). In the paper different determinants are allowed for financial assets and liabilities and the interdependence between different assets and liabilities is taken into account.

Although most of the households own financial assets, there is a substantial number of households who do not own any liabilities. Liabilities can be handled as a censored variable as has been the approach of Brown et al. (2013). However, the literature on household debt suggests that there is a selection issue (see Magri (2007), Duca and Rosenthal (1993) and Cox and Japelli (1993)).

Given the assumptions about the selection issue, the interdependence and the endogeneity of financial assets and liabilities, and using cross-sectional data, the holdings of financial assets and liabilities are modelled as a system of equations.

The system of equations is given as:

$$\begin{aligned} F_i &= \alpha_1 + \gamma_1 L_i + X_i'\beta_1 + Z_{1i}'\phi_1 + \varepsilon_{1i} \\ L_i &= \alpha_2 + \gamma_2 F_i + X_i'\beta_2 + Z_{2i}'\phi_2 + \varepsilon_{2i} \end{aligned} \quad , \qquad (1)$$

where variable F_i is the household's holdings of financial assets, L_i is the household's holdings of liabilities, and X_i is a column vector of exogenous variables that affect both the volume of financial assets and liabilities. Z_{1i} is a column vector of exogenous or predetermined variables that affect the volume of financial assets, while the predetermined variables in the column vector of Z_{2i} affect the holdings of liabilities. The error terms ε_{1i} and ε_{2i} reflect the impact of various unmeasured factors on financial assets and debt.

As the unobserved factors may affect a household's decision about financial assets and liabilities, the errors may be correlated across the two regressions. The exogenous variables are determined outside the system and they are uncorrelated with the error terms. The approach is similar to Davies (2011) and Zinni (2013) who estimate a SUR model using aggregate household data for 34 and 40 countries respectively, which enables them to explain cross-country differences using aggregate variables. However, both studies treat financial assets and liabilities as exogenous variables.

The eq. (2) can be estimated by 3SLS where all coefficients of the full system are estimated simultaneously, taking into account that the error terms of the two equations are correlated across the observations. It combines the

system estimation of seemingly unrelated regressions introduced by Zellner and Theil (1962) with the instrumental variables method of 2SLS.

First, the endogenous variables F_i and L_i have to be instrumented to obtain consistent estimators (Greene (2012)). The instruments for L_i should be orthogonal to the error term ε_{1i} and F_i while correlating with L_i. The variables in the vector of Z_{2i}, i.e. explanatory variables that appear only in the regression of liabilities, can be used as instruments for L_i. And the variables in the vector of Z_{1i}, i.e. explanatory variables that appear only in the regression of assets, can be used as instruments for F_i. Both regressions of eq. (1) contain one endogenous variable on the RHS. Hence, if each regression contains at least one exogenous variable which is not in the other regression, the model satisfies the order condition for the identification of the system.

The IV estimators are obtained by estimating the reduced form equations:

$$\begin{aligned} \hat{F}_i &= \alpha_1 + X_i'\beta_1 + Z_{1i}'\phi_1 + Z_{2i}'\phi_3 + \varepsilon_{1i} \\ \hat{L}_i &= \alpha_2 + X_i'\beta_2 + Z_{2i}'\phi_2 + Z_{1i}'\phi_4 + \varepsilon_{2i} \end{aligned}. \tag{2}$$

The reduced form is estimated by OLS and not by SUR as all exogenous variables in the system appear in both equations.

In the second step, eq. (1) is estimated using fitted values for the instrumented variables from eq. (2). The rank condition for identification is met if the set of exogenous variables in the vector of Z_{1i} truly enters the regression of financial assets and the explanatory variables in the vector of Z_{2i} enter the regression of liabilities in the reduced form model. This happens if the coefficients of ϕ_1 are nonzero for the holdings of financial assets and the coefficients of ϕ_2 are nonzero for the holdings of liabilities.

The equations are first estimated separately to obtain the residual vectors $\hat{\varepsilon}_1$ and $\hat{\varepsilon}_2$. The residuals are used for estimating the covariance $\mathrm{cov}(\varepsilon_{1i}, \varepsilon_{2j}) = \sigma_{12} \neq 0$ where i and j denote the observations and $i \neq j$. The estimators are assembled into

$$\hat{\Sigma}_\varepsilon = \begin{pmatrix} \hat{\sigma}_{11}\hat{\sigma}_{12} \\ \hat{\sigma}_{12}\hat{\sigma}_{22} \end{pmatrix}$$

and the weighting matrix is computed as $\hat{\Omega} = \hat{\Sigma}_\varepsilon \otimes I_n$ where I_n is the $n \times n$ identity matrix.

In the third step the system of equations is estimated jointly by "feasible" GLS. The coefficients are estimated as $\hat{\beta}_{FGLS} = (C'\hat{\Omega}^{-1}C)^{-1}C'\hat{\Omega}^{-1}Y$ where the vector C' contains the variables in the vectors X and Z_1 of the regression

on financial assets and the variables in the vectors X and Z_2 of the regression on liabilities in eq. (1) (Greene (2012), Ch. 10.).

Only a fraction of households declare liabilities, and the choice of the volume of liabilities is preceded by the decision whether or not to take on the liabilities. In other words, there is a latent variable for the size of liabilities L_i^* which is not observed. We observe the volume of the liabilities if the decision is taken to hold debt $L = 1$, otherwise if $L = 0$, the latent variable L_i^* is not observed. There is a large number of households which do not have any liabilities for various reasons such as preferences or other unobserved characteristics. The effect of liabilities on financial assets should be distinguished from the effect of unobserved characteristics which correspondingly influence the decision about debt ownership. If the same unobserved characteristics affect the holdings of financial assets, the estimated coefficient for liabilities would suffer from selection bias if no correction is made.

Different possible ways to correct for selection bias are provided by Basen (2011), Nichols (2007) and Vella (1998) among others. The current cross-sectional model with a system of equations is complemented with a selection equation in order to correct for the selection bias:

$$S_i^* = W_i'\delta + u_i^*, \tag{3}$$

where $S_i^* > 0$ means that the household owns debt. If $S_i^* \leq 0$, the household does not have any liabilities. The column vector of explanatory variables in the selection equation W_i contains the explanatory variables in eq. (1) and additional variables that affect the probability of owning liabilities but do *not* impact the volume of liabilities have to be found. The probit model for the probability of owning liabilities is estimated and the correction factor or inverse Mills ratio is calculated as:

$$\overline{\lambda}_i = \frac{\phi(W_i'\delta)}{\Phi(W_i'\delta)}. \tag{4}$$

The term $\overline{\lambda}_i$ is the inverse Mills ratio, W_i denotes the vector of explanatory variables in the debt selection equation (4), $\phi(W_i'\delta)$ is the probability density function and $\Phi(W_i'\delta)$ is the cumulative density function.

The correction factor is included as additional variables in both regressions of equation (1) and the model is estimated for the sub-sample of households with liabilities:

$$\begin{aligned} F_i &= \alpha_1 + \gamma_1 \hat{L}_i + X_i'\beta_1 + Z_{1i}'\phi_1 + \theta_1 \overline{\lambda}_i + \varepsilon_{1i} \\ L_i &= \alpha_2 + \gamma_2 \hat{F}_i + X_i'\beta_2 + Z_{2i}'\phi_2 + \theta_2 \overline{\lambda}_i + \varepsilon_{2i} \end{aligned} \tag{5}$$

where $\hat{L}_i$ denotes the instrumented variable of liabilities, $\hat{F}_i$ is the instrumented variable of financial assets and $\overline{\lambda}_i$ is the inverse Mills ratio estimated by eq. (4). The current model specification uses the two-stage Heckman estimator, meaning that the results of the system are corrected for selection bias (Heckman (1979)).

The main interest of the paper concerns the effect of liabilities on financial assets given by γ_1. As argued by Carroll et al. (2012), this is expected to be negative while the economy is growing but during a recession there are some factors that tilt the relationship in the opposite direction. Overall, the net effect is expected to be negative.

Also of interest is the effect of financial assets on household liabilities, which is captured by γ_2. One line of argument is that the stronger the financial position of the household, the lower the demand for credit (Crook (2006)). Another line of argument derives from the ability to use different financial products. Households with a higher level of financial assets can use a wider range of financial instruments to diversify their portfolios and these instruments may include both liabilities and assets. Empirical evidence reveals a positive relationship between liabilities and net wealth (Cox and Japelli (1993), Magri (2007)).

It is important to recognise that this estimation framework does not capture fully the dynamic feedback effects between changes in financial assets and changes in liabilities. This can be estimated with panel data, while data allow only the search for a suitable cross-sectional model, meaning the question about dynamic interaction is not addressed at present.

3.2. A model for estimating the interdependence of financial liabilities and financial assets

The choice of the exogenous variables for the models of financial assets and liabilities in eq. (5) is based on the studies of the determinants of household savings or household debt.

Determinants of financial assets

Browning and Lusardi (1996) and Attanasio and Weber (2010) give an overview of those determinants of households' saving behaviour which also determine their financial asset holdings. Carroll and Toche (2009) propose a structural "buffer stock" model of consumption which produces a target level for financial assets. Household income, income expectations, income uncer-

tainty, interest rates, impatience and relative risk aversion are the main determinants of financial assets.

Several empirical studies suggest that age, family composition, education and self-employment are important for savings, see among others Browning and Lusardi (1996), Tudela and Young (2005), and Kulikov et al. (2009). Additionally, a bequest motive is an important factor in wealth accumulation (Gale et al. (1994), Modigliani (1988)). As it is assumed that wealth components are interdependent, real assets and liabilities are added as possible determinants of financial assets.[1]

The income and wealth shocks during the recession had profound implications for households' balance sheets, see the analysis of UK households by Crossley et al. (2013), of US households by Chakrabarti et al. (2011) and a model explaining the empirical evidence by Alan et al. (2012).

The literature finds that households which experienced income declines cut back their consumption, but also used liquid funds to smooth their consumption profile. Therefore it is necessary to control for transitory changes in financial assets, which might occur due to unemployment or extraordinary low income.

For the estimations of eq. (5) the explanatory variables for the financial assets which do not affect the volume of liabilities are needed, i.e. the set of variables in the vector Z_1 in eq. (5). This is challenging as the balance of financial assets and liabilities is mostly determined by the same socio-demographic and economic characteristics. There is lack of theories to explain the *different* determinants for household financial liabilities and financial assets. Therefore the empirical literature and sample information about the relationship between liabilities or assets and the household's economic and socio-demographic characteristics is used for determining the set of variables in the vector Z_1.

The empirical literature does not give bequests as a determinant of liabilities but it is an important determinant of financial assets as pinpointed by Gale et al. (1994) and Modigliani (1988). Sample information confirms that bequests are not important for the balance of liabilities. Evidently the bequests increase the balance of financial assets and when this has been taken into account, the bequests per se do not play any role in determining the

[1] The volume of real assets may be considered endogenous as it is one of the wealth components. However, as pointed out by Flavin and Yamashita (2002), because of the transaction costs, endogenous changes in real assets are extremely infrequent and the balance sheet adjustment is mainly made via changes in liquid assets and liabilities. As the current paper does not focus on the effect of real estate assets on financial assets, the variable can be treated as predetermined or weakly exogenous and left uninstrumented.

balance of liabilities. Hence, it can be used as an explanatory variable only for the balance of financial assets.

Determinants of financial liabilities

Another strand of literature investigates the determinants of household debt or financial liabilities. The demand for household debt can be divided into the participation decision and, in case of participation, the size of the debt stock wanted by households. The volume of liabilities also depends on the credit supply, as some households would like to borrow more but are constrained by bank requirements. In the current specification the demand and supply of credit are not modelled separately, and eq. (5) provides the equilibrium result, i.e. the holding of liabilities that is the outcome of the supply and demand for credit.

The main determinants of household debt are derived from the life cycle model and are the same as for household savings: income dynamics, preferences and interest rates (Crook (2006)). The empirical studies which investigate the determinants of the supply and demand for debt indicate that the volume of household liabilities also depends on the age and education of household members, their occupational status and their net wealth, see Magri (2007), Crook (2001), Yilmazer and DeVaney (2005) and Costa and Farinha (2012) among others.

Financial assets and real assets are distinguished from net wealth as the different wealth components may have different impacts on liabilities. Additionally, extraordinary low income and unemployment may affect the volume of debt as households may smooth their consumption by borrowing.

When we compare the explanatory variables for financial liabilities and financial assets, the main economic variables and main household characteristics are common variables for both liabilities and assets. However, there are some variables which have been found to be important for credit rationing in the studies of Magri (2007), Crook (2001) and Cox and Japelli (1993) and which are not expected to be determinants of financial assets. Homeownership contains additional information beyond the data on the volume of real assets which is important to the credit supply. Therefore the variables should be included in the regression for liabilities, as is argued by Albuquerque et al. (2014) who use homeownership in addition to total wealth as an explanatory variable when estimating the determinants of aggregate household debt. Homeownership can be used as an additional explanatory variable for liabilities in the vector of Z_2.

Variables in the selection model

For the selection equation, additional variables to the determinants of the volume of liabilities are needed for exclusion restrictions, i.e. the variables are considered to influence the decision to borrow but they do not have any effect on the volume of liabilities. Duca and Rosenthal (1993) and Crook (2001) find using US data that being black decreases the probability of debt ownership but it does not increase a household's demand for debt. Cox and Japelli (1993) find that gender, and marital status affect participation in the credit markets but are insignificant in estimating the volumes of debt. Duca and Rosenthal (1993) find that marital status is important for owning debt but not for the volume of debt.

Given the results of the studies on participation in credit markets, foreign origin (immigrant), gender and marital status (couple, single, divorced or widowed) are used as additional variables in the selection model given in eq. (3). Evidently these social characteristics contain information about the attitude towards debt or willingness to borrow which may hinder the participation in the credit market, as discussed by Chien and Devaney (2001). These variables are not related to the volumes of liabilities when households are participating in the credit markets.

These variables are also added to the vector of Z_1, meaning they are explanatory variables for financial assets and do not appear in the regression for financial liabilities. There is empirical literature that notes the different saving behaviour of immigrants (see Piracha and Zhu (2012) among others) and sample information shows that gender and marital status are significant in the regression for financial assets, as also noted by Arrondel et al. (2013). Likewise, Brown et al. (2013) show that gender and foreign origin determine the balance of financial assets but are not related to the balance of total debt.

The bequest variable is added to the selection equation to ensure that all the variables used in eq. (5) are also included in the selection equation (4).

Even so, the exclusion restriction may be a concern as it is difficult to find a good exclusion restriction in most cases. When exclusion restrictions are not available then the model can be identified from the assumption of the joint normality of regression residuals. However, as pointed out by Rõõm and Dabušinskas (2011), this may result in poor identification and high multicollinearity in the structural equation. Therefore, to evaluate the goodness of exclusion restrictions, different sets of exclusion restrictions have been tested.

4. The dataset and descriptive statistics

4.1. The Household Finance and Consumption Survey

The paper uses data from the first wave of the Eurosystem Household Finance and Consumption Survey (HFCS). This is a harmonised micro database covering 15 euro area countries. The survey is coordinated by the European Central Bank and carried out by the national central bank of each country. The survey design and the questionnaire were harmonised across the countries and the survey was made within the same time span in all countries in 2009–2010.

The dataset covers more than 62,000 households with sample sizes in each country ranging from 340 households in Slovenia to 15,000 households in Finland. It provides detailed household-level data on household balance sheets accompanied by related economic and demographic variables. A detailed description of the methodology and the main results of the survey are provided in ECB (2013b).

The database contains very detailed information about the different wealth components of households. The main components of households' wealth are aggregated into liabilities, financial assets and real assets.

Liabilities include mortgages, and non-mortgage debt instruments such as credit lines or overdrafts, credit cards, and loans not collateralised by real estate. The survey collects information about debt repayments, so the debt repayment burden can be computed as the share of annual repayments in the annual total income of the household. The HFCS includes questions about reasons for saving, including the reason of paying back debt. We can use the variables related to liabilities in the robustness analysis.

The financial assets cover sight accounts, savings accounts, mutual funds, bonds, publicly traded shares, assets in managed accounts, informal loans to relatives or friends, and other financial assets. The HFCS contains information about private pension plans but in the baseline model this asset type is not included in the financial assets.

Real assets include home equity, vehicles, valuables and self-employment businesses. The question about bequests and the form of bequests is used for compiling a dummy for receiving a bequest in the form of financial assets.

The total income of the household includes employee income, self-employment income, income from pensions, unemployment and other social benefits, private transfers received, rental income, financial investment income, private business income and other sources of income. We compute a dummy for self-employment by using the information about self-employment

income rather than the employment status of a reference person, in line with Pissarides and Weber (1989) and Kukk and Staehr (2013). Households are defined as self-employed if their self-employment income exceeds 25 per cent of the household's total income.

Other income-related variables are used to indicate income uncertainty, such as the unemployment of a reference person, information about the income in a reference period compared to average income, or income expectations for the next period.

Additional socio-demographic variables are age, education, gender, marital status (couple, single, divorced or widowed) and foreign origin (immigrant) of the reference person, and number of children in the household. Risk preferences are captured by a dummy if the household states that it is risk averse.

Liabilities, assets and income are expressed in logarithms. In the pooled dataset it should be ensured that the financial and income figures are comparable across countries. As the interviews were carried out in different time periods in different countries during 2009–2010, real values could be used. However, as interviews were conducted during several quarters within a country, using the same annual price indices in a country for estimating real values does not improve the preciseness of the variables. The exact time span of the interviews in each country is not available, so quarterly or monthly consumer price indices cannot be used. As the annual inflation differences are very small across countries, as also pointed out by ECB (2013b), the nominal values of the variables are used in the paper.

The differences in the cost of living are remarkable across the countries and therefore income quintiles are computed for each country separately. Also the real assets are divided into quintiles, to take account of country level differences in illiquid assets such as real estate when the pooled dataset is used. A similar approach has been used by Teppa et al. (2013) and Arrondel et al. (2013). A list of the variables that have been used in the models given in Section 3 is presented in Table 1.

The survey weights are used when calculating the main statistics for the whole population and when estimating the probit model for calculating the inverse Mills ratio of eq. (4). In these cases the whole sample is used in the estimation sample. The weights are not used in eq. (5) as it is estimated for the sub-sample of households with liabilities and census parameters are not provided. Moreover, as standard errors are bootstrapped in eq. (5), weights are unnecessary (Cameron et al. (2009)). To see the effects of oversampling which are not off-set by the use of survey weights, additional estimations are implemented by excluding outliers.

Table 1: Definitions of the variables used in the model

Variable	Definition
Liabilities	Log of financial liabilities (collateral and non-collateral debt)
FinAsset	Log of financial assets (sight and saving accounts, bonds, funds, shares, investment accounts, and other financial assets). Pension assets are not included.
Inc	Five country-specific quintiles of total income of the household (salaries, business income, capital income and social benefits)
RealAsset	Five country-specific quintiles of real assets (housing equity, business equity, vehicles and valuables)
Age_cat	Age category with a value between 1 and 5. It takes the value 1 if the age of the reference person is < 35; value 2 if the age is between 35–44; value 3 if the age is between 45–54; value 4 if the age is between 55–64; value 5 if the age is over 65
Educ	Categorical variable for levels of education, takes the value 1 if the reference person has only primary education, value 2 for secondary education, value 3 for tertiary education
Child	Number of children in the household
IncIncrease	Dummy = 1 if the household expects income to increase in the following period, otherwise = 0
IncLow	Dummy = 1 if the household had lower income during the reference period than usual, otherwise = 0
Unempl	Dummy = 1 if the reference person of the household is unemployed, otherwise = 0
Selfempl	Dummy = 1 if the business-related income of the household is higher than 25%, otherwise = 0
Bequest	Dummy = 1 if the household has received a bequest in the form of financial assets (i.e. money, deposits or bonds), otherwise = 0
Immigrant	Dummy = 1 if the reference person reports being born abroad, otherwise = 0
Gender	Dummy = 1 if the reference person is female, otherwise = 0
Marital status	Categorical variable for different marital status, takes the value 1 if the reference person is married or cohabiting, value 2 if the reference person is single, value 3 if the reference person is divorced and value 4 if the reference person is widowed
Homeowner	Dummy = 1 if the household owns the main residence
Dsr	Annual debt payments as a share of the annual income of the household
Paydebt	Dummy = 1 if the household is saving to pay back debt
Risk0	Dummy = 1 if the household does not want to take any risk in investments, otherwise = 0

Source: Household Finance and Consumption Survey, 1st wave.

The HFCS contains five imputed datasets in which the values of financial and income variables that are missing in the dataset are imputed (ECB (2013a)). All five imputed datasets are used in the final estimations in order to avoid bias from missing observations. The multiple imputation (MI) point estimate of a coefficient $\hat{\gamma}$ is the average of the five complete data estimates given as

$$\bar{\gamma} = \frac{1}{5}\sum_{IM=1}^{5}\hat{\gamma}_{IM} \ , \tag{6}$$

The variance $\overline{\text{var}(\gamma)}$ of a completed data estimate contains two components:

1) The within imputation sampling variance, which is the average of the five complete-data variance estimates $\text{var}(\hat{\gamma})$.
2) The between imputations variance, which is the variance of the complete data point estimates. This gives the variability due to imputation uncertainty.

The total variance $\overline{\text{var}(\gamma)}$ of an estimated coefficient is calculated as

$$\overline{\text{var}(\gamma)} = \frac{1}{5}\sum_{IM=1}^{5}\text{var}(\hat{\gamma})_{IM} + 6/5\frac{1}{4}\sum_{IM=1}^{5}(\hat{\gamma}_{IM} - \bar{\gamma})^2 . \tag{7}$$

4.2. Descriptive statistics

Table 2 shows that in the HFCS dataset 43.7 per cent of households are indebted and most of them prefer to hold both financial assets and liabilities. About 26 per cent of the households report that they hold both liabilities and assets of over 5,000 euros. Only 4 per cent of the households have liabilities of more than 5,000 euros but financial assets of less than 1,000 euros. The statistics indicate that a substantial share of households tend to have both assets and liabilities. This paper examines whether the holdings of liabilities and financial assets are dependent on each other.

Table 2: Penetration of indebted households with different balance sheets

	(1)	(2)	(3)	(4)
	Total no of observations	Share of households with liabilities (%)	Share of households with liabilities and financial assets ≥ 5 000 EUR (%)	Share of households with liabilities ≥ 5 000 EUR and financial assets < 1 000 EUR (%)
TOTAL	**62 521**	**43.7**	**25.9**	**4.0**
Austria (2010)	2 380	35.6	23.3	1.9
Belgium (2010)	2 327	44.8	31.2	3.1
Cyprus (2010)	1 237	65.4	45.0	10.8
Spain (2008)	6 197	50.0	26.4	2.8
Finland (2009)	10 989	59.8	24.2	9.6
France (2010)	15 006	46.9	25.5	7.6
Germany (2010)	3 565	47.4	34.7	1.5
Greece (2009)	2 971	36.6	11.7	10.6
Italy (2010)	7 951	25.2	11.7	3.4
Luxembourg (2010)	950	58.3	46.0	3.6
Malta (2010)	843	34.1	24.4	1.4
Netherlands (2009)	1301	65.7	56.0	2.6
Portugal (2010)	4404	37.7	15.9	8.0
Slovenia (2010)	343	44.5	13.2	7.7
Slovakia (2010)	2057	26.8	7.4	4.2

Notes: Figures are calculated from the HFCS database using survey weights and five imputed datasets.

When the financial assets of households with liabilities are compared with those of households without liabilities, some differences emerge. Table 3 shows that indebted households (column 2) in most countries hold slightly fewer financial assets than households without liabilities (column 1), though the differences are small.

If income is taken into account and the ratio of financial assets to income is compared (columns 3 and 4), the differences are more clear than when the volume of financial assets is considered. The statistics imply that indebted households keep less in financial assets than households without any debt. However, there may be several other reasons for the difference in the stock of financial assets of households with and without liabilities, e.g. different preferences, household characteristics or economic conditions. In order to shed light on the difference which is related to liabilities, the model developed in Subsection 3.1 is estimated.

Table 3: Mean values of financial assets for households with and without financial liabilities (in EUR)

	(1)	(2)	(3)	(4)
	Financial assets (EUR)		Fin asset to income ratio	
	HH with liabilities	HH w/o liabilities	HH with liabilities	HH w/o liabilities
Total	27 272	35 269	0.59	1.12
AT	44 574	41 449	0.88	1.04
BE	72 089	103 339	1.17	2.60
CY	40 939	42 338	0.79	1.55
DE	28 581	39 809	0.56	1.09
ES	20 711	36 144	0.55	1.44
FI	25 624	28 605	0.48	0.89
FR	27 020	33 456	0.62	1.08
GR	7 896	11 609	0.23	0.49
IT	22 428	27 463	0.51	0.89
LU	54 316	95 719	0.58	1.39
MT	39 843	43 539	1.21	1.89
NL	28 525	44 239	0.59	1.10
PT	17 109	20 155	0.65	1.21
SI	5 208	8 845	0.20	0.46
SK	4 058	6 913	0.27	0.54

Notes: First wave of HFCS. For estimations, five imputations and survey weights have been used. Financial assets include deposits, money market funds and bonds, investment funds, shares, managed accounts, and money lent out.

The time of the survey has to be taken into account when interpreting the results. The survey was carried out in 2009–2010, i.e. in the middle of a crisis when households faced adverse economic shocks. As the first wave of HFCS is used, it is not possible to track the dynamics of household wealth in euro area countries. Changes in household finances are comprehensively analysed for US households using the biannual Household Financial Survey (HFS) by Moore and Palumbo (2010) and Bricker et al. (2011). Some developments which are relevant for the current estimations are provided next.

First, there were substantial and widespread declines in values of homes in all European countries, resulting in sizeable erosion of home equity, although of different magnitudes across the countries. The values of business equity likewise declined. The relationship between real assets and other wealth components might have been different when equity prices were at their peak. As we use the country-specific quintiles of the real assets, the relationship

between the real asset quintiles and the other wealth components is expected to be more stable than when absolute real estate value is used.

Second, there was a sharp decline in share prices, leading to a decline in the value of shareholdings and the total value of financial assets. Challe and Ragot (2012) and Alan et al. (2012) point out that precautionary wealth accumulation is countercyclical. Uncertainty in the housing and equity markets leads households to pile up buffer stocks. Consequently, the composition of financial assets is likely to be different during the recession from what it was in the pre-crisis period. However, as the paper investigates the balance of total financial assets, these developments have minor importance in interpreting the results.

The survey was conducted in 2009–2010 when households had experienced the main shocks of the recession. This suggests that at the time of the survey households were more aware of the different risks they might face, including risks related to their indebtedness. Consequently, households were more likely to adjust their balance sheets according to the perceived risks and so the relationship between liabilities and financial assets is expected to be explicit during this time.

5. The estimations for financial assets and liabilities

5.1. The baseline estimations

We investigate the relationship between indebtedness and the financial assets of households in the euro area countries by estimating the system of equations derived in Subsection 3.1:

$$\begin{aligned} F_i &= \alpha_1 + \gamma_1 \hat{L}_i + X_i' \beta_1 + Z_{1i}' \phi_1 + \theta_1 \overline{\lambda}_i + \tau_{1c} + \varepsilon_{1i} \\ L_i &= \alpha_2 + \gamma_2 \hat{F}_i + X_i' \beta_2 + Z_{2i}' \phi_2 + \theta_2 \overline{\lambda}_i + \tau_{2c} + \varepsilon_{2i} \end{aligned} . \tag{8}$$

Following the discussion in Subsection 3.2 on the determinants of financial assets and liabilities the variables that appear in the vectors of X, Z_1 and Z_2 can be listed. Income, real assets, number of children, age and education of the reference person, dummies for future income increase, extraordinary low income, unemployment and self-employment of the reference person are in the vector of X as they are common variables in both equations. A dummy for receipt of bequest in the form of financial assets, dummies for the reference person being an immigrant or female and for marital status appear in the vector Z_1, while a dummy for homeownership appears in the vector Z_2.

As the estimations use a pooled dataset, we control for institutional and other country-specific factors, including aggregate shocks, by using country-fixed effects τ in the first stage regressions given in eq. (2) and in the final regressions of eq. (8). Two countries which participate in HFCS are excluded from the estimations. Finland is excluded from the sample as the observations for Finland are missing several variables such as income expectations, temporary variation in income, information about bequests, risk attitudes and saving purposes, and data about the foreign origin of the reference person, among others which are essential for estimating the model and implementing further robustness tests. France is excluded from the sample as the observations lack information about transitory fluctuations in income, risk attitudes and saving purposes.

The model is estimated in two steps. As about 44 per cent of the population in euro area countries hold some type of debt, the sample selection is taken into account. First, the selection model for debt ownership is estimated and the inverse Mills ratio λ is calculated by eq. (4) for each country separately.

In the second step the system of equations is estimated by 3SLS, where financial assets and liabilities appear on the RHS of the regressions. The point estimates of the variables are the average estimates on the five imputed datasets as given by eq. (6). The standard errors of the coefficients are bootstrapped for each of the five datasets and complete standard errors are calculated taking into account the within and between variations of the coefficients as in eq. (7).

The results of the baseline model are given in Table 4. The first column gives the estimation results for the equation, where the dependant variable is the log volume of financial assets. The second column presents the estimation results for the second model, where the dependent variable is the log of financial liabilities.

The main interest is the interdependence of financial assets and liabilities, with special focus on the impact of liabilities on financial assets as the literature suggests that household indebtedness affects their financial behaviour. The results in column (1) in Table 4 show that the impact of households' financial liabilities on their financial assets is negative. An increase in a household's liabilities of 10 per cent reduces its financial assets by approximately 2.1 per cent.

Table 4: The baseline estimations for financial assets and liabilities

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		−0.214***	(0.075)	..	
FinAsset		..		−0.030	(0.083)
λ (IMR)		0.112	(0.104)	−0.632***	(0.069)
Inc	Q1				
	Q2	0.470***	(0.087)	0.126*	(0.074)
	Q3	0.811***	(0.078)	0.227**	(0.095)
	Q4	1.063***	(0.082)	0.297***	(0.109)
	Q5	1.676***	(0.086)	0.441***	(0.157)
RealAsset	Q1				
	Q2	0.904***	(0.100)	0.665***	(0.091)
	Q3	1.356***	(0.139)	1.051***	(0.124)
	Q4	1.757***	(0.158)	1.306***	(0.149)
	Q5	2.401***	(0.185)	1.706***	(0.193)
Age category	<35				
	35−44	0.110**	(0.056)	−0.123***	(0.045)
	44−54	0.121*	(0.062)	−0.363***	(0.049)
	55−64	0.167**	(0.079)	−0.565***	(0.062)
	> 65	0.295***	(0.099)	−0.540***	(0.085)
Educ	Cat1				
	Cat2	0.447***	(0.048)	−0.032	(0.054)
	Cat3	0.847***	(0.052)	0.191**	(0.081)
Child		−0.061***	(0.023)	0.090***	(0.018)
IncIncrease		0.069	(0.051)	0.105**	(0.045)
IncLow		−0.187***	(0.043)	−0.050	(0.039)
Unempl		−0.402***	(0.090)	−0.099	(0.074)
Selfempl		0.262***	(0.045)	0.184***	(0.042)
Bequest		0.452***	(0.050)	..	
Immigrant		−0.142*	(0.072)	..	
Gender		−0.179***	(0.039)	..	
Marital status	couple				
	single	−0.024	(0.056)	..	
	divorced	0.005	(0.092)	..	
	widowed	−0.139**	(0.064)	..	
Homeowner		..		0.783***	(0.065)
Country FE		Yes		Yes	
"R^2"		0.374		0.393	
Observations		12 787		12 787	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies and a constant are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given in the table. No of observations refers to the minimum sample size of the five datasets.

The negative relationship between financial assets and liabilities is likewise found by Brown et al. (2013) when jointly modelling the assets and liabilities. The findings are consistent with the model in Carroll et al. (2012), in which households' lower buffer stocks or optimal asset holdings are explained by the improved availability of credit. The use of credit leads households to hold lower buffer stocks, meaning they also have lower levels of financial assets. Similarly, Callen and Thimann (1997) find in their study using aggregate data from OECD countries that financial deregulation is negatively correlated with the household saving rate.

The result in column (1) in Table 4 entails that the negative relationship between financial assets and liabilities also holds during a recession when households are more aware of the risks they might face. It could be expected that indebtedness is associated with higher savings in order to insure households against the financial risks related to borrowing. However, the results suggest that indebtedness is related to a lower level of financial assets during the recession.

Column (2) in Table 4 does not show any impact of financial assets on liabilities as the estimated coefficient for financial assets is statistically insignificant. Brown et al. (2013) find a positive relationship between liabilities and financial assets, which in economic terms is marginal. In other studies household assets are not disentangled into financial and real assets; instead the correlation of volume of debt and net wealth is typically reported. The results of different studies indicate a positive relationship between net wealth and the debt balance (Magri (2007), Cox and Japelli (1993), Crook (2001)). As in other studies the relationship between liabilities and net wealth in this sample is also positive (not reported), but when real and financial assets are disentangled, it is not possible to find a positive relationship between liabilities and financial assets but only between liabilities and real assets.

The negative relationship between household debt and financial assets at the individual level is also found by Yilmazer and DeVaney (2005) in the US using the HFS. However, as they estimate a tobit model assuming exogeneity of all variables while the dependent variable is household debt, it is not clear which way the causality goes. The current results of the system of equations suggest that lower holdings of financial assets are associated with a higher balance of liabilities while the balance of liabilities is not affected by the holdings of financial assets.

It must be emphasised that the estimations in Table 4 do not reveal whether financial assets affect the volume of liabilities at the moment when the borrowing decision is taken as in most cases the borrowing act has taken place before the survey period. During the survey period most households

could make adjustment decisions about repaying debt or taking up additional debt. The results imply that the balance of liabilities is independent of the balance of financial assets, suggesting that households do not adjust their balance of liabilities in response to changes in their financial assets.

The coefficient of the selection term, the inverse Mills ratio (IMR), shows how unobserved characteristics which are associated with debt ownership are related to the volume of financial liabilities and assets. Column (2) in Table 4 reveals that the term is significantly negative in the regression of volumes of liabilities, inferring that selection bias is present in the estimations without the IMR. Column (1) shows that the IMR is not statistically significant in the regression of financial assets, suggesting that the unobserved characteristics which affect debt ownership are not important in determining the volume of financial assets.

For comparison, the estimations without the IMR are given in Appendix A Table A.1. The estimations suggest a very similar negative impact on financial assets from liabilities if we do not correct for selection bias; the point estimate is –0.24 compared to –0.21 without correction. The estimated coefficients of other variables do not differ in the regression of financial assets compared to the estimations with the IMR. But the IMR is important in the regression of liabilities where the coefficients of other variables are different when the IMR is excluded from the regression. Although the main interest of the paper is the regression of financial assets, the IMR is kept in the further estimations to ensure that the selection bias is controlled for in the full system of equations. Initially the IMR has been estimated with a different set of variables in eq. (3) to see how sensitive the final results of eq. (8) are to the different IMR. The final estimations are very similar, hence the problem of the exclusion restriction which was mentioned by Rõõm and Dabušinskas (2011) is not a concern.

Table 4 shows that real assets are associated positively with both financial assets and liabilities, though the relationship is stronger for financial assets. Households in the highest real asset quintile have on average 240 per cent more financial assets than households in the lowest real asset quintile, if all other characteristics are kept the same. The difference in liabilities between households in the same real asset quintiles is 170 per cent. As already mentioned in Subsection 4.2, the estimated magnitude of the relationship of real assets and other wealth components applies to the recession period when the value of real assets had declined significantly.

There are only a few studies which look at the relationship between different wealth components. Costa and Farinha (2012) estimate a positive relationship between debt-to-income and real wealth quartiles using the HFCS Portugal dataset. Yilmazer and DeVaney (2005) find a similarly positive rela-

tionship between financial liabilities and non-financial assets for the US using HFC. As mentioned above, several studies find a positive relationship between liabilities and net wealth. The current estimations suggest that the positive relationship stems mainly from real assets as no significant impact from financial assets to liabilities was found.

The coefficients of other economic and socio-demographic variables are consistent with other studies which investigate liabilities or assets. Income has a positive impact on both financial assets and financial liabilities, with a stronger effect for financial assets. Households in the highest income quintile have on average 168 per cent more financial assets and 44 per cent more liabilities than households in the lowest income quintile, if all other characteristics are kept the same. The findings are consistent with the results of Brown et al. (2013).

The positive relationship between financial assets and income is to be expected as income is related to the ability to accumulate financial assets as given by Juster et al. (2006) and Kulikov et al. (2009). Arrondel et al. (2013) carried out estimations on the volume of different assets country by country using the HFCS and also found that income is positively associated with financial assets.

The modest positive relationship between income and liabilities is likewise expected. The balance of liabilities is an outcome of demand and supply for credit, and higher income increases the options for obtaining credit, which may explain the positive relationship between income and financial liabilities. Duca and Rosenthal (1993) and Crook (2001) find a positive relationship between current income and debt for US households while Bover et al. (2014) find a positive relationship between income and debt in most euro area countries using the HFCS dataset.

The coefficients of the age categories of the reference person confirm the life-cycle pattern of the financial wealth components. The stock of financial assets increases with age; a household where the reference person is over 65 owns 30 per cent more financial assets than a household where the reference person is under 35, all other things being equal. The stock of financial liabilities decreases strongly with age; a household where the reference person is over 55 owns on average 57 per cent fewer liabilities than a household where the reference person is under 35.

This pattern is consistent with the results of other studies, see Tudela and Young (2005) and Arrondel et al. (2013) on financial assets, Magri (2007) and Bover et al. (2014) on liabilities and Brown et al. (2013) on financial assets and liabilities. This study refers additionally to the different pattern of financial assets and liabilities over the life-cycle.

Education of the reference person has slightly different impacts on financial assets and liabilities. Higher education for the reference person implies a noticeably larger volume of financial assets, which is coherent with other studies, see Arrondel et al. (2013) or the overview of Attanasio and Weber (2010) and Browning and Lusardi (1996).

The dummies for expected income increase, extraordinary low income and unemployment contain information about income uncertainty, which theoretically should affect both financial assets and liabilities, as discussed in Subsection 3.2. The estimations show that the dummy for income increase is not significant in the regression for financial assets. Evidently the expected income increase does not lower the financial assets as predicted by the model of Carroll and Toche (2009). One explanation is that the dummy which is used refers only to an income increase in the following year while household saving is affected by long-term income growth. However, the expected increase in income is related to a higher balance of liabilities, as theoretically expected.

The dummies for unemployment and extraordinary low income are associated with lower levels of financial assets, which is expected given that households use their sources to compensate for changes in their short-term income. However, these dummies are not important in the regression for liabilities, although the model of Carroll et al. (2012) suggests that households borrow when they experience a negative income shock in order to smooth consumption. One possible explanation is that even when households would want to borrow, financial institutions are reluctant to lend to cover declines in income, especially during a period of credit tightening.

The other control variables which determine either the volume of financial assets or liabilities have the expected signs and are statistically significant. As the main focus of the paper is on the impact of the components of financial wealth, we do not discuss the estimated coefficients of these other control variables.

The upshot of the current analysis is that the explanatory variables do not exhibit a symmetric relationship between financial assets and liabilities. Hence, in order to understand the impact of economic or socio-demographic variables on the household balance sheet, it is useful to distinguish between the different components of financial wealth. Poterba and Samwick (2001) study the age-specific probabilities of owning different types of assets and they emphasise that the accumulation of different wealth components changes over a person's life. The current results contribute to the literature by presenting differences in households' determinants of financial liabilities and assets.

The negative impact of liabilities on financial assets is an important implication of increased household indebtedness. The increasing penetration of debt is related to lower accumulation of financial assets among an increasing number of households. Whether it affects the financial vulnerability of households depends on their ability to insure themselves against negative shocks in other ways. Indebted households might be more willing to use borrowing when faced with negative shocks.

According to the HFCS, 10 per cent of indebted households in the euro area countries feel credit constrained, while only 4 per cent of households without debt feel credit constrained.[2] For other insurance options, a slightly higher percentage of indebted households are able to get financial assistance from friends or relatives in an emergency than is the case for households without debt, at 28 per cent and 25 per cent respectively.[3] Although no other insurance options were tracked in HFCS, these statistics suggest that the choices for indebted households for insuring themselves against negative shocks are not evidently different from those of households without debt. The negative relationship between liabilities and financial assets may therefore increase the financial vulnerability of indebted households as they have fewer resources available when they are hit by a negative shock.

5.2. Estimations including other debt-related variables

In the current model the interest rate is not included as an explanatory variable as it is not available in the dataset for financial assets and most of the liabilities. [4] Although the interest rate appears in theoretical models of saving and borrowing, there is a theoretical ambiguity about the direction of the effect. A few empirical studies which use aggregate data and include an interest rate in their model do not find any relationship between savings and

[2] The dataset contains additional questions about applying for credit in last three years, whether the application was rejected and whether the household is not applying for credit due to perceived credit constraints. Following Teppa et al. (2013) these questions are used to compute a dummy for being credit constrained. The statistics in the text are calculated by using survey weights and five imputations.

[3] The question is "In an emergency, could you/your household get financial assistance of say EUR 5,000 from friends or relatives who do not live with you?". The statistics in the text are calculated by using survey weights and five imputations.

[4] It would be possible to include the interest rate on mortgages as it is available in the dataset, but it would not solve the problem as a significant share of mortgage takers own other liabilities for which the interest rate is not known. If some indebted households are excluded from the sample because of their type of liabilities, a different model specification is required to model the interdependence between different debt types. The current model combines all wealth components, aggregating them to total financial assets and total liabilities. Therefore limited information about interest rates cannot be used.

the interest rate; see Callen and Thimon (1997) and Schmidt-Hebbel et al. (1992) and the discussion therein.

The interest rate is rarely used in empirical models of cross-sectional data as it barely explains the cross-sectional variation of savings. The omission of the interest rates for financial assets in the current model should therefore not alter the results.

The interest rates on liabilities might differ across households as financial intermediaries look at creditworthiness when they set the interest rate for a loan product. However, most studies that have included the interest rate find a negligible effect on the demand for debt (Crook (2001), Magri (2007) and Meriküll (2014)). Magri (2007) concluded that once the main factors affecting the demand for credit are taken into account, the cost of borrowing is apparently not important.

It is not possible to include the average interest rate of a household in the model, but the robustness of the results can be examined by including the debt service ratio in the model. The debt service ratio is the share of interest and principal payments of total income. The variable can be used as a proxy for the cost of borrowing, which might affect the volumes of liabilities.

Additionally, a high debt service ratio indicates higher compulsory expenses for a household than those for a household without liabilities. This might reduce the saving abilities of the household, resulting in a lower balance in financial assets. Bricker et al. (2011) analyse family finances in the USA in 2007–2009 and suggest that households with high debt servicing payments were more likely to have had declines in wealth.

In Table 5 the debt service ratio has been included in the baseline model given in eq. (8). The coefficient of the debt service payment variable is insignificant in the equation for financial assets, implying that high debt payments are not related to the balance of financial assets. Surprisingly, it is not significant in the equation for financial liabilities either.

The explanation might be that the debt servicing ratio is determined not only by the interest rate of the loan but also by the initial volume of liabilities and the maturity of the loan. The linkage between the balance of liabilities in the survey period and the debt servicing burden is not apparent in the cross-sectional data as the period during which households have been repaying the loan resulting in a lower balance of liabilities varies across households. Therefore the debt service ratio is not related to the holdings of liabilities or financial assets in the cross sectional dataset.

The inclusion of the debt service burden variable in the model does not alter the estimated coefficients of the other variables. It confirms that the

negative impact of liabilities on financial assets does not pick up any effect related to the debt servicing burden.

Table 5: The estimations for financial assets and liabilities

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		–0.204***	(0.078)	..	
FinAsset		..		–0.017	(0.083)
Dsr		–0.036	(0.079)	0.018	(0.191)
PayDebt		0.258***	(0.059)	–0.464***	(0.045)
λ (IMR)		0.105	(0.104)	–0.622***	(0.069)
Inc	Q1				
	Q2	0.454***	(0.086)	0.123*	(0.073)
	Q3	0.791***	(0.079)	0.225**	(0.095)
	Q4	1.036***	(0.084)	0.303***	(0.107)
	Q5	1.647***	(0.087)	0.440***	(0.154)
RealAsset	Q1				
	Q2	0.895***	(0.102)	0.660***	(0.090)
	Q3	1.340***	(0.142)	1.048***	(0.122)
	Q4	1.741***	(0.162)	1.291***	(0.149)
	Q5	2.384***	(0.192)	1.680***	(0.195)
Other explanatory variables		Yes		Yes	
Country FE		Yes		Yes	
"R^2"		0.378		0.399	
Observations		12787		12787	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies, a constant and the full set of explanatory variables of eq. (8) are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations refers to the minimum sample size of the five datasets.

Iacovello and Pagan (2009) have pointed out that household debt behaves pro-cyclically, i.e. households decrease their debt positions during a recession. The reasoning behind this is that as household leverage, i.e. the debt-to-collateral ratio, increases due to negative wealth shocks, households need to adjust their debt holdings to re-balance their wealth components; see the model of Guerrieri and Lorenzoni (2011).

Households might use their financial assets for repaying their liabilities and this would lead to a negative relationship between financial assets and liabilities. There is evidence of deleveraging at the household level in the USA (Bricker et al. (2011), Chakrabarti et al. (2011)). In the HFCS, 48 per

cent of indebted households report paying back debt as one of their reasons for saving.

A dummy is added to the baseline model if a household is saving to pay back debt, in order to capture the deleveraging effect on financial assets. The estimations in Table 5 show that households who save to pay back their debt have 46 per cent lower volumes of liabilities and around 26 per cent higher volumes of financial assets than households who do not save for this purpose.

As the motivation for deleveraging is related to the economic downturn, these results apply specifically to the time of the recession. The result suggests that in addition to the direct negative effect of liabilities on financial assets, there is an indirect positive effect for households who wish to deleverage.

The inclusion of the savings dummy does not change the estimated coefficient in the equations for either financial liabilities or assets. The model was estimated with other reasons for saving included, but it did not alter the outcome so the results are not reported here. The negative impact of liabilities on financial assets is not associated with a plan to pay back the loan as this saving purpose leads to a *temporary* accumulation of financial assets. The total effect of liabilities for households who want to decrease their balance of liabilities and save for this purpose is smaller. The negative effect of liabilities on financial assets (the point estimate in Table 5 is –0.20) may be offset by the saving purpose related to indebtedness (the point estimate for the dummy in Table 5 is 0.26).

5.3. Additional robustness tests

The accumulation of financial assets depends not only on households' saving or dissaving decisions but also on the returns of previous investments. Juster et al. (2006) argue that capital gains on savings affect the saving rate negatively. If capital gains are also related to borrowing, (e.g. if higher returns are used as an additional source of financing instead of borrowing) the estimated effect of liabilities on financial assets given in Table 4 might pick up the negative effect of capital gains.

It is not possible to distinguish the volume of the financial assets that are induced by the increase in asset prices. For that purpose, data about the year of acquisition of different equities and the purchase and current prices are needed. In order to examine the robustness of the estimations, a dummy

variable for being risk averse is used. It can be treated as a rough proxy for low returns on assets if households are not taking any risks.[5]

Table 6: Estimations for financial assets and liabilities including a dummy for being risk averse

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		–0.180**	(0.072)	..	
FinAsset		..		–0.080	(0.093)
Risk0		–0.507***	(0.038)	–0.168***	(0.057)
λ (IMR)		0.116	(0.102)	–0.624***	(0.069)
Inc	Q1				
	Q2	0.470***	(0.086)	0.150*	(0.077)
	Q3	0.797***	(0.077)	0.264***	(0.101)
	Q4	1.043***	(0.081)	0.346***	(0.117)
	Q5	1.609***	(0.086)	0.506***	(0.167)
RealAsset	Q1				
	Q2	0.851***	(0.096)	0.694***	(0.095)
	Q3	1.286***	(0.133)	1.098***	(0.131)
	Q4	1.642***	(0.151)	1.358***	(0.157)
	Q5	2.242***	(0.176)	1.777***	(0.204)
Other explanatory variables		Yes		Yes	
Country dummies		Yes		Yes	
"R^2"		0.393		0.391	
Observations		12787		12787	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies, a constant and the full set of explanatory variables of eq. (8) are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations refers to the minimum sample size of the five datasets.

Table 6 exhibits the estimation results for the model where a dummy for being risk averse is added. Risk averse households have on average a 51 per cent lower volume of financial assets than households who are not risk averse. The dummy evidently picks up the effect of potential returns as according to the theoretical model incorporating precautionary saving the sign is expected to be opposite as households with low risk preference accumulate higher buffer stocks (Browning and Lusardi (1996)).

[5] The question which is used to compute the dummy of risk averse is "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?". Households may choose between 4 answers and the dummy of being risk averse refers to the most conservative answer "Not willing to take any financial risk".

The study of Brown et al. (2013) investigates the relationship between risk attitudes, financial assets and liabilities for the US using PSID. The risk attitudes are derived from the readiness to take labour income risk. They do not find any relationship between risk attitude and the balance of financial assets. However, they find that the willingness to take more risk is positively related to the balance of total debt, similar to the current estimations.

The inclusion of the dummy variable does not alter the main results as the negative effect of liabilities on financial assets remains very similar. Most of the financial assets are held in deposits which give a very modest return — if at all — and it is apparent that not controlling for the change in asset prices does not affect the core findings.

Several additional robustness tests have been implemented. In the baseline model of eq. (8) the pension assets are excluded. The reason for excluding pension assets from total financial assets is that the volume of pension assets depends more on the pension system of different countries than on the active saving decisions of households (ECB (2013a)). Additionally, the pension assets are less liquid than other types of financial asset.

Nevertheless, if households treat pension assets as alternative savings for other asset types, pension assets should not be excluded from the estimations. The robustness test with financial assets including private pension plans is given in Table A.2 in Appendix A and the estimations give a similar impact of liabilities on financial assets, as seen in Table 4.

Wealthy households are oversampled in most countries and as the survey weights are not used in the estimations of eq. (8), outliers might affect the results. Therefore supplementary estimations were carried out excluding households with extraordinarily high values of assets or liabilities. Households were defined as outliers if they fell into the 100^{th} percentile of financial assets, real assets, debt or income or the 1^{st} percentile of income. The estimations are given in Table A.3 in Appendix A which shows that the results are similar to the baseline results in Table 4.

In the estimations we pool together 13 countries which reveal a difference in the level of financial assets and liabilities; see the main statistics in ECB (2013b). We capture the differences in the volumes of liabilities and financial assets because of institutional, cultural and other country-specific factors by including country dummies in all the estimated models. The country dummies are included in both steps of the model of eq. (8), the IMR is calculated by eq. (4) for each country separately, and country-specific quintiles of income and real assets are used.

To investigate additionally the robustness of the pooled estimations, the log of PPP adjusted per capita GDP was included in eq. (8) to see whether the

estimations are robust to the different welfare levels of countries. The relationship between the GDP variable and liabilities is positive and statistically significant, likewise the relationship between GDP and financial assets. As the inclusion of the GDP variable does not change the main estimations, the results are not reported here.

An additional robustness test was implemented by excluding countries one-by-one. The qualitative results remain the same, suggesting that the results apply to different sets of euro area countries. For comparison, the estimations for the sample without Italy, which has the biggest sample size, are given in Table A.4 in Appendix A.

6. Final comments

The research question of the paper is motivated by the increased indebtedness of households in European countries. The paper examines how households' liabilities affect their financial asset holdings. Most of the literature which investigates the borrowing or saving behaviour of households uses net wealth to describe the finances of households. In this paper net wealth is disentangled into its components of liabilities, financial assets and real assets. Additionally, it is taken into account that households hold both financial assets and liabilities and that adjustments of assets and liabilities are not independent from each other.

A system of equations for financial liabilities and financial assets is estimated while allowing for the endogeneity of the two wealth components. Furthermore, selection bias issues are addressed by estimating the selection model of debt ownership. The sample covers 13 euro area countries from the recession period, 2009–2010.

The results suggest that households' liabilities impact their financial assets negatively while no significant effect was found from financial assets to liabilities. An increase in households' liabilities of 10 per cent reduces their financial assets by 2.1 per cent. The negative relationship between liabilities and financial assets remains after controls for the debt service burden and for saving to pay back the debt are included.

The results are confirmed by a large number of robustness tests. The paper provides evidence for the interdependence of households' liabilities and financial assets. The findings provide empirical evidence for the theoretical assumption that credit markets reduce the holdings of financial assets of households. The results posit that increasing volumes of household debt are followed by lower incentives to keep financial assets.

The outcome highlights that it is important to examine the components of households' wealth separately in order to improve the understanding of households' borrowing and saving decisions. The relationship of economic and socio-demographic variables to financial liabilities and assets is different, meaning that the composition of net wealth is different across different sub-samples.

In the light of the results, the different wealth components of households might be more informative than net wealth. It is particularly important to understand how households' liabilities affect their other financial decisions as the penetration of debt and the volumes of debt have increased.

There are some saving activities which are related to liabilities and which influence the balance of financial assets. According to HFCS, 48 per cent of indebted households are saving to pay back debt in euro area countries. This particular saving purpose is related to the recession as households seek to decrease their financial exposure. The estimations show that indebted households who save to pay back their debt have on average 46 per cent fewer liabilities and 26 per cent more financial assets than indebted households without the saving purpose, all else being equal.

A limitation of this paper is the use of cross-sectional data. The current estimations apply to the period of the deep crisis when households were arguably more aware of the possible risks that accompanied their liabilities than they were during the times of economic growth. Additional survey waves are needed for an examination of whether the impact of households' liabilities on their financial assets changes over the business cycle.

The current study opens the door for further research on interdependencies between financial liabilities and assets. It is worth taking a more detailed approach and investigating the interdependence between different types of liabilities and different components of financial assets, taking into account the interdependence between all wealth components. This is left for future research.

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Appendix A: The robustness estimations

Table A.1: The estimations for the baseline model without the selection model (excluding the inverse Mills ratio)

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		−0.241***	(0.062)		..
FinAsset			..	−0.095	(0.087)
Inc	Q1				
	Q2	0.465***	(0.087)	0.223***	(0.075)
	Q3	0.798***	(0.077)	0.424***	(0.091)
	Q4	1.051***	(0.082)	0.517***	(0.108)
	Q5	1.664***	(0.086)	0.717***	(0.155)
RealAsset	Q1				
	Q2	0.912***	(0.098)	0.783***	(0.091)
	Q3	1.373***	(0.135)	1.221***	(0.125)
	Q4	1.779***	(0.151)	1.504***	(0.150)
	Q5	2.430***	(0.176)	1.969***	(0.195)
Age category	<35				
	35−44	0.121**	(0.056)	−0.140***	(0.046)
	44−54	0.140**	(0.063)	−0.436***	(0.050)
	55−64	0.202**	(0.080)	−0.747***	(0.064)
	>65	0.364***	(0.097)	−0.980***	(0.084)
Educ	Cat1				
	Cat2	0.442***	(0.048)	0.033	(0.056)
	Cat3	0.849***	(0.052)	0.264***	(0.084)
Child		−0.061**	(0.024)	0.130***	(0.018)
IncIncrease		0.070	(0.051)	0.130***	(0.045)
IncLow		−0.199***	(0.041)	0.011	(0.039)
Unempl		−0.402***	(0.090)	−0.126*	(0.076)
Selfempl		0.267***	(0.045)	0.199***	(0.043)
Bequest		0.447***	(0.050)		..
Immigrant		−0.160**	(0.071)		..
Gender		−0.167***	(0.040)		..
Marital status	couple				
	single	0.014	(0.057)		..
	divorced	0.049	(0.092)		..
	widowed	−0.172***	(0.063)		..
Homeowner			..	0.893***	(0.066)
Country dummies			Yes		Yes
"R^2"			0.371		0.384
Observations			12 787		12 787

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies and a constant are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations is the minimum sample size of the five datasets.

Table A.2: Financial assets including pension assets

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		−0.239***	(0.075)	..	
FinAsset		..		−0.045	(0.081)
λ (IMR)		0.030	(0.102)	−0.639***	(0.068)
Inc	Q1				
	Q2	0.510***	(0.083)	0.139*	(0.074)
	Q3	0.841***	(0.076)	0.250**	(0.097)
	Q4	1.121***	(0.078)	0.328***	(0.111)
	Q5	1.748***	(0.083)	0.479***	(0.160)
RealAsset	Q1				
	Q2	0.943***	(0.099)	0.676***	(0.095)
	Q3	1.399***	(0.140)	1.073***	(0.125)
	Q4	1.755***	(0.160)	1.326***	(0.148)
	Q5	2.386***	(0.187)	1.732***	(0.189)
Age category	<35				
	35−44	0.107**	(0.054)	−0.127***	(0.045)
	44−54	0.199***	(0.059)	−0.351***	(0.053)
	55−64	0.195**	(0.076)	−0.560***	(0.065)
	> 65	0.116	(0.098)	−0.542***	(0.083)
Educ	Cat1				
	Cat2	0.473***	(0.047)	−0.035	(0.055)
	Cat3	0.820***	(0.049)	0.194**	(0.076)
Child		−0.041*	(0.022)	0.086***	(0.017)
IncIncrease		0.070	(0.047)	0.098**	(0.043)
IncLow		−0.209***	(0.042)	−0.047	(0.040)
Unempl		−0.473***	(0.088)	−0.112	(0.074)
Selfempl		0.313***	(0.041)	0.193***	(0.043)
Bequest		0.431***	(0.044)	..	
Immigrant		−0.211***	(0.067)	..	
Gender		−0.137***	(0.037)	..	
Marital status					
	single	−0.087	(0.054)	..	
	divorced	−0.075	(0.084)	..	
	widowed	−0.242***	(0.059)	..	
Homeowner		..		0.767***	(0.064)
Country dummies		Yes		Yes	
"R^2"		0.418		0.389	
Observations		13 036		13 036	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies and a constant are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations is the minimum sample size of the five datasets.

Table A.3: The robustness estimations without outliers

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		−0.186**	(0.073)	..	
FinAsset		..		−0.030	(0.082)
λ (IMR)		0.130	(0.102)	−0.622***	(0.068)
Inc	Q1				
	Q2	0.470***	(0.088)	0.128*	(0.073)
	Q3	0.812***	(0.078)	0.237**	(0.094)
	Q4	1.072***	(0.085)	0.314***	(0.108)
	Q5	1.609***	(0.091)	0.421***	(0.152)
RealAsset	Q1				
	Q2	0.886***	(0.100)	0.653***	(0.092)
	Q3	1.314***	(0.136)	1.039***	(0.120)
	Q4	1.723***	(0.157)	1.296***	(0.146)
	Q5	2.220***	(0.177)	1.595***	(0.182)
Age category	<35				
	35−44	0.118**	(0.055)	−0.132***	(0.047)
	44−54	0.114*	(0.059)	−0.366***	(0.049)
	55−64	0.145*	(0.078)	−0.572***	(0.059)
	>65	0.214**	(0.101)	−0.597***	(0.082)
Educ	Cat1				
	Cat2	0.413***	(0.047)	−0.043	(0.051)
	Cat3	0.788***	(0.053)	0.171**	(0.075)
Child		−0.082***	(0.023)	0.084***	(0.019)
IncIncrease		0.070	(0.051)	0.105**	(0.046)
IncLow		−0.194***	(0.043)	−0.049	(0.041)
Unempl		−0.397***	(0.094)	−0.093	(0.072)
Selfempl		0.230***	(0.045)	0.143***	(0.041)
Bequest		0.458***	(0.049)	..	
Immigrant		−0.162**	(0.071)	..	
Gender		−0.164***	(0.039)	..	
Marital status	couple				
	single	−0.035	(0.059)	..	
	divorced	0.027	(0.090)	..	
	widowed	−0.142**	(0.062)	..	
Homeowner		..		0.808***	(0.063)
Country FE		Yes		Yes	
"R^2"		0.371		0.390	
Observations		12 360		12 360	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies and a constant are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations is the minimum sample size of the five datasets.

Table A.4: The robustness estimations without Italy

		(1)		(2)	
Dependent variable:		**Financial Assets**		**Liabilities**	
Liabilities		−0.218**	(0.089)	..	
FinAsset		..		−0.018	(0.084)
λ (IMR)		0.017	(0.125)	−0.708***	(0.072)
Inc	Q1				
	Q2	0.475***	(0.093)	0.106	(0.075)
	Q3	0.805***	(0.084)	0.201**	(0.098)
	Q4	1.048***	(0.089)	0.260**	(0.110)
	Q5	1.647***	(0.095)	0.412***	(0.159)
RealAsset	Q1				
	Q2	0.908***	(0.114)	0.669***	(0.094)
	Q3	1.360***	(0.162)	1.065***	(0.125)
	Q4	1.801***	(0.187)	1.354***	(0.154)
	Q5	2.471***	(0.224)	1.784***	(0.197)
Age category	<35				
	35-44	0.102*	(0.059)	−0.125**	(0.049)
	44-54	0.159**	(0.067)	−0.359***	(0.055)
	55-64	0.211**	(0.087)	−0.574***	(0.068)
	>65	0.389***	(0.109)	−0.523***	(0.096)
Educ	Cat1				
	Cat2	0.489***	(0.058)	−0.060	(0.061)
	Cat3	0.887***	(0.059)	0.135	(0.085)
Child		−0.062**	(0.026)	0.096***	(0.018)
IncIncrease		0.103*	(0.055)	0.095**	(0.046)
IncLow		−0.185***	(0.048)	−0.040	(0.042)
Unempl		−0.419***	(0.098)	−0.100	(0.077)
Selfempl		0.302***	(0.052)	0.194***	(0.047)
Bequest		0.437***	(0.050)	..	
Immigrant		−0.129*	(0.079)	..	
Gender		−0.194***	(0.043)	..	
Marital status	couple				
	single	−0.021	(0.060)	..	
	divorced	0.003	(0.103)	..	
	widowed	−0.160**	(0.069)	..	
Homeowner		..		0.765***	(0.072)
Country FE		Yes		Yes	
"R^2"		0.364		0.406	
Observations		11 316		11 316	

Notes: The complete estimations for the system of equations using five imputed datasets. 13 country dummies and a constant are included in the estimations but are not shown in the table. Bootstrapped errors are reported in round parentheses to the right of the coefficient estimates. Superscripts ***, ** and * indicate that the coefficient is statistically different from 0 at the 1%, 5% and 10% levels respectively. "R^2" is estimated for each imputation separately and the smallest is given here. No of observations is the minimum sample size of the five datasets.

Working Papers of Eesti Pank 2014

No 1
Jaanika Meriküll, Tairi Rõõm. Are Foreign-Owned Firms Different? Comparison of Employment Volatility and Elasticity of Labour Demand