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THE ROLE OF RISK ATTITUDES
AND EXPECTATIONS IN
HOUSEHOLD BORROWING IN
ESTONIA

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The role of risk attitudes and expectations in household borrowing in Estonia

Eva Branten*

Abstract

This study investigates the relations between risk attitudes and expectations and different aspects of borrowing by households in Estonia. The central research question is whether risk aversion and optimism provide additional information beyond the main economic and sociodemographic characteristics in explaining borrowing behaviour. The paper uses microdata from the Estonian Household Finance and Consumption Survey (HFCS) to estimate probit and Heckman models. My analysis shows that risk-tolerant households apply for loans more often than risk-averse households do and that their loans are larger. For mortgage loans, risk aversion is related to the probability of having a loan, whereas for non-mortgage loans, risk aversion is related to the size of the outstanding liabilities. The variables describing the household's expectations for its future financial situation are on their own related to the decision to apply for a loan, but they do not contain any relevant additional information beyond the main economic and sociodemographic characteristics of the household.

JEL Codes: G51, D14

Keywords: household debt, mortgage loans, non-mortgage loans, borrowing decisions, income and price expectations, risk attitudes, Household Finance and Consumption Survey

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

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Non-technical summary

This paper studies the role that the risk attitudes of households and their expectations for their financial situation play in borrowing decisions in Estonia. The aim of the study is to ascertain whether optimism and aversion to risk provide additional information beyond that given by the main economic and sociodemographic characteristics for explaining borrowing behaviour, and what the magnitude of their effect is. The microdata from the 2013 and 2017 waves of the Estonian Household Finance and Consumption Survey are employed for the analysis.

This study contributes to a greater understanding of the financial behaviour of households in relation to their risk attitudes and expectations about their future financial situation. The study looks at different aspects of the borrowing of households such as the decision of whether to apply for a loan or not, the size of debt they decide to take on, and the debt service burden this gives them. It is important to clarify these relations since over-optimism and a willingness to take on too much risk may lead to excessive borrowing, which could entail a risk to the households themselves and to overall financial stability. The knowledge gained from this study could be of use in predicting borrowing behaviour and credit growth, and this could be of interest for financial stability analysis.

This study relates to several strands of research. Firstly, it relates to the broad literature on the factors of household debt. Secondly, it relates to the literature discussing the relations between the expectations of households and their economic behaviour, where relatively few earlier studies have focused on household borrowing. My study contributes to filling this research gap. Some of the previous studies in that strand have used aggregate-level data (e.g. Kłopotcka (2017), Białowolski (2019)). My study is similar in its object of research and use of microdata to the studies of Brown et al. (2005) and Brown et al. (2008). Finally, my study also relates to previous studies investigating the risk attitudes of households. There are relatively few studies of how financial risk attitudes form in Eastern European countries and in the Baltic states (e.g. Dohmen et al. (2016), Pońsko (2018)), and my study also contributes to filling this research gap. The case of Estonia is interesting since the credit market in Estonia is relatively young and households have relatively little experience of financial risk-taking. Even so, households have borrowed actively in recent years and the investment opportunities for households have broadened. This has made questions about financial risk-taking increasingly topical.

The theoretical foundations of this study can be found in the Life-cycle/Permanent Income Hypothesis (Modigliani and Brumberg (1954), Friedman (1957)), which suggests that consumers aim to hold their consumption levels steady over time at the level of their permanent income by borrowing and saving. Brown et al. (2005) describe two versions of the life-cycle model, showing a positive relationship between optimistic expectations of future income and the optimally chosen size of loan, and Brown et al. (2013) use a life-cycle model to show theoretically how risk aversion affects the size of a debt. The models by Brown et al. (2005) and Brown et al. (2013) provide the theoretical motivation for this study. The methods used to develop the empirical models in the current study are probit modelling and Heckman modelling.

The current analysis shows that risk-tolerant households apply for loans more often than risk-averse households do, and that their loans are larger. It is also of note that the effect of risk aversion on debt size is quite large. At the same time, risk aversion is not related to the level of the debt service burden as measured by the debt service-to-income ratio of the household. Both

these results are relevant for financial stability analysis, since if risk-tolerant households do not increase their debt service burden by too much more than risk-averse households, then the risks for households themselves and for the financial system are reduced. However, the absolute size of the debt, which this analysis finds to be related to risk aversion, is relevant for the extent of the possible problems that households and the financial system could face if the incomes of households were to fall or interest rates to increase, and loan repayment difficulties consequently to arise.

The differences in the results for mortgage loans and non-mortgage loans merit deeper analysis. This analysis shows that for mortgage loans, risk aversion is related to the probability of having a loan, whereas for non-mortgage loans, risk aversion is related to the size of the outstanding liabilities. This is intuitive. Since a mortgage loan is a large liability for a long period of time, taking the decision to take that loan requires a certain amount of risk tolerance. The amount of risk tolerance needed for taking a non-mortgage loan depends on the size of the loan, and larger non-mortgage loans are taken by risk-tolerant households.

This study has shown that the probability of the household being unwilling to take any financial risk is negatively related to its income and its perceived ability to get financial assistance from friends or relatives, to the level of education of the household's reference person, and to that person being employed, and it is positively related to the age of the household's reference person. The results also indicate that men are less risk averse than women. These results for Estonia are in line with many previous studies by other authors from different countries and regions (examples of these studies are provided in de Venter et al. (2012), Tavor (2019), and Fisher and Yao (2017) among others).

Optimistic expectations in the household for its income and for house prices are on their own positively related to the decision of the household to apply for credit, but they do not contain any relevant additional information beyond the household's main economic and socio-demographic characteristics. These results could be viewed in the context of the general economic situation in Estonia in the period from 2013 to 2017, which was a time of economic expansion. It might be that the expectations of households did not contain a great deal of animal spirits, which are states that cannot be explained by economic rationality.

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1. Introduction

This paper studies the role played by the risk attitudes of households and their expectations about their financial situation in the borrowing decisions taken in Estonia. The aim of the study is to assess whether risk averseness and optimism provide additional information beyond that given by the main economic and sociodemographic characteristics in explaining borrowing behaviour, and what the magnitude of their effect is. Data from the 2013 and 2017 waves of the Estonian Household Finance and Consumption Survey are employed for the analysis.

The theoretical foundations of this study can be found in the Life-cycle/Permanent Income Hypothesis (Modigliani and Brumberg (1954), Friedman (1957)), which suggests that consumers aim to hold their consumption levels steady over time at the level of their permanent income by borrowing and saving. Consumption smoothing provides a link between financial expectations and borrowing, while risk averseness affects the shape of the utility function. Brown et al. (2005) describe two versions of the life-cycle model, showing there to be a positive relationship between optimistic expectations for future income and the optimally chosen size of a loan, and Brown et al. (2013) use a life-cycle model to show theoretically how risk aversion impacts the size of debt. The models by Brown et al. (2005) and Brown et al. (2013) provide the theoretical motivation for this study.

A large strand of the literature concerns the determinants that affect household debt. Data from the Eurosystem Household Finance and Consumption Survey have been used by Bover et al. (2014) to investigate different measures of debt, and by Du Caju et al. (2016) to study how different household-level characteristics affect the likelihood of a household being over-indebted. My study has similarities to the first part of the analysis in Bover et al. (2014), particularly for the variables under observation. The financial vulnerability of euro area households has been analysed from the Household Finance and Consumption Survey data by Ampudia et al. (2014), while Terraneo (2018) uses HFCS data to analyse the financial fragility of households in Southern Europe.

The risk preference of households has been noted in several studies as a factor related to household debt. The importance of risk attitudes in explaining household indebtedness in Southern European countries has been investigated using data from the Household Finance and Consumption Survey by Massó and Abalde (2020). Many of the variables used in my study are similar to those used in their study, but there are key differences in the detailed research questions, methodology and geographical area. My study also shares similarities with the study by Brown et al. (2013) in that it analyses mortgage loans and non-mortgage loans separately. Brown et al. (2013) show from US data that the aversion to risk is negatively related to the level of debt held by the household.

This study relates to several strands of research. Firstly, it relates to the broad literature on factors of household debt. Secondly, it relates to the literature discussing the relations between households' expectations and their economic behaviour, where relatively few earlier studies have focused on household borrowing. My study contributes to filling this research gap. Some of the previous studies in that strand have used aggregate-level data (e.g. Kłopotcka (2017), Białowolski (2019)), while the current study uses microdata. My study is similar in the object of its research and its use of microdata to the studies of Brown et al. (2005) and Brown et al. (2008). Finally, my study also relates to previous studies investigating the risk attitudes of households. There are relatively few studies on how attitudes to financial risk have formed in Eastern European countries and the Baltic states (e.g. Dohmen et al. (2016), Pońsko (2018))

and my study also contributes to filling this research gap. Estonia's case is interesting since the credit market in Estonia is relatively young and households have relatively little experience of financial risk-taking. Even so, households have borrowed actively in recent years and the investment opportunities for households have broadened. This has made questions about financial risk-taking increasingly topical.

My study contributes to a greater understanding of household financial behaviour in relation to the risk attitudes of households and their expectations about their financial situation. The study looks at different aspects of the borrowing decisions of households such as the decision of whether to apply for a loan or not, the size of debt they decide to take on, and the debt service burden this gives them. It is important to clarify these relations since over-optimism and a willingness to take on too much risk may lead to excessive borrowing, which could entail a risk to the households themselves and to overall financial stability. The knowledge gained through the study could be of use in predicting borrowing behaviour and credit growth, and this could be of interest for financial stability analysis.

My analysis shows that risk-tolerant households apply for loans more often than risk-averse households do, and their loans are larger even when other characteristics of households are controlled for. For mortgage loans, risk aversion is related to the probability of having a loan, whereas for non-mortgage loans, risk aversion is related to the size of the debt. A household's expectations of its future financial situation do not contain any relevant additional information for explaining borrowing decisions beyond that given by the main economic and socio-demographic characteristics. The study shows that risk aversion is related to the main characteristics of the household or of the household's reference person, such as income, education, age, employment status, gender and the perceived ability to get financial assistance from friends or relatives.

The paper proceeds as follows. Section 2 describes the theoretical background of the study and reviews the related literature. Section 3 gives an overview of the trends in household borrowing and the macroeconomic environment in Estonia. Section 4 describes the data and the methods applied in this study. Section 5 presents the results. Section 6 concludes.

2. Literature review

One of the main concepts that can explain the relations between the expectations households have for their future financial situation and their borrowing is the Life-cycle/Permanent Income Hypothesis (Modigliani and Brumberg (1954), Friedman (1957)). The Life-cycle/Permanent Income Hypothesis suggests that consumers aim to hold their consumption levels steady over time at the level of their permanent income by borrowing and saving. Consumption smoothing creates a positive relationship between optimistic financial expectations and borrowing. Important aspects that should be considered when applying the concept of the Life-cycle/Permanent Income Hypothesis are precautionary saving (Leland (1968)) and borrowing constraints (Zeldes (1989)). Precautionary saving implies that uncertainty about future income reduces current consumption and increases saving. Borrowing constraints can reduce consumption directly if they are currently binding, or indirectly through the possibility of borrowing constraints becoming binding in the future. The life-cycle model also provides an

important theoretical background for studying how risk averseness affects borrowing, since risk averseness is reflected in the utility function of the household.

Brown et al. (2005) describe two versions of the life-cycle model, showing there to be a positive relationship between optimistic expectations for future income and the optimally chosen size of a loan, and Brown et al. (2013) use a life-cycle model to show theoretically how risk aversion impacts the size of the debt. Brown et al. (2005) model loan sizes as the outcome of simultaneous decisions by borrowers and lenders, while expectations enter the model through the probabilities of occurrence of a high income state and a low state. The expectations are the same for borrowers and lenders. In the model of Brown et al. (2013), the relationship between risk aversion and the optimally chosen level of debt is found by solving the individual's lifetime expected utility maximisation problem, given the budget constraint.

Quite a lot of studies have investigated the determinants of household debt and the debt burden. Some authors have used macro-level aggregate data, while others have used individual-level or household-level microdata. Microdata from the Eurosystem Household Finance and Consumption Survey have been used by Bover et al. (2014), one of whose several research questions analyses how different household-level characteristics affect different measures of debt, and by Du Caju et al. (2016) to analyse how these affect the likelihood of the household being over-indebted. Over-indebtedness and repayment difficulties have also been discussed in Gutiérrez-Nieto et al. (2017) and Aristei and Gallo (2016) among others. HFCS data have been employed for analysing the financial fragility of households by Ampudia et al. (2014) and Terraneo (2018).

Risk preference has been observed as a factor affecting household debt in several studies, including Brown et al. (2013) and Massó and Abalde (2020), which are the closest to my study. Brown et al. (2013) find from US data that risk aversion is negatively related to the level of debt of the household. Like the study by Brown et al. (2013), my study analyses the effects of risk attitudes on both the total debt of the household and the mortgage debt and non-mortgage debt separately. The importance of risk attitudes in explaining household indebtedness in Southern European countries has been investigated from the HFCS data by Massó and Abalde (2020).

Relatively few earlier studies have focused on the relations between the expectations of households about their future financial situation and their borrowing decisions. Aggregate-level data were used for this in Kłopotcka (2017) and Białowolski (2019). Białowolski (2019) studies how economic sentiment influences the saving and borrowing behaviour of households in Poland. One of his results is that consumer confidence affects the acquisition of debt for durables and mortgages positively, but has a negative impact on the acquisition of debt for unexpected expenditures or consumption purposes. Kłopotcka (2017) finds from data for Poland that indexes of consumer confidence have predictive power on their own and are informative for future household saving and borrowing rates alongside the information contained in economic fundamentals. Hyytinen and Putkuri (2018) use microdata to analyse the forecast errors that households make and how these relate to the borrowing behaviour of households and their over-indebtedness. They find that the households with the largest optimistic forecast errors have larger debt-to-income ratios and are more likely to perceive difficulties in coping with their liabilities. My study is similar in its object of research and its use of microdata to the studies of Brown et al. (2005) and Brown et al. (2008).

An interesting question is how the expectations of households form, and how much they are driven by the news and how much by animal spirits that cannot be explained by economic rationality, as first described by Keynes (1936). This is an important question since economic outcomes like loan repayment difficulties may depend on how much the expectations are objectively motivated. Paradiso et al. (2014) provide a list of examples of cognitive biases in economic decision making. Ahmed and Cassou (2016) suggest that consumer confidence shocks during economic expansions probably reflect the news, while those during recessions probably reflect animal spirits. Bovi (2009) posits that psychological factors mean that people tend systematically to consider personal or future conditions to be better than aggregate or past conditions. Paradiso et al. (2014) also find the confidence of consumers to be anchored on over-optimistic values, indicating the presence of bias towards optimism.

3. Overview of the growth of household credit and macroeconomic trends in Estonia

Households in Estonia are less indebted than households in the euro area are on average (see Figures 1 and 2). Household indebtedness rose quickly before and during the global financial crisis, fell somewhat after that and has been relatively stable since 2013. There was a slight increase in the household debt-to-GDP ratio in 2020, due to both an increase in household debt and a fall in GDP.

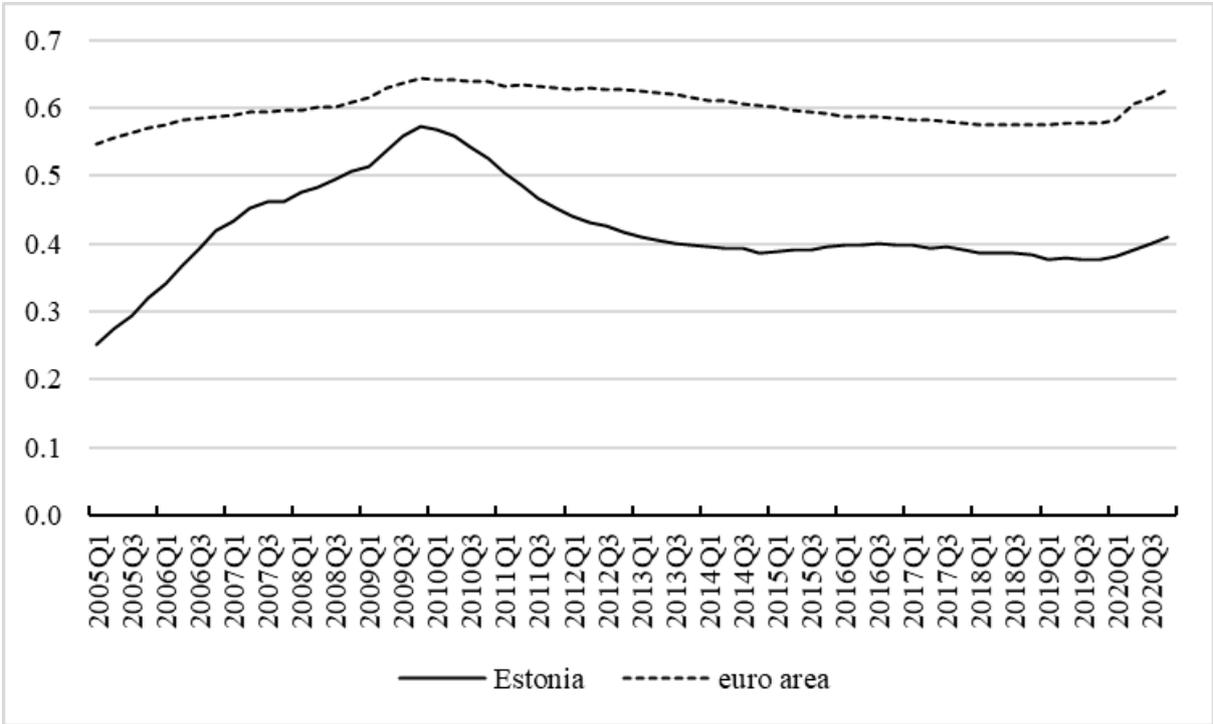


Figure 1. Ratio of household debt to GDP in 2005–2020

Sources: ECB Statistical Data Warehouse, Eesti Pank, Statistics Estonia, author’s calculations.

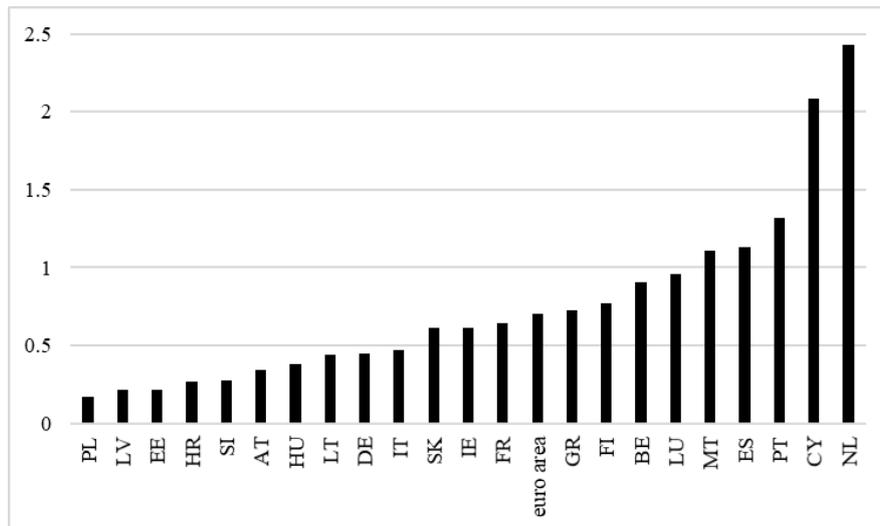


Figure 2. Median ratio of debt to the gross annual income of households (calculated only on households with debt; the data were collected in 2017 in most countries)

Source: European Central Bank (2020d).

Although the growth rates for the stock of loans are not comparable to those that were seen before the global financial crisis, demand for household loans has been strong in recent years, with the stock of loans growing by about 6-7% a year (see Figure 3). The demand for loans has been supported by growth in incomes and low interest rates (see Figure 4), and probably also by the confidence of households.¹

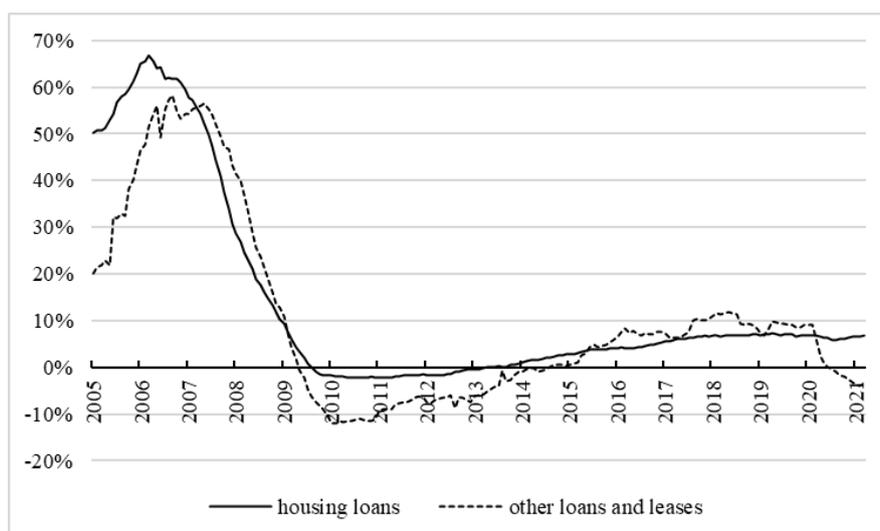


Figure 3. Yearly growth in the stock of loans and leases issued by the banking sector to households in Estonia in January 2005–March 2021

Sources: Eesti Pank, author’s calculations.

¹ The possible reasons behind the demand for household loans in Estonia in recent years have been discussed in various Financial Stability Reviews by Eesti Pank.

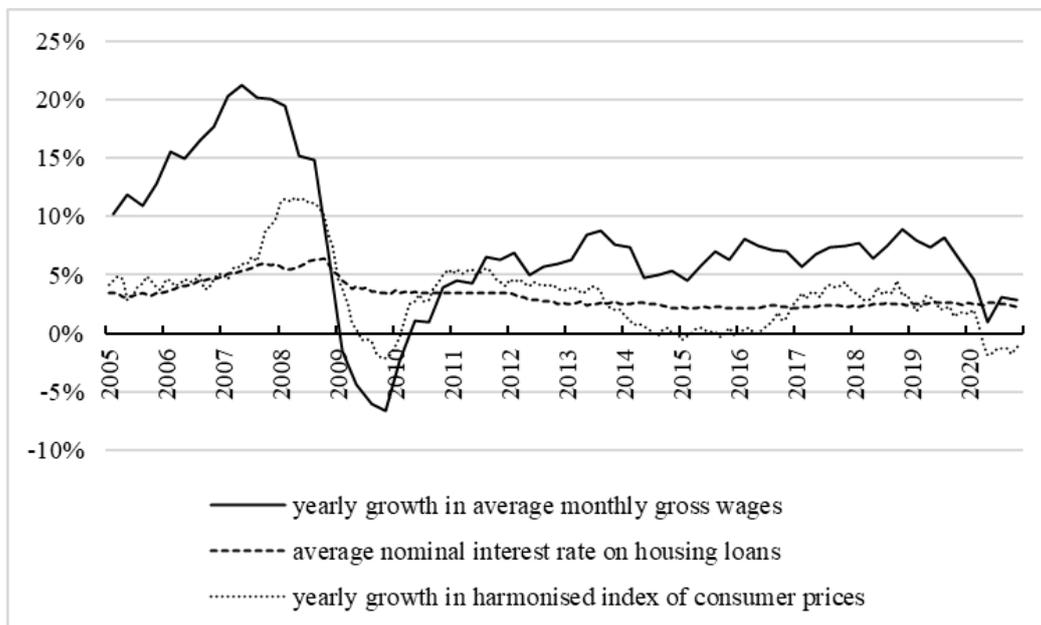


Figure 4. Yearly growth in average monthly gross wages and the harmonised index of consumer prices, and the average nominal interest rate on new housing loans in Estonia in 2005–2020

Sources: Eesti Pank, Statistics Estonia, author’s calculations.

Figure 5 depicts the consumer confidence indicator² and its components in Estonia in January 2005–April 2021. The level of confidence was highest during the economic boom in 2006 and the beginning of 2007, and lowest during the global financial crisis in 2009. After the global financial crisis, confidence next peaked in 2019. In 2020, consumer confidence deteriorated significantly because of the Covid-19 pandemic. The volumes of loans issued to households fell significantly after the start of the pandemic but then recovered to a certain extent and by the end of 2020 the turnover of housing loans was even larger than it was before the pandemic.

The data presented in Figure 5 indicate that the views of households in Estonia on the general economic situation over the next 12 months are more volatile than the other components of the consumer confidence indicator. That is also the case for the euro area (see Figure 6). The consumer confidence indicator and its components are more volatile in Estonia than they are in the euro area as a whole.³

² The data on the consumer confidence indicator for Estonia are compiled by the Estonian Institute of Economic Research using the methodology of the European Commission. The data are monthly. The components of the consumer confidence indicator are the following: households’ assessment of their financial situation over the last 12 months; households’ assessment of their financial situation over the next 12 months; households’ assessment of the general economic situation over the next 12 months; and households’ assessment of their major purchases over the next 12 months. The values of the components of the consumer confidence indicator show the differences in per cent between the share of households expressing positive views for each question and the share of households expressing negative views. The consumer confidence indicator is calculated as the arithmetic mean of its four components.

³ The standard deviation of the consumer confidence indicator in the period from January 2005 to April 2021 was 9.6 in Estonia, while in the euro area it was 5.2.

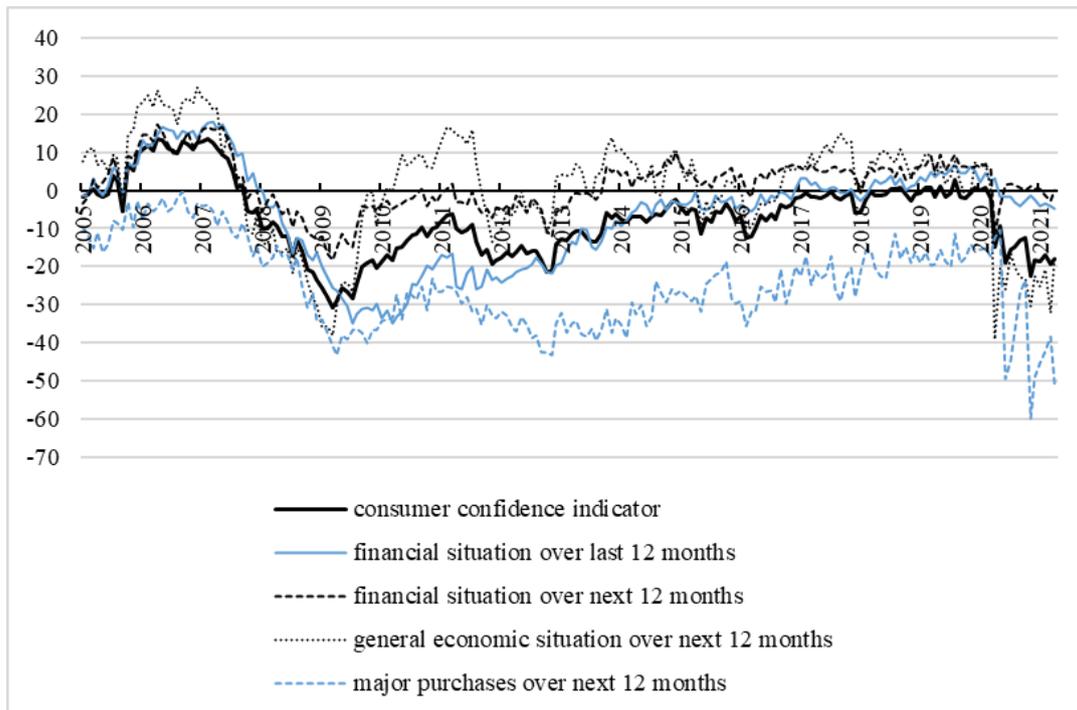


Figure 5. Consumer confidence indicator and its components (seasonally adjusted) in Estonia in January 2005–April 2021

Sources: Estonian Institute of Economic Research, European Commission.

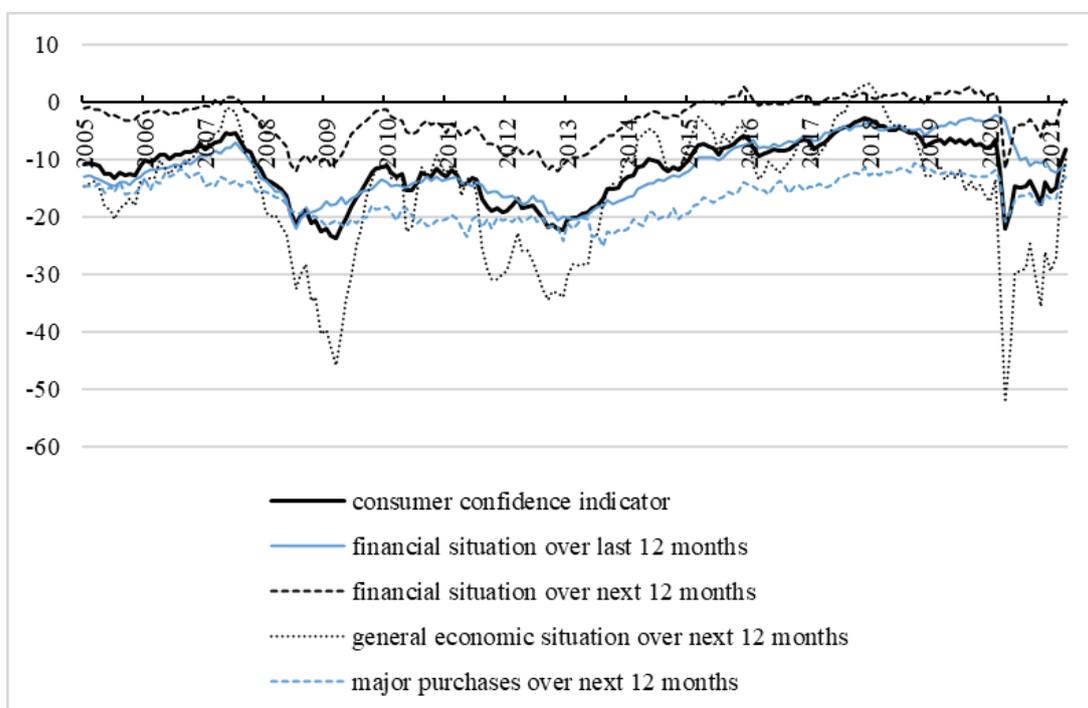


Figure 6. Consumer confidence indicator and its components (seasonally adjusted) in the euro area in January 2005–April 2021

Source: European Commission.

It is also worth noting from Figures 5 and 6 that in a large majority of periods, the assessments households give for their financial situation over the next 12 months are more optimistic than the assessments they give for their financial situation over the past 12 months. This may indicate a bias to optimism where the future is concerned, which is consistent with the studies finding that people tend to rate future conditions systematically better than past conditions (e.g. Bovi (2009)).

The turnover of household loans exhibits some co-movement with the consumer confidence indicator in Estonia. The following analysis looks at whether it is possible to detect a relationship between a household's expectations about its future financial situation and its borrowing on the micro level.

4. Data and method

This study employs microdata from two waves of the Estonian Household Finance and Consumption Survey carried out in 2013 and 2017. The Household Finance and Consumption Survey is a joint project by the European Central Bank and national central banks of the euro area and the surveys are conducted in a standardised form in all the member states of the euro area. The Household Finance and Consumption Survey collects information on the assets, liabilities, incomes, and consumption of households, and also on the expectations and opinions of households and on demographic variables for household members (Eesti Pank. The Estonian Household Finance and Consumption Survey (HFCS), methodological report). The results of the Estonian Household Finance and Consumption Survey are provided in Meriküll and Rõõm (2016, 2019).

The summary statistics of the variables that are already present in the HFCS dataset or are defined from the HFCS data and used in this analysis are presented in Table 1. A description of the variables is given in the Appendix. The following analysis and the models that are estimated cover households where the age of the Canberra definition reference person is between 20 and 64 years⁴. There were 1709 households with a reference person aged between 20 and 64 in the 2013 survey, and 2278 households in the 2017 survey. There were 1321 households that participated in both the 2013 and 2017 surveys. All the households that participated in the 2013 survey were contacted and invited to participate in the 2017 survey. The 2017 survey also included new split households, where a member of a household that was interviewed in 2013 had moved into a separate household, and new households drawn randomly from the Population Register (Eesti Pank. The Estonian Household Finance and Consumption Survey (HFCS), methodological report).

⁴ The household reference person here is chosen according to the international standards of the Canberra Group (UNECE 2011), which suggests applying the following criteria in the following order to select a unique reference person in the household: 1) one of the partners in a registered or de facto marriage with dependent children, 2) one of the partners in a registered or de facto marriage without dependent children, 3) a lone parent with dependent children, 4) the person with the highest income, 5) the oldest person.

Table 1. Summary statistics of the variables

Variable	Mean ^a	Standard deviation ^a	Number of observations
Statistics from the 2017 HFCS from all the households that participated in the 2017 HFCS			
<i>Variables describing expectations and attitudes towards risk of households</i>			
Expectation income vs prices	0.08	0.267	2260
Expectation house price	0.07	0.250	2278
Level of risk aversion	3.63	0.631	2276
Risk averse	0.70	0.459	2276
<i>Variables describing economic and socio-demographic characteristics of households</i>			
Income quintile	3.15	1.393	2278
Annual income	24,630	22,671	2278
Age ^b	49.10	16.850	2278
Education ^b	4.04	1.801	2278
Male ^b	0.44	0.497	2278
Employed ^b	0.62	0.485	2278
Married ^b	0.34	0.473	2278
Household size	2.30	1.330	2278
Financial assistance from friends or relatives	0.32	0.466	2245
Statistics from the 2017 HFCS from the households that participated in both the 2017 and 2013 HFCS			
<i>Variables related to debt of households</i>			
Applied	0.30	0.461	1321
Received	0.89	0.318	416
Perceived constraint	0.07	0.257	1321
Has debt	0.62	0.486	1321
Has mortgage debt	0.28	0.447	1321
Has non-mortgage debt	0.53	0.499	1321
Liabilities size	22,469	40,529	835
Mortgage debt size	44,078	50,976	383
Non-mortgage debt size	3,243	4,934	723
Debt service to income ratio	0.10	0.102	665
<i>Variables describing expectations and attitudes towards risk of households</i>			
Expectation house price	0.08	0.270	1321
Statistics from the 2013 HFCS from the households that participated in both the 2017 and 2013 HFCS			
<i>Variables describing expectations and attitudes towards risk of households</i>			
Expectation income vs prices	0.08	0.268	1318
Level of risk aversion	3.57	0.697	1321
Risk averse	0.68	0.468	1321
<i>Variables describing economic and socio-demographic characteristics of households</i>			
Income quintile	3.43	1.379	1321
Annual income	21,555	24,974	1321
Age ^c	44.15	11.916	1321
Education ^c	3.62	1.116	1321
Male ^c	0.59	0.493	1321
Employed ^c	0.79	0.410	1321
Household size	2.67	1.406	1321
Financial assistance from friends or relatives	0.26	0.441	1306

Notes:

^a Calculated using weights of households.^b The household reference person here is the interview reference person.^c The household reference person here is the Canberra definition reference person.

Sources: Estonian Household Finance and Consumption Survey; author's calculations and author's compilation.

Contrary to what might be expected given the general macroeconomic situation in Estonia, fewer households expected that their income would grow less than prices in the 2013 survey than did in the 2017 survey. In 2013, 30% of households thought this, and in 2017 37% did. About 53% of the households that participated in both surveys gave the same assessment for the growth outlook of their income in both surveys.⁵ The risk attitudes of Estonian households were more stable over the period between 2013 and 2017 than expectations were, with about 66% of the households participating in both the 2013 and 2017 surveys giving the same assessment for their level of risk averseness in both surveys.⁶ In general, Estonian households are risk-averse, as about 70% of households were not willing to take any financial risk when saving or making investments in 2017.

Probit and Heckman models are estimated using the microdata dataset. Probit models are estimated to investigate the factors that are related to whether 1) the household expects that its income would grow more than prices over the next year, 2) the household expects the price of the residence the household is living in to increase by more than 5% over the next 12 months, and 3) the household is not willing to take any financial risk. Probit models are also estimated to study the factors of i) whether the household had applied for credit within the previous three years, ii) whether the household received as much credit as it applied for⁷, and iii) whether the household did not apply for credit because of a perceived credit constraint. The logit model, which is a relatively similar approach to the probit model employed in this study, has been used in, for example, Pattarin and Cosma (2012) to ascertain the relations between attitudes towards credit and the use of consumer credit. The logit model has also been applied in Bover et al. (2014) to model the probability of holding debt, and in Du Caju et al. (2016) to model the probabilities of different measures of indebtedness. The ordered logit approach has been used in Colasante and Riccetti (2021) to model the factors of risk attitudes.

The Heckman model is estimated to ascertain the factors that are related to different measures of household borrowing. The selection equation estimates the probability of the household having debt and the outcome equation estimates the size of the debt, conditional on borrowing. The rationale behind using the Heckman model is the assumption that the group of households that have a loan liability is different from the group of households that do not have a loan liability in certain characteristics, meaning that the sample of households that have debt is not randomly drawn from the population.⁸ The Heckman model is then used to correct for

⁵ About 19% of the households that participated both in the 2013 and 2017 surveys had more optimistic expectations in 2017 than in 2013 and about 28% had more pessimistic expectations. About 5% of the households had the opposite expectations in 2013 and 2017, expecting once that income would grow by more than prices, and the other time that income would grow by less than prices. A variant in between these two is that income would go up by about the same amount as prices.

⁶ About 18% of the households that participated in both the 2013 and 2017 surveys became more risk averse in the 2017 survey and about 17% became more risk-tolerant. About 6% of the households changed their assessment for their level of risk averseness by more than 1 point on the 4-point scale used in the survey for this question. The question of whether financial risk tolerance is a relatively stable personal trait has also been analysed and answered positively in the study of de Venter et al. (2012), for example.

⁷ The probit model is used here instead of the Heckman model because the inverse of the Mills' ratio did not appear to be statistically significant in the Heckman outcome equation that was estimated during the analysis process for this paper.

⁸ The sample selection approach has also been applied in Brown et al. (2008) to model the size of mortgage debt and in Aristei and Gallo (2016), for example, who apply a sample selection ordered probit in the context of the repayment difficulties of households. In the first stage, a probit model describing the likelihood of mortgage insolvency is estimated, and in the second stage, an ordered probit model describing the intensity of arrears is estimated for insolvent households.

the non-random sampling. The actual estimation of the Heckman model supports this assumption, since the inverse of the Mills' ratio that is included in the outcome equation turns out to be statistically significant.

The variables of the exclusion restriction that are included in the Heckman selection equation but not in the outcome equation are a dummy that takes the value 1 if the reference person of the household is employed, and a variable indicating the size of the household. The first exclusion restriction is selected following the intuition that employment status plays a significant role in the probability of a household applying for and having a loan above all, while it is of lesser importance for explaining the size of the debt. Before the exclusion restrictions were selected, correlations between the dependent variable of the selection equation and different control variables and correlations between the dependent variable of the outcome equation and different control variables were investigated. The control variables in the model were selected on the basis of the previous theoretical and empirical literature and the analysis of correlations done for this study.

The Heckman selection equation is as follows:

$$\text{Probability}(\text{HD}_{2017i}=1) = F(\alpha_0 + \alpha_1(\text{RA}_{2013i}) + \alpha_2(\text{EIP}_{2013i}) + \alpha_3(\text{EHP}_{2017i}) + \sum_{k=1}^K \gamma_k x_{2013ik} + \sum_{s=1}^S \delta_s z_{2013is} + u_i) \quad (1)$$

where HD_{2017i} , RA_{2013i} , EIP_{2013i} , and EHP_{2017i} denote the values of the variables “Has debt”, “Risk averse”, “Expectation income vs prices”, and “Expectation house price” described in Table 1 and the Appendix for household i in the 2017 or 2013 survey, x_{2013ik} denotes the control variables and z_{2013is} denotes exclusion restrictions, and u_i denotes the error term. α_0 , α_1 , α_2 , α_3 , γ_k , δ_s are the parameters. $F(\cdot)$ denotes the cumulative distribution function for a standard normally distributed random variable.

The Heckman outcome equation is:

$$\ln(\text{LS}_{2017i}) = \beta_0 + \beta_1(\text{RA}_{2013i}) + \beta_2(\text{EIP}_{2013i}) + \beta_3(\text{EHP}_{2017i}) + \sum_{k=1}^K \mu_k x_{2013ik} + \theta \text{IMR}_i + u_i \quad (2)$$

where LS_{2017i} is the outstanding balance of liabilities of household i in the 2017 survey and IMR_i denotes the inverse of the Mills' ratio for household i , which corrects for the selection in the outcome equation. β_0 , β_1 , β_2 , β_3 , μ_k , θ are the parameters.

The Heckman selection and outcome equations described above are estimated for the total debt, covering both mortgage and non-mortgage loans, and for mortgage loans and non-mortgage loans separately. The Heckman model is also used for modelling the debt service-to-income ratio of the household.

It should be noted that the models with the dependent variable for whether the household had applied for credit are estimated for the panel of households that participated in both the 2013 and 2017 HFCS. The values of the dependent variable of the models are taken from the 2017 HFCS, while the values of the explanatory variables are taken from the 2013 HFCS. The same applies for the models with the dependent variables for whether the household received credit and for whether the household did not apply for credit because of a perceived credit constraint, and also for the Heckman models estimated. The rationale behind this is the assumption that the situation for the loan liabilities of households in 2017 was affected by the decisions taken previously, which are assumed to be affected by the past values of different

explanatory variables. The variable for house price expectation is only available in the 2017 survey and so this is used. In the probit models estimated with expectations and risk attitudes as dependent variables, the values of both the dependent variables and the explanatory variables are taken from the 2017 HFCS and these models are estimated using the whole sample of the 2017 HFCS.

The HFCS data are multiply-imputed data⁹ and the estimations of the models are carried out in the multiple imputation (MI) regime in Stata. Imputed variables in the HFCS dataset include components of net assets, income and consumption; details of loans such as the interest rate, the year the loan was taken, the maturity of the loan, and its initial value and current value; indicators for credit constraints; and some components of pension plans (Eesti Pank. The Estonian Household Finance and Consumption Survey (HFCS), methodological report).

The models describing how risk attitudes and expectations are formed are estimated so that the household member-level variables take the values of the interview reference person. The other models are estimated so that the household member-level variables take the values of the Canberra definition reference person. The interview reference person was in the large majority of cases the person who answered the household questionnaire, also including the questions about the risk attitudes and expectations. This means it may be informative to use the characteristics of this person to analyse how those risk attitudes and expectations are formed. The characteristics of the Canberra definition reference person may, however, provide more information for the household's borrowing decisions. As a robustness check, the models are also estimated so that the household member-level variables take the values of the Canberra definition reference person for models describing the formation of risk attitudes and expectations and of the interview reference person for the other models. The main results of this paper are robust to changes in the choice of the reference person and the choice of the explanatory variables included in the models.

5. Results

Before the analysis of the relations between expectations, risk attitudes and the credit variables is conducted, the factors related to these expectations and risk attitudes are clarified. Table 2 gives an indication of the main variables that may affect how expectations and attitudes towards risk are formed. Income, age, education, employment status, gender, and the perceived ability to get financial assistance from friends or relatives can be noted as particularly important factors.

In the 2017 survey, 70% of households were not willing to take any financial risk. Higher income, a higher level of education, being employed, and perceiving the ability to get financial assistance from friends or relatives were positively related to a willingness to take risk. The magnitude of the average marginal effect is largest for age. Households where the reference person is aged 20–34 are 21.5 percentage points less likely to be risk averse than households where the reference person is aged 50–64. The magnitude of the effect is also quite large for income and education. Households in the quintile with the highest income are about 20.3 percentage points less likely to be risk averse than households in the lowest income quintile.

⁹ More information on the multiple imputation of the data can be found in the methodological reports of the HFCS: Eesti Pank. The Estonian Household Finance and Consumption Survey (HFCS), methodological report; European Central Bank (2013); European Central Bank (2016); European Central Bank (2020c).

The probability of those with tertiary-level education being risk averse is 17.8 percentage points lower than the probability for those with less than upper-secondary education. The results also indicate that men are less risk averse than women, but that effect is relatively small next to the effects of age, income and education.

My results that income and education are negatively related to risk averseness are in line with quite a lot of previous studies (examples of these are provided in de Venter et al. (2012) and Tavor (2019)). Several previous studies have also found a positive relationship between age and risk averseness, and have found that women are more risk averse than men are (examples of these are provided in de Venter et al. (2012) and Tavor (2019), while some examples for gender differences are also provided in Fisher and Yao (2017) for example). Banks et al. (2020) show that an increase in risk averseness at older ages can largely be explained by health changes and other life events, such as retirement, widowhood or marital change. Fisher and Yao (2017, p. 191) point out that “gender differences in financial risk tolerance are explained by gender differences in the individual determinants of financial risk tolerance, and that the disparity does not result from gender in and of itself”. Their study finds income uncertainty to be a variable that intermediates the effect of gender on financial risk tolerance.

As can be seen from Table 2, most of the main characteristics of a household are not significantly related to its expectations about its future financial situation. The household’s perceived ability to get financial assistance from friends or relatives seems to contribute to optimism in its expectations, though it is not impossible that optimism encourages the expectation that assistance is available from friends or relatives. It is notable that younger people and men may be more optimistic in their income expectations, though the magnitude of the effect of gender is not very large.

Table 2. Estimated probit models for explaining expectations and risk aversion

	Dependent variable: Expectation income vs prices (2017)	Dependent variable: Expectation house price (2017)	Dependent variable: Risk averse (2017)
<i>Income quintile (reference group: 1st quintile) (2017)</i>			
2 nd quintile	-0.0209 (0.0327)	-0.0189 (0.0298)	-0.0522 (0.0536)
3 rd quintile	0.00584 (0.0324)	-0.0263 (0.0281)	-0.0739 (0.0514)
4 th quintile	0.0139 (0.0329)	-0.0235 (0.0288)	-0.137*** (0.0519)
5 th quintile	0.0197 (0.0335)	-0.0267 (0.0311)	-0.203*** (0.0534)
<i>Age (reference group: 50-64 years) (2017)</i>			
20-34 years	0.0937*** (0.0186)	0.00431 (0.0174)	-0.215*** (0.0281)
35-49 years	0.0615*** (0.0209)	-0.00776 (0.0191)	-0.105*** (0.0274)
<i>Education level (reference group: second stage of basic education or below) (2017)</i>			
Education level: upper secondary or post-secondary	0.00728 (0.0215)	0.00805 (0.0260)	-0.0931** (0.0396)
Education level: tertiary	0.0260 (0.0258)	-0.0105 (0.0260)	-0.178*** (0.0419)
Male (2017)	0.0331** (0.0140)	0.0147 (0.0138)	-0.0403* (0.0212)
Employed (2017)	0.0112 (0.0180)	0.0113 (0.0185)	-0.0683** (0.0282)
Married (2017)	-0.0164 (0.0146)	-0.00646 (0.0143)	0.0314 (0.0245)
Financial assistance from friends or relatives (2017)	0.0547*** (0.0143)	0.0255* (0.0149)	-0.124*** (0.0203)
Household size (2017)	0.000435 (0.00610)	0.00616 (0.00561)	-0.00255 (0.00939)
Number of observations	2228	2245	2243
Pseudo R ² ^a	0.120	0.011	0.183

Notes: Average marginal effects of the variables. Standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.

^a Calculated as the arithmetic mean of the values of Pseudo R² in the models estimated for each implicate separately.

Sources: Estonian Household Finance and Consumption Survey; author's calculations.

The following analysis concerns different aspects of borrowing. Models (1) and (2) in Table 3, which include no control variables, show that optimistic expectations held by a household for income and house prices are statistically significantly and positively related to the decision of the household to apply for credit. At the same time, model (3) shows risk averse households are less likely to apply for credit. However, when control variables are added, the variables describing expectations become insignificant.¹⁰ It seems that the variables describing a household's expectations are on their own related to the decision to apply for a loan, but in this setting they do not contain any relevant additional information beyond the main economic and socio-demographic characteristics of the household. These results could be viewed in the context of the general state of the economy in Estonia in 2013 to 2017, which was a time of economic expansion. Ahmed and Cassou (2016, p. 86) point out that “during economic expansions, consumer confidence shocks likely reflect news, while during economic contractions, consumer confidence shocks are consistent with animal spirits”. It might in consequence be that the confidence indicators of households did not contain much of the animal spirits, which are states that cannot be explained by economic rationality.

In the 2017 survey, 30% of households had applied for credit within the previous three years. Model (4) in Table 3 shows the reluctance of the household to take any financial risk is, on average, related to the probability of the household applying for a loan being 6.7 percentage points lower. The magnitude of this average marginal effect on the probability of applying for a loan is about two sevenths of the effect of being aged between 20 and 34, and half the size of the effect of being employed.

Although the willingness to take some financial risk is related to a larger probability of applying for a loan, it is statistically insignificant in explaining whether the loan application was satisfied, as shown in model (5) in Table 3.¹¹ It is also irrelevant for the probability of not applying for credit because of a perceived credit constraint, as shown in model (6) in Table 3.¹²

¹⁰ They are also insignificant in the model that only contains expectations and risk aversion as explanatory variables. In the model containing only expectations as explanatory variables, the variable for expectations about future income is significant.

¹¹ It is also insignificant in the model without the control variables.

¹² It is also insignificant in the model without the control variables.

Table 3. Estimated probit models for explaining households applying for credit, receiving credit and not applying for credit due to perceived credit constraints

	Dependent variable: Applied (2017)				Dependent variable: Received (2017)	Dependent variable: Perceived constraint (2017)
	(1)	(2)	(3)	(4)	(5)	(6)
Expectation income vs prices (2013)	0.0960* (0.0511)			0.0187 (0.0466)	0.0716 (0.0709)	-0.0391 (0.0351)
Expectation house price (2017)		0.0868** (0.0433)		0.0574 (0.0530)	0.0562 (0.0493)	0.0251 (0.0394)
Risk averse (2013)			-0.149*** (0.0301)	-0.0674** (0.0318)	0.0558 (0.0403)	-0.0251 (0.0219)
<i>Income quintile (reference group: 1st quintile) (2013)</i>						
2 nd quintile				-0.0144 (0.0667)	0.0224 (0.0949)	-0.00604 (0.0361)
3 rd quintile				-0.0137 (0.0617)	0.0593 (0.0831)	-0.0188 (0.0356)
4 th quintile				-0.0160 (0.0594)	0.0374 (0.0847)	-0.0438 (0.0355)
5 th quintile				0.0598 (0.0604)	0.188** (0.0872)	-0.0453 (0.0340)
<i>Age (reference group: 50-64 years) (2013)</i>						
20-34 years				0.236*** (0.0386)	-0.0200 (0.0506)	0.0218 (0.0245)
35-49 years				0.151*** (0.0344)	0.0702 (0.0565)	-0.000817 (0.0215)
<i>Education level (reference group: second stage of basic education or below) (2013)</i>						
Education level: upper secondary or post-secondary				-0.0763 (0.0476)	0.106** (0.0516)	-0.0634** (0.0275)
Education level: tertiary				-0.0995** (0.0496)	0.0720 (0.0530)	-0.0653** (0.0292)
Employed (2013)				0.132*** (0.0462)	-0.0840 (0.0618)	0.0191 (0.0294)
Household size (2013)				0.00700 (0.0111)	-0.0260* (0.0154)	0.00682 (0.00601)
Number of observations	1318	2278	1321	1318	416	1318
Pseudo R ² ^a	0.003	0.002	0.020	0.081	0.123	0.038

Notes: Average marginal effects of the variables. Standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.

^a Calculated as the arithmetic mean of the values of Pseudo R² in the models estimated for each implicate separately.

Sources: Estonian Household Finance and Consumption Survey; author's calculations.

Tables 4–6 present the estimated Heckman models. Table 4 covers the total debt of the household, Table 5 presents mortgage debt and non-mortgage debt separately, and Table 6 shows the debt service burden. Table 4 shows that reluctance of a household to take any financial risk is statistically significantly and negatively related to the size of that household's debt even when the other main characteristics of the household and the selection are controlled for. It is interesting that income is a statistically significant factor in explaining whether or not the household has debt, meaning it is important in the Heckman selection equation, but after the selection is controlled for, the significance of income disappears for explaining the size of total debt in the Heckman outcome equation. Table 5 shows that income is still important for explaining the size of mortgage debt.

Table 4. Estimated Heckman model for explaining the size of total debt

	Selection equation: Has debt (2017)	Outcome equation: Logarithm value of Liabilities size (2017)
Expectation income vs prices (2013)	0.0432 (0.0506)	0.0338 (0.265)
Expectation house price (2017)	-0.00305 (0.0540)	-0.259 (0.366)
Risk averse (2013)	-0.0433 (0.0328)	-0.720*** (0.182)
Annual income ^a (2013)	0.0296** (0.0125)	0.101 (0.117)
<i>Age (reference group: 50-64 years) (2013)</i>		
20-34 years	0.229*** (0.0363)	0.570 (0.486)
35-49 years	0.200*** (0.0345)	-0.0415 (0.464)
<i>Education level (reference group: second stage of basic education or below) (2013)</i>		
Education level: upper secondary or post-secondary	-0.0116 (0.0514)	0.507* (0.287)
Education level: tertiary	-0.0135 (0.0532)	0.606** (0.305)
Employed (2013)	0.121*** (0.0415)	
Household size (2013)	0.0347*** (0.0126)	
Constant		11.27*** (2.674)
Inverse of Mills' ratio		-9.717*** (3.303)
Number of observations	1318	830
Pseudo R ^{2b}	0.112	
Adjusted R ^{2b}		0.202

Notes: Average marginal effects of the variables in the selection equation and coefficients of the variables in the outcome equation. Standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.

^aTransformed by inverse hyperbolic sine.

^bCalculated as the arithmetic mean of the values of Pseudo R² or Adjusted R² in the models estimated for each implicate separately.

Sources: Estonian Household Finance and Consumption Survey; author's calculations.

Table 5 finds slightly different results for mortgage loans and non-mortgage loans. For mortgage loans, risk aversion is related to the probability of the household having a loan, as risk aversion is statistically significant in the Heckman selection equation, whereas for non-mortgage loans, risk aversion is related to the size of the outstanding liabilities since risk aversion is statistically significant in the Heckman outcome equation. This result seems intuitively logical. Since a mortgage loan is a large liability for a long period of time, the decision on whether or not to take on such a liability depends on how risk averse the household is. Non-mortgage loans are usually smaller and have a shorter term, so the decision of whether to take on this type of liability is easier to take and less demanding of risk-tolerance. It is, however, risk-tolerant households that take larger non-mortgage loans. Brown et al. (2013) find a negative relationship between risk aversion and the level of debt for both mortgage and non-mortgage debt. My slightly different result for mortgage loans may arise because a different method, the Heckman model, was applied in this study.

It is worth noting from Tables 4 and 5 that the magnitude of the effect that the risk aversion has on loan size is relatively large. The relatively large effect of risk attitudes on the level of debt is also pointed out by Brown et al. (2013). Tables 4 and 5 show that the outstanding balance of total liabilities is on average 72% smaller for households reluctant to take any financial risk and the balance of non-mortgage debt is 38.6% smaller *ceteris paribus*.

Table 5. Estimated Heckman models for explaining the sizes of mortgage and non-mortgage debt

	Selection equation: Has mortgage debt (2017)	Outcome equation: Logarithm value of Mortgage debt size (2017)	Selection equation: Has non-mortgage debt (2017)	Outcome equation: Logarithm value of Non-mortgage debt size (2017)
Expectation income vs prices (2013)	0.0282 (0.0449)	-0.0151 (0.214)	0.00621 (0.0573)	0.133 (0.275)
Expectation house price (2017)	0.0326 (0.0515)	-0.222 (0.216)	0.0205 (0.0592)	-0.145 (0.357)
Risk averse (2013)	-0.117*** (0.0283)	-0.212 (0.238)	-0.000481 (0.0355)	-0.386** (0.171)
Annual income ^a (2013)	0.0297 (0.0224)	0.201** (0.0953)	0.0285** (0.0122)	-0.0194 (0.125)
<i>Age (reference group: 50-64 years) (2013)</i>				
20-34 years	0.258*** (0.0352)	0.558 (0.473)	0.145*** (0.0409)	0.271 (0.386)
35-49 years	0.201*** (0.0324)	0.149 (0.398)	0.148*** (0.0369)	-0.228 (0.412)
<i>Education level (reference group: second stage of basic education or below) (2013)</i>				
Education level: upper secondary or post-secondary	0.0947* (0.0504)	0.358 (0.366)	-0.0397 (0.0543)	0.0369 (0.286)
Education level: tertiary	0.111** (0.0534)	0.707* (0.375)	-0.0910 (0.0561)	-0.0411 (0.354)
Employed (2013)	0.137*** (0.0449)		0.114*** (0.0439)	
Household size (2013)	0.0175* (0.0102)		0.0342*** (0.0126)	
Constant		8.427*** (2.713)		11.34*** (3.050)
Inverse of Mills' ratio		-1.899 (2.569)		-8.247** (3.798)
Number of observations	1318	380	1318	720
Pseudo R ² ^b	0.158		0.061	
Adjusted R ² ^b		0.195		0.064

Notes. Average marginal effects of the variables in the selection equations and coefficients of the variables in the outcome equations. Standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.

^aTransformed by inverse hyperbolic sine.

^bCalculated as the arithmetic mean of the values of Pseudo R² or Adjusted R² in the models estimated for each implicate separately.

Sources: Estonian Household Finance and Consumption Survey; author's calculations.

Table 6 presents the results of the Heckman model describing the factors of the debt service burden of the household. It shows that the expectations and risk aversion of the household are not significantly related to the household's debt service-to-income ratio.

Table 6. Estimated Heckman model for explaining the debt service-to-income ratio

	Selection equation: Has debt (2017)	Outcome equation: Debt service to income ratio (2017)
Expectation income vs prices (2013)	0.0432 (0.0506)	-0.0141 (0.00976)
Expectation house price (2017)	-0.00305 (0.0540)	0.0141 (0.0163)
Risk averse (2013)	-0.0433 (0.0328)	-0.0145 (0.0106)
Annual income ^a (2013)	0.0296** (0.0125)	0.00497 (0.00626)
<i>Age (reference group: 50-64 years) (2013)</i>		
20-34 years	0.229*** (0.0363)	0.0341 (0.0269)
35-49 years	0.200*** (0.0345)	0.0391 (0.0258)
<i>Education level (reference group: second stage of basic education or below) (2013)</i>		
Education level: upper secondary or post-secondary	-0.0116 (0.0514)	-0.00577 (0.0206)
Education level: tertiary	-0.0135 (0.0532)	-0.0240 (0.0200)
Employed (2013)	0.121*** (0.0415)	
Household size (2013)	0.0347*** (0.0126)	
Constant		-0.108 (0.156)
Inverse of Mills' ratio		0.360* (0.202)
Number of observations	1318	663
Pseudo R ² ^b	0.112	
Adjusted R ² ^b		0.020

Notes. Average marginal effects of the variables in the selection equation and coefficients of the variables in the outcome equation. Standard errors in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels respectively.

^aTransformed by inverse hyperbolic sine.

^bCalculated as the arithmetic mean of the values of Pseudo R² or Adjusted R² in the models estimated for each implicate separately.

Sources: Estonian Household Finance and Consumption Survey; author's calculations.

An interesting conclusion that can be drawn from Table 6 is that risk aversion is not related to the level of the debt service burden of the household. However, it should be noted here that the debt service-to-income ratio is not fully controlled by households themselves and may change over time through increases in interest rates or falls in incomes for example.

6. Conclusion and discussion

The results of this study highlight how important the attitude of the household towards risk is in decisions related to borrowing.

The analysis shows that risk-tolerant households apply for loans more often than risk-averse households do, and their loans are typically larger. It is also of note that the effect of risk aversion on debt size is quite large. However, risk aversion is not related to the level of the debt service burden measured by the debt service-to-income ratio of the household. Both these results are relevant for financial stability analysis, since if risk-tolerant households do not increase their debt service burden by too much more than risk-averse households, the risks for households themselves and for the financial system are reduced. However, the absolute size of debt, which my analysis shows to be related to risk attitude, is relevant for the extent of the possible problems that households and the financial system could face if the incomes of households were to fall or interest rates to rise, and loan repayment difficulties were then to arise.

Deeper analysis is merited for the differences between the results for mortgage loans and those for non-mortgage loans. The analysis shows that for mortgage loans, risk aversion is related to the probability of having a loan, whereas for non-mortgage loans, risk aversion is related to the size of the outstanding liabilities. This is intuitive. Since a mortgage loan is a large liability for a long period of time, deciding to take that loan requires a certain amount of risk tolerance. The amount of risk tolerance needed to take a non-mortgage loan depends on the size of the loan, and larger non-mortgage loans are taken by risk-tolerant households.

This study has shown for the factors related to the risk averseness of the household that the probability of the household being unwilling to take on any financial risk is negatively related to its income, its reference person's level of education, its reference person being employed, and it perceiving the ability to get financial assistance from friends or relatives, while the probability is positively related to the age of the household's reference person. The results also indicate that men are less risk averse than women. These results for Estonia are in line with quite many previous studies by other authors from different countries and regions, and examples of such studies are provided in de Venter et al. (2012), Tavor (2019), and Fisher and Yao (2017) among others.

Finally, van Oest and Franses (2008) and Segers et al. (2017) have pointed out the problem that consumer confidence is often measured using repeated cross-sectional data, where assessments of confidence are collected at different time points from different households rather than from the same households, which makes it difficult to interpret changes in the indicators. The set of microdata used in this study from the Household Finance and Consumption Survey provides a great opportunity to investigate the stability of proxies of confidence and risk attitudes within the same households over time in the future if more waves of the survey are carried out.

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Appendix

Table A1. Description of the variables used in the analysis

Variable	Description of the variable
Applied	Household has applied for credit within the last three years (1=yes, 0=no).
Received	Household received as much credit it applied for within the last three years, variable only defined for households that had applied for credit within the last three years (1=yes, 0=no).
Perceived constraint	Household has not applied for credit due to perceived credit constraints (1=yes, 0=no). The question in the HFCS questionnaire was “In the last three years, did you (or another member of your household) consider applying for a loan or credit but then decided not to, thinking that the application would be rejected?”
Has debt	Household has debt (1=yes, 0=no).
Has mortgage debt	Household has mortgage debt (1=yes, 0=no).
Has non-mortgage debt	Household has non-mortgage debt (1=yes, 0=no).
Liabilities size	Total outstanding balance of household’s liabilities, in euros. Variable only defined for households with debt.
Mortgage debt size	Outstanding balance of household’s mortgage debt, in euros. Variable only defined for households with mortgage debt.
Non-mortgage debt size	Outstanding balance of household’s non-mortgage debt, in euros. Variable only defined for households with non-mortgage debt. Variable includes outstanding balances on credit lines or overdrafts, outstanding balance of credit cards for which the owner of the card is charged interest, and outstanding balances on other non-mortgage loans (including private loans from relatives, friends, etc.) and leases.
Debt service to income ratio	Share of debt payments to gross income of the household. Variable only defined for households holding debt instruments for which payments are collected.
Expectation income vs prices	Household expects its total income to go up more than prices over the next year (1=yes, 0=no).
Expectation house price	Household expects the price of the residence the household is living in to increase by more than 5 per cent over the next 12 months (1=yes, 0=no).
Level of risk aversion	The question in the HFCS questionnaire was: “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?” The options for answers include the following: a) take substantial financial risks expecting to earn substantial returns (variable takes the value 1); b) take above average financial risks expecting to earn above average returns (variable takes the value 2); c) take average financial risks expecting to earn average returns (variable takes the value 3); d) not willing to take any financial risk (variable takes the value 4).
Risk averse	Household is not willing to take any financial risk (1=yes, 0=no).
Income quintile	Income quintile (based on the sample also including households with reference person of age <20 or >64 years) of the household.
Annual income	Annual gross income of the household, in euros.
Age	Age of the reference person of the household.
Education	Highest completed education of the reference person of the household. The variable has possible values from 0 to 6 in the 2013 survey and possible values from 0 to 8 in the 2017 survey.
Male	Gender of the reference person of the household is “male” (1=yes, 0=no).
Employed	The reference person of the household is employed (1=yes, 0=no).
Married	The reference person of the household is married (1=yes, 0=no).
Household size	Number of members in the household.
Financial assistance from friends or relatives	The household perceives that it can get financial assistance from friends or relatives (1=yes, 0=no). The question in the HFCS questionnaire was: “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?”

Source: Author’s compilation based on: Eesti Pank. The Estonian Household Finance and Consumption Survey (HFCS), methodological report; European Central Bank 2020a; European Central Bank 2020b.

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