Households Borrowing During a Creditless Recovery

Jaanika Meriküll

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Abstract

This paper investigates the contribution of households to the creditless recovery. We use Estonian cross-sectional microdata on households' assets, liabilities, income, expectations and intention to use credit in 2001–2010. The results indicate that (1) there was a large-scale drop in households demand for credit during the recession and sluggish recovery after the recession. (2) One third of the sluggish recovery in credit demand is explained by changed household endowments such as income reduction and lower income expectations, while two thirds is explained by changed behavioural relations such as renters taking mortgages less often and employed individuals using credit less often. (3) Changed behavioural relations explain a higher proportion of the credit demand drop in longer-term credit such as loans than in shorter-term credit such as credit card purchases. (4) 44% of households who wanted to use credit were credit constrained during the recovery and households with lower credit worthiness were more likely to apply for credit.

Non-technical summary

The downswing in the Estonian economy turned into growth in 2010. However, contrary to traditional economic growth patterns, the growth was not accompanied by a recovery in credit volumes. The credit stock has been decreasing since 2009 in all major customer groups, for both companies and households. This is not usual in international practice, but neither is it uncommon. In developed countries, every fifth or sixth recovery from economic recession is usually creditless. This occurs even more frequently in developing countries, where every fourth recovery is creditless (Abiad et al. (2011); Bijsterbosch and Dahlhaus (2011)).

According to scientific literature, the aforementioned recovery from economic recession is more likely to occur when the recession is preceded by a rapid growth in the debt burden, a current account deficit and a rise in real estate prices, and when the recession is accompanied by banking and exchange rate crisis. The deeper the recession, the higher is the likelihood of creditless recovery. Although Estonia managed to avoid both the banking and the exchange rate crisis, the rapid growth in the debt burden together with the rise in real estate prices preceding the recession and the depth of the recession (-14% in 2009) place Estonia among countries facing a high risk of creditless recovery. Based on the experience of developed countries, Bijsterbosch and Dahlhaus (2011) estimate, for example, that the probability of a creditless recovery following the last economic recession is 94% in Latvia, 43% in Estonia and 41% in Lithuania. Hence, the continuously modest borrowing activity and the decrease in outstanding loan stock in Estonia are not surprising.

The majority of international scientific literature focuses on the business sector in analysing creditless recovery. The role of households has been far less analysed. Theoretical approaches, linking loan decisions of households to macro level business and credit cycles, show that the borrowing activity of households should be procyclical. Many studies have found that households' housing investments are procyclical, while being the leading indicator of economic growth. The Estonian macroeconomic data, however, do not confirm such procyclicality for 2010–2011.

The present paper aims to analyse the borrowing behaviour of households during the creditless recovery that started in 2010, based on Estonian data. The share of households in the outstanding loan stock of all Estonian residents and non-residents grew sharply during the boom period, from 23% to 43% in 2001–2007. As corporate loans are usually with shorter maturities and the outstanding corporate loan stock decreased more rapidly during the recession, the share of households in the outstanding loan stock reached as high as 50% in 2011. Therefore, households play an important role in the creditless recovery

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of recent years in terms of loan volumes.

The analysis draws on the micro data of the TNS Emor F-monitoring survey on household assets, liabilities, income and borrowing intentions during 2001–2010. Approximately 1,000 households are surveyed every year. This allows to conduct an analysis of cross-sectional data of 10,000 households over the period of ten years. Households' borrowing intentions during the period of rapid growth and the period of creditless recovery are compared in the analysis.

Results show that household credit demand grew sharply between 2004 and 2007 and dropped sharply (35%) in 2009 from 2008. While in 2008, 28% of households intended to take a loan, sign a lease agreement, use a hire purchase or a credit card debt in the coming year, by 2009 this share had dropped to 18%, the lowest level in a decade. Although growth started to pick up in 2010, household credit demand remained modest.

A component analysis shows that a third of the drop in household credit demand can be explained by household characteristics as lower incomes and lower income expectations. The remaining two thirds result from the change in households' behavioural relations, such as lower credit demand of households living in rentals or employed households having lower demand for credit. Changes in behavioural patterns explain the majority of the modest demand for long-term credit and, for smaller extent, the demand for short-term credit. The role of the loan supply in household credit volumes seems important at first sight (44% of households faced credit constraints in 2010). However, this share can be largely explained by the fact that households with high indebtedness and low incomes are more likely to apply for credit.

Contents

1. Introduction

Recessions followed by creditless recoveries are not a rare phenomena. Historical episodes of recessions followed by growth recovery without credit recovery have recently inspired numerous papers on the subject. The empirical regularities over the last decades are that one of every five or six recessions is followed by a creditless recovery in developed economies (Abiad et al. (2011)) and one of every four in developing economies (Bijsterbosch and Dahlhaus (2011)). While recessions coinciding with financial crises generally have steeper declines and more sluggish growth afterwards[1], Claessens et al. (2009) find that globally synchronised recessions are deeper and usually coincide with credit contraction and household and equity price declines.

Many determinants of creditless recoveries have been identified by the empirical literature. Country-level analysis by Abiad et al. (2011) indicates that a credit boom prior to the recession and recessions that coincide with banking crises are the main factors. While the first factor captures the "normal" situation with lowered credit demand and deleveraging, the second factor may lead to possible distortions in production structure towards lower production in credit dependent industries and more severe asymmetric information problems. They find that currency and sovereign debt crises have a smaller effect on the propensity towards a creditless recovery. Productivity and capital deepening are especially adversely affected during a creditless recovery, while creditless recoveries do not necessarily coincide with jobless recoveries. Another cross-country finding is that creditless recoveries are the more probable the deeper the preceding decline. Bijsterbosch and Dahlhaus (2011) add currency crises to this list of determinants of creditless recovery in their similar paper, but they use data from developing countries.

Biggs et al. (2009) criticise the notion of creditless growth by focusing researchers' attention on the fact that economic growth is based on GDP, which is a flow variable, while credit growth is based on the stock of credit. They suggest explaining GDP growth by the second difference of credit (the growth of credit growth) in the empirical analysis and define this as the "credit impulse". They show that their suggestion is empirically valid and that the credit impulse is more important than credit growth in explaining the post-recession recovery in GDP growth.

The aim of this study is to investigate the contribution of households to the creditless recovery. Up to our knowledge, this is the first study to analyse empirically household micro level decisions over the credit cycle and in the

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[1]See Cerra and Saxena (2008), Bordo and Haubrich (2009), Abiad et al. (2011) and Kannan (2010).

creditless recovery. We make use of the Estonian household-level F-monitor microdata of 2001–2010 on real and financial wealth, income dynamics and expectations, household social characteristics, and, most importantly, credit demand. The dataset is cross-sectional and covers around 1000 households yearly. The survey collects data on households' intention of using credit within the next twelve months over a large set of credit types: loans including real estate collateralized and non-collateralized loans, lease purchases, hire purchases and credit card purchases. We use these households' self-estimated intentions of using credit as proxies for credit demand. We decompose the change in the demand for credit during creditless recovery into changes in endowments such as income and assets, and behavioural changes in households' credit demand such as changed income elasticities of credit demand. The standard Oaxaca-Blinder decomposition is used. Although our main focus is on credit demand we also use information on financial constraints to investigate their importance on the creditless recovery. The credit constraint data was only collected in 2010.

The analysis of creditless recoveries focuses usually on the business sector. There is a line of literature that demonstrates that at industry level, industries less dependent on external finance are hit less hard during recessions (Braun and Larrain (2005)) and grow faster after recessions associated with financial crises (Abiad et al. (2011), Kannan (2010)). This literature proceeds from the index proposed by Rajan and Zingales (1998) of dependence on external finance to identify the effect of credit stress on growth. Rajan and Zingales (1998) show that some industries are by definition more external finance dependent and that this regularity can be used to identify the causal effect of credit on growth. The usual conclusion is to confirm that the credit constraints are related to a more sluggish recovery. This effect is confirmed in both developed and developing countries. Country level analyses reach the same conclusion that financial factors are the most important ones behind creditless recoveries and that firms find a way to restore liquidity with less interaction with formal credit markets (Calvo et al. (2006)).

The contribution of the household sector to a creditless recovery has received less research attention. The latest empirical evidence on the housing, credit and real economy cycles by Igan et al. (2011) concludes that the household sector has a determinant role for the business cycles. They find from a wide and long dataset of developed countries that over the long term house prices lead the credit and real activity cycles in all of the countries. Residential investments lead house prices over the short and medium term and house prices and credit lead or co-move with interest rates. It is also found that US cycles lead the cycles of other countries. Leamer (2007) goes even further and shows that it would be better to talk of consumer cycles in the economy instead

of business cycles. He claims that consumer side residential investments lead recessions and that weakness on the business side coincides with recession.

Consumer residential investments are largely financed by debt. At the micro level, the household borrowing decisions are made based on the idea of permanent income hypothesis, i.e. households smooth consumption over the life-cycle. Iacoviello and Pavan (2011) seek to connect household micro level decisions with macro level business cycles by an equilibrium business cycle model. They demonstrate that households' residential investments and mortgage debt is pro-cyclical. Their model describes the latest recession well; if the debt burden is high, then higher household risks and lower downpayment requirements lead to the vulnerability of output to negative shocks. Latest empirical analysis confirms this finding. Jordà et al. (2011) show that credit intensive booms are followed by deeper recessions and slower recoveries.

Behavioural changes in household credit demand following the global financial crisis have been reported using the US data. According to Chakrabarti et al. (2011), households have been rebuilding their net wealth from savings and retirement accounts to pay back mortgage debt. Households increased their savings and reduced their consumption during the 2007 recession, and higher savings were used to pay down mortgage debt. Non-mortgage loans were paid down by a smaller amount or even increased for some loan types such as student loans. Households also plan to cut their consumption spending and pay down debt if their income increases by more than expected. At the same time Chakrabarti et al. (2011) showed that consumers also found it harder to take on debt in 2010.

The reactions of the USA and EU members to the latest crisis have been quite different. Dolls et al. (2010) show by microsimulation that automatic stabilisers in the EU absorb a higher share of income shock than do those in the USA. The difference in automatic stabilisers is much larger in the case of an unemployment shock. Stronger automatic stabilisers in Europe mean that the demand stabilisation is 50% higher in Europe than it is in the USA[2]. However, the automatic stabilisers are much weaker in Eastern Europe, and especially in Estonia, than they are in the rest of the EU. Estonian income and demand stabilisation coefficients are some of the lowest among EU members and are much closer to those of the USA than to the EU average. (Dolls et al. (2010))

The paper is organised as follows. The next section presents the background of the study in terms of a general country-level comparison providing a description of the environment from which the dataset comes. Section 3

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[2]However, given the latest developments in Europe the full benefit and cost of stronger automatic stabilisers may not have been revealed yet.

presents the data and the empirical estimation strategy used. Section 4 presents the results in three subsections: first, we present the credit demand estimations for the whole period analysed, 2001–2010, and compare credit demand equations across different types of household debt; second we present the decomposition results for the determinants behind lower credit demand from households in creditless recoveries; lastly the characteristics of credit constraints in 2010 are presented. The last section summarises.

2.   Background of the study

The impact of the global financial crisis of 2007–2009 was especially severe for the countries of Central and Eastern Europe, including Estonia. These countries financed their rapid growth before the crisis heavily with capital inflows and current account deficits. When global trade collapsed and foreign capital lost interest in these suddenly risky markets, the rapid growth was replaced by a sharp and deep recession. Estonia's credit deepening and economic growth is depicted in Figure 1. The period of 2001–2007 describes the rapid economic and credit growth of the country (see the left-right red dotted arrow in Figure 1). The line of rapid growth was interrupted by recession in 2008–2009, but then the country started an export-driven recovery in 2010. Despite the recovery in the real economy, the decline in credit stock continued, indicating a period of creditless recovery (see the right-left red dotted arrow in Figure 1).

The creditless recovery experienced by the Estonian economy is not surprising. Although banking, exchange rate and sovereign debt crises were all avoided, the preceding credit boom and the extreme severity of the crisis exposed the country to a high risk of a creditless recovery. Among the countries with similar catching-up backgrounds, Estonia's level of credit deepening is among the highest (see the hollow markers on Figure 1). Bijsterbosch and Dahlhaus (2011) use their estimated historical regularities and data from 2009 to predict the probabilities of creditless recoveries starting in 2010 for Central and Eastern European countries. They make use of their estimations on the data from a wide set of low and middle income countries over 1970–2009. They estimate the probability of a creditless recovery by looking at credit deepening, currency crises, banking crises, current account deficits and other controls. The results indicate that the likelihood of a creditless recovery starting in 2010 is especially high for the Baltic states. For example the probability of Latvia experiencing a creditless recovery starting in 2010 is 94%, the probability for Estonia is 43% and the probability in Lithuania is 41%. The probability of the same risk being realised in other Central and Eastern
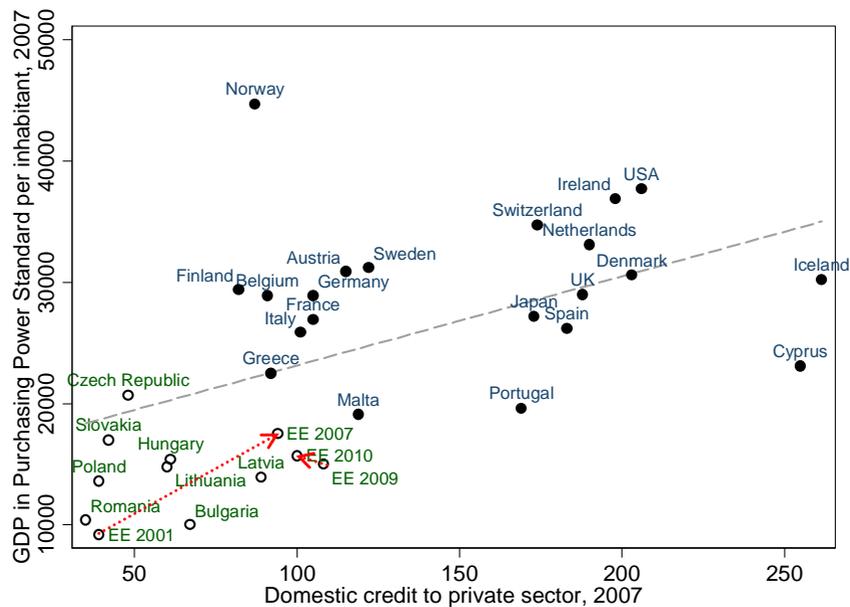
Figure 1: Credit deepening and income level, 2007
Note: Grey dotted line shows a linear OLS fit over the observed countries in 2007.
Source: World Bank (credit deepening), Eurostat (GDP).

European countries with similar backgrounds but a less severe drop in 2009 is between 1% and 15%. The effect of real estate prices has not been investigated by Abiad et al. (2011) or by Bijsterbosch and Dahlhaus (2011), but Estonia's pre-crisis real estate boom and the subsequent drop in the value of collateral may also have had an impact on lowering credit in the recovery.

The banking sector in the Central and Eastern European economies is largely owned by foreign banks, and this, coupled with the accession to global credit markets, financed the pre-crisis credit boom. Estonia has the region's highest share of foreign-owned banks by assets, at more than 90% in 2006, and one of the highest shares of foreign-currency loans in household loans, at more than 80% in 2008. (Marer (2010)). The high share of foreign-owned banks turned into an advantage during the recession as the banking system was supported by parent banks and there was no banking crisis. A currency crisis was also avoided. The fixed exchange rate[3] was maintained by internal devalua-

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[3]Estonia adopted a currency board system right after regaining independence shortly after the collapse of the Soviet Union in 1992. The exchange rate was initially fixed to the Deutschmark and then to the Euro, and the country became a member of the euro area from January 2011.

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tion through fiscal and nominal wage adjustment. See Purfield and Rosenberg (2010) for more details about Estonia's adjustment strategy during the global financial crisis.

Figure 2 shows the vast deepening of credit during the pre-crisis period. The total credit stock increased between 2001 and 2007 by 5.9 times, while households' credit stock increased by as much as 11.8 times. This corresponds to an increase in the share of the economy's total credit stock held by households from 23% to 45%. Since the global financial crisis, the credit stock held by households has started to decline. The deleveraging has been somewhat quicker in the business sector, which has shorter-term loans, and this has increased the share of total credit stock held by households to as high as 50% in 2011[4].
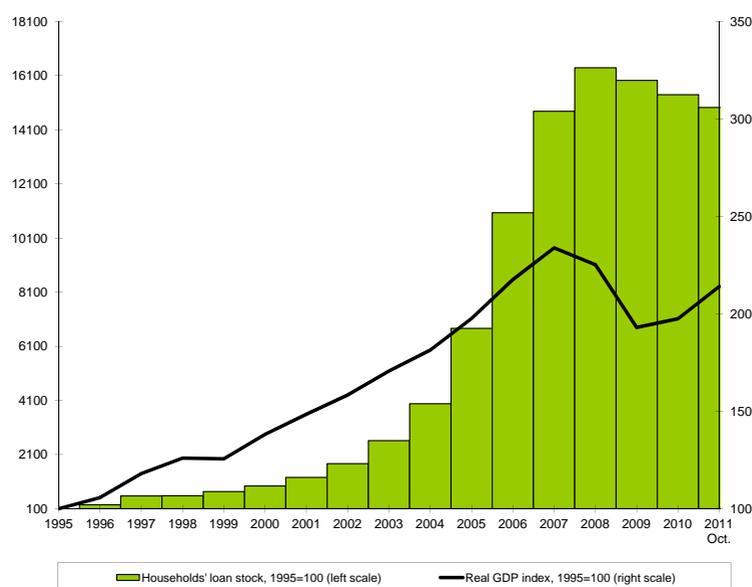
Figure 2: Estonian credit stock and real GDP index, 1995–2011
Source: Bank of Estonia (credit stock), Statistics Estonia (GDP).

The ratio of households' credit stock to GDP has also increased significantly in other Euro area countries since the 1990s, see for example Balta and Ruscher (2011). The Euro area household debt to GDP ratio reached 54% in 2009, and the ratio in Estonia also peaked in 2009 and reached the same level

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[4]See Bank of Estonia statistics on the stock of loans by customer group for more details: http://statistika.eestipank.ee/?lng=enlistMenu/898/treeMenu/FINANTSSEKTOR/147/650 .

of 54%. Given Estonia's lesser total private sector credit deepening and its lower level of development, the household sector debt is high by international standards and the deleveraging that has taken place since 2010 cannot come as a surprise. Estonia's household debt to GDP fell to 51% in 2010 and household sector deleveraging is expected to continue as the credit stock has also shrunk in 2011 while GDP growth is expected to be positive.

3. Data and methodology

The paper makes use of the financial monitoring microdata for households from TNS Emor, abbreviated to F-monitor. F-monitor contains information on households' assets, liabilities, income, expectations and borrowing intentions. The survey covers around 1000 households each year and has been conducted since 1998. We employ the data from the last ten years, 2001–2010. The survey is not conducted as a panel, i.e. it does not cover the same set of households every year.

The surveyed unit is the household and the population is all Estonian resident households. The survey design changes somewhat over the ten years. Stratified random sampling based on six major regions is used in 2001–2005 and simple random sampling in 2006–2010. The sample is drawn from the population register as at 1 January of the preceding year. The respondent is a household representative who is older than 18. From 2006 an upper age limit of 74 was also introduced. The "youngest male rule" is used to choose the respondent whereby the youngest male of the household within this age group is chosen for personal interview. If there is no male of such age in the household or the males are not present, the youngest female of the same age group is chosen for the interview.

The interviews were done with laptops using the CAPI (computer-assisted personal interviews) method and special filters and controls were programmed to minimise the number of mistakes made during the interviewing process. The response rate was quite high at 40–50% in 2001–2003, though the response rate is not reported for later years. The main reason for non-response was the absence of the household when the two visits were made to the address. Sampling weights are used to make the responding set of households representative of the whole population. The sampling weights show the number of households the sample household represents in the population of the same set of socio-demographic characteristics[5].

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[5]The survey covers 0.17% of the total population of households. The average size of the weight over ten years is 574, meaning each household represents almost 600 households in the population.

The main variable of interest is borrowing intentions, which is taken as a proxy of credit demand. Households' credit demand is measured by the following question: "Do you or members of your household intend to borrow within the next 12 months?" The same question is asked about loans, lease purchases, hire purchases and credit card purchases[6]. The answers are collected as ordered categorical variables, where respondents choose one of the following options: "Yes, certainly"; "Yes, probably"; "Do not know"; "Probably not"; "Certainly not". These answers are transformed into a binary credit demand variable which takes the value "1" if the household has responded "Yes, certainly" or "Yes, probably" and the value "0" if the household has responded "Probably not" or "Certainly not" or "Do not know".

The following Figure 3 presents the share of households intending to use credit in the following year in the form of loans, lease purchases, hire purchases or credit card debt. The credit card questions were not part of the survey before 2003. The credit demand follows the business cycle pictured in Figure 2 quite well, as credit demand was higher during the period of rapid growth in 2004–2007, dropped significantly during the economic down-turn in 2009 and recovered slightly in 2010.

Around 23% of households intended to use credit within the next 12 months in the pre-boom period of 2001–2003, then during the 2004–2008 boom years this share increased to 28%, from where it dropped to 18% during the deep recession of 2009. So while the economy dropped by 14.3% in real terms, households' intention to use credit dropped by 35.5% or there were 10%-points fewer households willing to use credit. When the economy started to grow again in 2010 (the survey was conducted in the third quarter of 2010 when the quarter-based yearly real growth was 5.1%), the recovery in households' intention to use credit was 2%-points. However, given the confidence intervals of the credit demand estimate, the improvement is not statistically significant.

We analyse borrowing intentions for all available credit types: loans, lease purchases, hire purchases and credit card purchases. The logit models are estimated to fit the observed binary credit demand proxy with the latent variable of credit demand:

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[6]Lease purchases are capital rents mostly used to pay for a car. There are two main types of leases, one with an obligation to buy the car when the contract ends, another with the option of buying the car when the contract ends. Hire purchases are used for small consumer goods purchases. The hirer will have the right to use the good after the hiring contract has been signed and will agree to pay for the good in parts. Hire purchases are also called instalment plan purchases. Swedbank, Estonia's largest commercial bank, says the yearly interest rate for a typical housing loan was 6 months Euribor + 1.5%; for a lease purchase it was 6 months Euribor + 3%; for a hire purchase 21.9% and for an American Express Blue credit card 21.009%. See https://www.swedbank.ee/private/credit/obligations/borrow_sensibly/percentageRate.
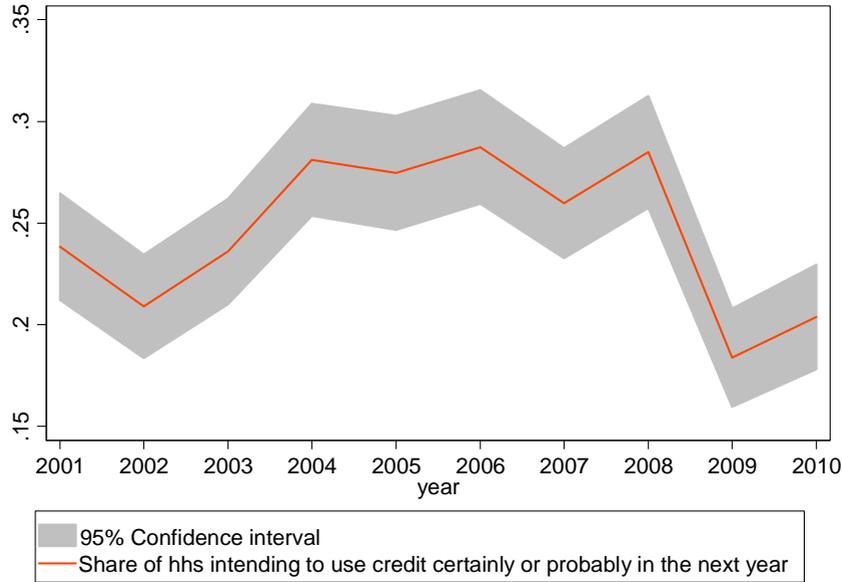
Figure 3: Households' (hhs) credit demand from F-monitor data, 2001–2011
Source: author's calculations from F-monitor survey data.

$$Pr(Intention\ to\ use\ credit_{i,k}|x_i) = \frac{1}{1+e^{-\beta x_i}}$$

where i stands for individual households and k for different types of credit, $k = 1, ..., 4$. The set of explanatory variables x_i includes: the existing debt burden of households; financial assets as savings stocks to monthly income; the existence of stocks, investment fund investments, and net lending between individuals; real income (in 2001 prices); household income change compared to the previous year; expected household income change for the next year; households' average yearly interest rate; household's responding member's and household's characteristics given as the responding member's age, ethnicity, sex and employment status and the household's size and location in one of six major regions. Some additional data on household wealth, measured as the amount of real estate or number of cars owned, and whether household is renting home has been collected since 2006. Since 2006 the intention to use collateral and non-collateral loans has also been differentiated, and in consequence we use two different estimation samples, the longer timespan of 2001–2010 and the shorter one of 2006–2010 with its richer set of variables. We also introduce year dummies to control for cycle effects.

Households' demand for credit originates from their rational behaviour

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aimed at smoothing intertemporal consumption and using lending or borrowing to transfer income intertemporally. These theories go back to the permanent income hypothesis of Friedman and state that under perfect credit markets households' consumption and their demand for credit should depend only on their permanent income calculated as expected total lifetime income based on physical and human assets, the interest rate, the household time preference rate and the intertemporal elasticity of substitution. However, this smoothing theory captures households' credit demand and supply decisions only under the existence of perfect credit markets with no credit constraints. This is rarely the case in reality. The empirical literature usually distinguishes a wider set of characteristics behind the demand of households for credit. Our dataset enables us to introduce the most common of these: household wealth, income dynamics and expectations, market average interest rate and the household's socio-demographic characteristics. There are, however, characteristics that we are not able to control for in this dataset, such as time-preferences, risk aversion, educational attainment and real estate prices.

Table 1 and Table 2 present a description of the variables. Many variables of the F-monitor data are binary or categorical. The monetary categorical variables are transformed into discrete continuous variables and deflated to the prices of the year 2001 using the CPI. If the respondent refused to answer, this was considered as a missing observation, though fortunately there were only a few observations like this for the household income. If the respondent answered "Do not know", dependent and explanatory variables were treated differently. For the dependent variable of the intention to use credit, the "Yes" answers were taken as a sign of the existence of demand, while the answer "Do not know" was treated like the "No" answers as an indication of no sign. For explanatory variables the answer "Do not know" was treated as a missing observation for all the variables.

4. Results

4.1. Credit demand by type of credit

Table 3 and 4 present the results of the estimated household credit demand equations for 2001–2010 and for 2006–2010. The shorter timespan was used as the more recent data enable real estate collateral loans and non-collateral loans to be distinguished and include data on household real assets and renting. The tables show that the existing debt burden measured by the debt service ratio only explains households' demand for shorter-term credit through hire purchases and credit card purchases statistically significantly. Surprisingly this

Table 1: Variables description, 2001–2010

Name	Type	Description	Mean, n=7277
		Dependent variables: credit demand	
Loans	[0;1]	1 if household certainly or probably intends to take a loan in the next year, 0 otherwise	0.070
Leases	[0;1]	1 if household certainly or probably intends to use lease purchase in the next year, 0 otherwise	0.061
Hire purchases*	[0;1]	1 if household certainly or probably intends to use hire purchase in the next year, 0 otherwise	0.086
Credit cards	[0;1]	1 if household certainly or probably intends to use credit card purchase in the next year, 0 otherwise	0.165
		Explanatory variables	
Debt burden	[cont.]	Household debt service ratio (monthly payments to income), self-estimated since 2004, authors' calculations based on monthly payments on loans, lease purchases and hire purchases (categorical variables) and income before 2004	0.071
Savings to income	[cont.]	Savings stock to monthly income divided by 100. Savings are collected as a continuous variable since 2006, categorical before 2006 (taken within group means with the threshold multiplied by 1.5 for the highest unlimited category)	0.046
Stocks	[0;1]	1 if household has stocks or bonds, 0 otherwise	0.028
Investments	[0;1]	1 if household has holdings in investment funds, 0 otherwise	0.032
Lending	[0;1]	1 if household is a creditor to other households, 0 otherwise	0.135
Income	[cont.]	Categorical income is transformed to continuous by taking within group means and multiplying the threshold by 1.5 for the highest unlimited category, in 2001 prices (based on CPI). In thous. EEK per household member.	3.175
Income change	[cat.]	Household's self-estimated perception of whether their current economic situation has, compared to last year: 2=improved significantly, 1=improved somewhat, 0=remained the same, –1=worsened somewhat or –2=worsened significantly	–0.024
Income expectations	[cat.]	Household's self-estimated perception of whether their economic situation next year will: 2=improve significantly, 1=improve somewhat, 0=remain the same, –1=worsen somewhat or –2=worsen significantly	0.071
Intr. rates	[cont.]	Yearly average interest rates for households	5.423
Age	[cont.]	Age of the responding household member	48.9
Ethnicity	[0;1]	1 if responding household member is Estonian, 0 otherwise	0.694
Sex	[0;1]	1 if responding household member is male, 0 if female	0.411
Wage-earner	[0;1]	if responding household member is a wage-earner, 0 otherwise	0.495
Self-employed	[0;1]	1 if responding household member is self-employed or an entrepreneur, 0 otherwise	0.045
Household's size	[cont.]	Size of the household	2.473
Regions	[0;1]	The country is divided into six main regions	

*Note: The answer "Do not know" is treated as absence of signal (value 0) for dependent variables and as a missing observation for explanatory variables. * denotes sample size of 5744 for 2003–2010 only.*
Source: F-monitor survey data.

Table 2: Variables description, additional variables in 2006–2010

Name	Type	Description	Mean, n=3416
		Dependent variables: credit demand	
Mortgages	[0;1]	1 if household certainly or probably intends to take a mortgage in the next year, 0 otherwise	0.034
Other loans	[0;1]	1 if household certainly or probably intends to take any other loan in the next year, 0 otherwise	0.028
		Explanatory variables	
Rents home	[0;1]	1 if household rents home, 0 otherwise	0.133
No of real estate properties	[cont.]	Number of real estates owned by household	1.198
No of cars	[cont.]	Number of cars owned by household	0.668

Note: The answer "Do not know" is treated as absence of signal (value 0) for dependent variables and as a missing observation for explanatory variables.
Source: F-monitor survey data.

relation is positive, as households with already relatively high debt burdens use credit more often for consumption goods purchases. This positive relationship probably originates from the type of household that is accustomed to using credit for consumption and from the fact that credit institutions are less careful about investigating credit worthiness for small consumer loans.

Home ownership has a statistically significant effect only on mortgage loan demand, which is a very logical result. Households who rent their home have a 1.5%-point higher probability of demanding a mortgage loan compared to households who own their home. This is a very high marginal effect given that the average share of households intending to take a mortgage is 3.4% in the sample. Estonian households are home owners rather than renters and this is typical for all the former centrally planned countries. According to Eurostat, the 2001 national level census showed that the ten former centrally planned EU member states had a significantly higher home ownership rate at 78% than did the EU15 countries at 66%. The average home ownership rate in the USA was 69% in 2004, before the crisis (Chakrabarti et al. (2011)). The Estonian home ownership rate reached 88% in 2006, but the adjustment in the home ownership rate due to the crisis has also been stronger in Estonia than for example in the USA, dropping to 83% in 2010 while the US rate fell to 67%.

Surprisingly savings do not have significant explanatory power for credit demand. Savings measured as savings to monthly income or as real savings don't have any role and nor do they for consumer credit. The same holds for real assets, as neither the number of real estate properties owned nor the number of cars owned can explain households' demand for credit. Financial assets

Table 3: Benchmark model of credit demand, 2001–2010

	Loans	Leases	Hire purchases	Credit card purchases
Debt burden	–0.009	0.016**	0.053***	0.145***
	(0.011)	(0.007)	(0.012)	(0.024)
Savings to income	0.002	0.001	–0.012	–0.005
	(0.001)	(0.001)	(0.018)	(0.008)
Stocks (d)	0.025*	0.004	–0.015*	0.054*
	(0.015)	(0.007)	(0.009)	(0.029)
Investments (d)	–0.021***	–0.005	0.009	0.054**
	(0.006)	(0.006)	(0.015)	(0.024)
Lending (d)	0.014**	0.008**	0.015**	0.009
	(0.006)	(0.004)	(0.007)	(0.011)
Income	0.001	0.002***	–0.002**	0.008***
	(0.001)	(0.001)	(0.001)	(0.002)
Income change	0.007***	0.003*	0.008***	–0.001
	(0.002)	(0.002)	(0.003)	(0.005)
Income expectations	0.005**	0.004**	0.007**	0.016***
	(0.003)	(0.002)	(0.003)	(0.005)
Interest rate	0.000	–0.002	0.007***	0.008
	(0.002)	(0.001)	(0.002)	(0.007)
Age	–0.002***	–0.001***	–0.002***	–0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Estonian (d)	–0.020***	–0.012***	0.009*	–0.022**
	(0.005)	(0.004)	(0.005)	(0.010)
Man=1 (d)	0.002	0.005*	–0.012***	–0.027***
	(0.003)	(0.003)	(0.004)	(0.008)
Wage-earner (d)	0.015***	0.022***	0.035***	0.086***
	(0.004)	(0.004)	(0.005)	(0.010)
Self-employed (d)	0.030**	0.073***	0.026*	0.116***
	(0.013)	(0.017)	(0.015)	(0.032)
Household size	0.004***	0.004***	0.004**	0.017***
	(0.001)	(0.001)	(0.002)	(0.003)
Control for year	Yes	Yes	Yes	Yes
Control for region	Yes	Yes	Yes	Yes
Predicted y	0.035	0.023	0.046	0.105
Actual y	0.070	0.061	0.086	0.165
F-test	21.4	18.7	21.1	30.6
Prob > F	0.000	0.000	0.000	0.000
No of obs	7277	7277	7277	5744

*Note: Survey estimation. Survey design based clustered standard errors in parenthesis. ***, **, * stand for statistical significance at the levels of 1%, 5% and 10% respectively. Source: author's calculations from F-monitor survey data.*

Table 4: Benchmark model of credit demand, 2006–2010

	Mortgages	Other loans	Leases	Hire purchases	Credit card purchases
Debt burden	−0.017	0.008	0.005	0.045***	0.158***
	(0.010)	(0.006)	(0.008)	(0.015)	(0.032)
Rents home (d)	0.015**	0.006	0.009	0.013	0.025
	(0.006)	(0.005)	(0.006)	(0.009)	(0.019)
No of real estate properties	−0.001	0.001	0.003	−0.002	0.011
	(0.002)	(0.001)	(0.002)	(0.004)	(0.007)
No of cars	−0.002	0.002	−0.001	−0.006	0.012
	(0.002)	(0.001)	(0.002)	(0.004)	(0.007)
Savings to income	−0.002	0.001	0.001	−0.001	−0.006
	(0.002)	(0.001)	(0.001)	(0.003)	(0.007)
Stocks (d)	−0.009	0.001	−0.004	−0.026***	0.048
	(0.006)	(0.006)	(0.006)	(0.007)	(0.035)
Investments (d)	−0.009**	−0.006**	0.005	0.020	0.036
	(0.004)	(0.003)	(0.008)	(0.016)	(0.027)
Lending (d)	0.009*	0.002	0.003	0.010	−0.001
	(0.005)	(0.003)	(0.004)	(0.008)	(0.014)
Income	−0.000	0.001*	0.002***	−0.001	0.008***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.002)
Income change	0.002	0.003*	0.003*	0.007**	0.004
	(0.002)	(0.001)	(0.002)	(0.003)	(0.007)
Income expectations	0.002	−0.001	0.003	0.005	0.007
	(0.002)	(0.002)	(0.002)	(0.004)	(0.007)
Interest rate	0.034***	0.000	0.011*	0.015*	0.006
	(0.007)	(0.004)	(0.006)	(0.009)	(0.017)
Age	−0.001***	−0.000***	−0.001***	−0.001***	−0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Estonian (d)	−0.012***	−0.003	−0.012**	−0.001	−0.024*
	(0.004)	(0.003)	(0.005)	(0.006)	(0.013)
Man=1 (d)	−0.004	0.003	0.005	−0.003	−0.024**
	(0.003)	(0.002)	(0.003)	(0.005)	(0.010)
Wage-earner (d)	0.002	0.006**	0.012***	0.036***	0.074***
	(0.003)	(0.003)	(0.004)	(0.007)	(0.013)
Self-employed (d)	0.018	−0.001	0.033*	0.049*	0.075**
	(0.013)	(0.005)	(0.017)	(0.028)	(0.038)
Household size	0.002	0.003***	0.003**	0.003	0.013***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.005)
Control for year	Yes	Yes	Yes	Yes	Yes
Control for region	Yes	Yes	Yes	Yes	Yes
Predicted y	0.013	0.010	0.016	0.033	0.110
Actual y	0.034	0.027	0.047	0.060	0.168
F-test	6.5	8.8	9.4	7.1	19.7
Prob > F	0.000	0.000	0.000	0.000	0.000
No of obs	3416	3416	3416	3416	3416

Note: Survey estimation. Survey design based clustered standard errors in parenthesis. ***, **, * stand for statistical significance at the levels of 1%, 5% and 10% respectively.
Source: author's calculations from F-monitor survey data.

have a diverse effects across types of credit: households with investment funds have lower demand for loans and households with stocks have lower demand for hire purchases, while households who are net lenders to other households have higher demand for longer-term debt. The latter is probably the result of a feature identified by Stenning et al. (2010) that households in post-socialist countries use informal instruments more frequently or a combination of formal and informal instruments to raise debt. The share of households who are net lenders to other households fell to 11% during the credit boom years in Estonia and increased during the global financial crisis to reach 18% in 2010. The importance of the informal sources of borrowing has increased during the crisis as formal loan service ratios have increased. It is logical that households who are creditors to other households have higher credit worthiness and higher demand for formal credit instruments.

Income variables all have a statistically significant role in credit demand. Income level is relevant for lease purchases (mostly consumer debt for cars) and credit card debt, while it is not relevant for real estate collateral loans. There is also evidence that lower income households use hire purchases more often. Income change is related to higher credit demand for all the types of credit, while income expectations are relevant only over the longer sample, 2001–2010. These expectations are affected by the higher importance of the recession years in the shorter sample of 2006–2010. Interest rates are measured as yearly averages over the whole household sector and have a surprising positive effect on most of the types of credit. It is difficult to explain the sign of this effect, it is probably indicating that the price elasticities may become rather un-normal during the credit boom period. The most important socio-demographic characteristic is age, as households with a younger reporting member demand more debt. This is well in line with the life-cycle permanent income hypothesis that young households use debt to finance durables and housing. There is also evidence that households with an employed respondent, non-Estonian households and large households demand more debt.

4.2. Determinants of credit demand in a creditless recovery

This section presents the determinants behind the lower credit demand from households in the creditless recovery of 2010. We make use of the Oaxaca-Blinder decomposition often used by labour economists. We investigate whether the different demand for credit in 2006–2008 (the boom years) compared to that in the creditless recovery of 2010 is explained by differences in observable characteristics or by differences in coefficients. The latter component is often called the unexplained part or the part that cannot be explained by endowments of explanatory variables. We call it here the component due

to behavioural change.

We use the version of the Oaxaca-Blinder decomposition developed for non-linear regression models of binary dependent variables in Stata by Sinning and Hahn (2008). The idea of the decomposition is that separate models are estimated for group A (2006–2008 in our case) and group B (2010 in our case) and the decomposition of the conditional mean difference in output of the two groups is derived as follows:

$$y_B - y_A = E\beta_A(y_B|x_B) - E\beta_A(y_A|x_A) + E\beta_B(y_B|x_B) - E\beta_A(y_B|x_B)$$

where the first term captures the difference in credit demand due to changed characteristics (endowments) and the second term the difference due to changed coefficients (behavioural change). The results are sensitive to the counterfactual vector of the coefficients, so we use the coefficients of the group A, which is β_A. This means that the first term is interpreted as a change in credit demand due to a change in endowments while the coefficients (behavioural relations) would have remained the same as those of the period 2006–2008. A similar method is used by Herceg and Šošić (2011) to estimate the factors behind the rapid debt accumulation of Croatian households in 2006–2008.

We change the set of explanatory variables from those in the previous section and exclude the household socio-demographic characteristics. These fundamentals change slowly in the population, and as we explain differences over a short period of time these would lead to only a small or no change in endowments and we would erroneously attribute too much importance to behavioural change in credit demand. Table 5 presents the results of the decomposition. Approximately one third of the reduction in credit demand is explained by changed fundamentals, the most important of these being reduced income and lower income expectations. Two thirds of the reduction in credit demand is explained by the change in behavioural relations, the most important of which is labour market status as households with an employed representative demand less credit than they used to during the boom years. Another interesting result regards home ownership. Home renters usually have higher demand for debt and the share of home renters by endowments increased in 2010, so it follows that as there are more renters there should be more demand for credit. However, at the same time the renters inclination to use credit has dropped during the aftermath of the crisis.

Table 5: Oaxaca-Blinder decomposition of credit demand: 2006–2008 vs 2010

	Loans	Leases	Hire purchases	Credit card purchases
Share of hhs intending to use credit, 2006–2008	0.076	0.059	0.068	0.162
Share of hhs intending to use credit, 2010	0.023	0.020	0.035	0.153
Change in the share of hhs intending to use credit	−0.053***	−0.039***	−0.033***	−0.008
...change due to changed endowments (% of change)	14.2	24.9	42.0	81.5
...change due to changed coefficients (% of change)	85.8	75.1	58.0	18.5
Statistically significant change in endowments	Rents home (+), lending (+), income expectations (−)	Lending (+), income change (−), income expectations (−)	Rents home (+), income change (−)	income expectations (−)
Statistically significant change in coefficients	Rents home (−), employed (−)	Lending (−), employed (−)	income change (−), employed (−)	Investments (+)

Note: Decomposition of differences reported are calculated based on logit models with nldecompose command for Stata by Sinning and Hahn (2008), while the linear regression models command oaxaca in Stata is used for the detailed contribution of each variable. Survey estimation. Survey design based clustered standard errors in parenthesis. ***, **, * stand for statistical significance at the level of 1%, 5% and 10% respectively.
Source: author's calculations from F-monitor survey data.

There is also evidence that endowments can explain the higher share of the reduced credit demand for shorter-term credit. Endowments explain 14% of the demand for loans, 25% of the demand for leases, 42% of the demand for hire purchases and 82% of the demand for credit card purchases. However, the credit card debt is the only type of credit for which the demand did not fall statistically significantly over the recession, dropping only from 16% to 15%. Overall, we observe that households are hesitating especially in terms of longer-term debt and postponing these borrowing decisions, while their intention to use shorter-term debt such as credit cards is only slightly affected by the recession.

4.3. Credit supply in a creditless recovery

The F-monitor survey only collected data on borrowing-constrained households for 2010. The borrowing-constraint variable corresponds to the period twelve months before the time of the survey, meaning the twelve months before August 2010. The households are asked whether they have wanted to take a mortgage loan or consumer loan within the last twelve months and whether they have received the loan; have received the loan, but for a smaller amount than they requested; or have not received the loan. The households which wish to take a loan but which have been hesitating or discouraged from applying for a loan are also captured by this borrowing constraint variable. Unfortunately the credit constraints data has only been collected for 2010 and only for housing and consumer loans.

The share of credit constrained households is very high in Estonia during the aftermath of the global financial crisis. The share of households who wanted housing loans, but were discouraged or rejected is 48%. In addition 9% of households who wanted a housing loan received the loan but for a smaller amount than they requested. However, the confidence intervals of this estimate are wide, the share of housing loan credit constrained households (the sum of discouraged, rejected or rationed) is 57% with 95% confidence bounds between 42% and 71%. Credit constraints are less severe for consumer loans, 20% of households who wanted a consumer loan were rejected or discouraged and 6% received the loan but for a smaller amount than they requested. Again the 95% confidence bounds are wide, as the share of consumer loan constrained households is 26% [12%, 40%] of all the consumer loan applicants.

The number of observations for credit constrained households is very small as only a small fraction of households wanted to take a loan in 2010 and the credit constrained made up only a half of those. The number of mortgage loan credit constrained households is 28 in the sample and the number of consumer

loan credit constrained households is 11. This limits the confidence of our results and the number of explanatory variables due to the degrees of freedom. Our default specification uses a constraint variable that captures either or both of housing and consumer loan constraints. This lifts the number of constrained households to 36 in the sample, which corresponds to a ratio of 44% of constrained households over those who wanted a loan. This is a very high share. In comparison the proportion of credit constrained households among those participating in the debt market is around 20% in the USA (Jappelli (1990)), 10% in Italy (Magri (2007)) and 9% in the UK (Gathergood (2011)). These numbers refer to the "normal" period, but Gathergood (2011) shows that the ratio of credit constrained households tripled from 9% in 2006 to 27% in 2010 as a consequence of the global financial crisis. It must be remembered with the Estonian data that the demand for credit also dropped significantly, so that the share of credit constrained households in the total sample of households is only 3.6%.

We use the Heckman selection model to estimate the characteristics of credit constrained households as there has been a selection among the households who want to use credit. By using this methodology we aim to control for the possible adverse selection of households who want to use credit in this particular period and might cause this high rate of credit constraints. The credit constraint is measured as an ordinal variable that takes the value 2 if the household was rejected or discouraged; the value 1 if the household received a loan for a smaller amount than they requested; and the value 0 if the household received the loan. For better identification we use excluded variables for outcome equations that are assumed to affect only the selection. These variables that affect the decision of households to request credit, but not the decision of the banks whether to deliver the credit are: whether the household is a home renter; the household's income expectations; and household size. Household size and home ownership should not affect the forecast default rate and income expectations are not observable for the bank.

Table 6 presents the results. The estimation results show that households with low current income have a higher probability of being credit constrained. This corresponds well with the mainstream findings in the literature that the most important characteristics explaining household credit constraints are current income, wealth and age (Jappelli (1990)). However, the household respondent's age is insignificant here and so are the real and financial wealth variables.

Equally, ethnicity characteristics, which have been found to be significant for the USA (Duca and Rosenthal (1993)) and the UK (Gathergood (2011)), are not statistically significant in our estimations. The labour market characteristics may control for ethnicity as it has been found that there is a substan-

Table 6: Characteristics of credit constraints, Heckman selection, 2010

	All loans	Housing loans	Consumer loans
Outcome equation (credit constraints)			
Debt burden	–1.2604*	–0.2215	–0.8213
	(0.7264)	(1.4062)	(1.0333)
Income	–0.0924***	–0.0835***	–0.1243**
	(0.0249)	(0.0224)	(0.0529)
Income change	–0.0574	0.0033	–0.0194
	(0.1341)	(0.1594)	(0.1309)
Age	0.0010	0.0020	
	(0.0113)	(0.0149)	
Wage-earner	–0.1395	0.0129	–0.1693
	(0.2802)	(0.6357)	(0.3504)
Self-employed	0.8734***	0.6480	1.0786***
	(0.2759)	(0.5464)	(0.3127)
Tallinn	0.3154	0.6854**	–0.0088
	(0.2426)	(0.3340)	(0.3424)
Selection equation (demand for credit)			
Debt burden	0.1805***	0.0763**	0.0907**
	(0.0543)	(0.0381)	(0.0365)
Rents home (d)	0.0538	0.0493	–0.0019
	(0.0355)	(0.0391)	(0.0152)
Income	0.0034	0.0020	0.0003
	(0.0023)	(0.0018)	(0.0014)
Income change	–0.0033	–0.0064	0.0023
	(0.0113)	(0.0074)	(0.0085)
Income expectations	–0.0068	–0.0051	–0.0059
	(0.0101)	(0.0070)	(0.0072)
Age	–0.0010	–0.0003	–0.0008**
	(0.0007)	(0.0005)	(0.0004)
Household size	0.0030	0.0111**	–0.0055
	(0.0064)	(0.0052)	(0.0065)
Wage-earner (d)	0.0547***	0.0478***	0.0183
	(0.0194)	(0.0145)	(0.0133)
Self-employed (d)	–0.0131	0.0232	–0.0075
	(0.0392)	(0.0422)	(0.0244)
Tallinn (d)	0.0151	0.0042	0.0181
	(0.0206)	(0.0133)	(0.0158)
F-test	7.3	3.9	12.1
Prob > F	0.000	0.000	0.000
No of obs	709	708	709
Heckman's lambda	–0.412	0.449	–0.158
rho	–0.467	0.489	–0.239

Note: The coefficients are reported for the outcome equation (credit constraints) and marginal effects for the selection equation (demand for credit). Survey estimation. Survey design based clustered standard errors in parenthesis. ***, **, * stand for statistical significance at the level of 1%, 5% and 10% respectively.
Source: author's calculations from F-monitor survey data.

tial 10–15% ethnic wage gap favouring Estonians (Leping and Toomet (2008)) and that non-Estonians have considerably more problems in exiting unemployment (Meriküll (2011)). In the 2010 data we can also control for educational attainment, which also appears to be insignificant for credit constraints. These results for wealth, ethnicity and education are not reported, but are available from the author upon request.

Another statistically significant explanatory variable for household credit constraints is the type of employment. Self-employed household representatives or those who are running their own business are more often credit constrained. This corresponds with the results of Magri (2007) who finds from Italian data that the self-employed are more often credit rationed. Magri (2007) also finds that an important characteristic behind household credit constraint is regional residence, as enforcement costs differ greatly across regions. We control for the capital region Tallinn in our regressions, but it only becomes significant for housing loans. Interestingly the probability of being credit constrained is the highest in the more prosperous capital region, which could be an indication of congestion in the real estate market as the preceding real estate boom was the strongest there.

Interestingly, the high debt service ratio affects the probability of a demand for credit positively and credit rationing negatively. This means there is evidence that households which already had a high debt burden are self-selecting to participate in the debt market during the aftermath of the recession. The reason why banks are delivering loans to those households which already have high debt service ratios may stem from debt refinancing schemes.

5. Summary

This paper sought to uncover the factors behind the decreasing credit stock of households during the aftermath of the global financial crisis. We concentrated on the creditless recovery period of 2010, when economy was growing by 3% in real terms but the credit stock continued to decline.

Our results indicate that approximately one third of the reduced demand for credit is explained by such fundamentals as reduced income and lower income expectations. Two thirds of the reduced credit demand is explained by changed behavioural relations, among which the most relevant are that employed households and home renting households demand less credit than they did earlier during the credit boom years of 2006–2008. It is difficult to forecast whether or when these behavioural factors will change, as the reduced elasticities of demand could be a result of an adjustment towards an equilibrium with less credit or they could indicate postponed borrowing. These developments

are presumably also closely related to the adjustments in the real estate market. However, if fundamentals such as household income and income expectations recover, we should also see a recovery in credit demand and especially in the demand for shorter-term and consumer credit.

The share of credit constrained households is very high in 2010, and in total 44% (with 95% confidence bounds between 33% and 55%) of those households who wanted to use housing or consumer loans were rejected or discouraged. However, as the demand for credit was low, the share of credit constrained households in all of the households was only 3.6%. There is evidence of adverse selection for credit, as households which already have a high debt service ratio have been self-selecting to participate in the debt market. At the same time banks have been delivering loans to those highly indebted households, the reasons for which may stem from the schemes to refinance debt under the hope that incomes will be restored in the long-run. Households with low current income and those with a self-employed respondent are also credit rationed, which is in line with the findings of the international literature.

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