The Implications of Household Debt on GDP and Private Consumption Growth in Estonia[1]

Danai Tanamee
Faculty of Economics, Srinakharinwirot University, Thailand
E-mail: danait@g.swu.ac.th

Huy Nguyen
International Monetary Fund, USA.
E-mail: HNguyen4@imf.org

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Abstract
The relationship between household debt growth and economic growth has been the subject of debate. On one hand, it is generally viewed as a positive relationship. On the other hand, rapid growth of household debt could cause economic downturns. This research aims to (1) study the relationship between rising household-debt-to-GDP and the growth of real GDP and private consumption in the short run and medium run in Estonia and (2) analyze the role that institutional factors play in the relationship. The research uses the local projection model to trace impulse response functions for the path of GDP and consumption growth following a change in household debt ratio. Estonia's data show that both the level and growth rate of household debt matter to its economic activities. The studied relationship between household debt and real GDP and private consumption in Estonia indicates that rising household debt is associated with higher private consumption and real GDP growth in the short run and slower economic activities in the medium run. Overall financial development and the depth of Estonia's financial market and institution likely help reverse negative impacts of rising household debt on real GDP growth. Estonia could consider improving its financial institution efficiency to mitigate negative impacts of household debts on real GDP growth.
Keywords: Household Debt, Private Consumption, Real GDP Growth, Local Projection Method, Macro Prudential Policies

Introduction
The relationship between private credit growth and economic growth has been under intensive scrutiny since the global financial crisis in 2008. While the common view is generally positive, rapid private credit growth could increase the possibilities of financial crises and downturns in the medium run. Estonia is an interesting case because, among many reasons, the relations between household debt and private consumption and real GDP growth in Estonia are different after the global financial crisis. Figure 1 and Table 1 suggest that the rising household debt in Estonia after global financial crisis is negatively associated with private consumption and real GDP growth. Moreover, post-crisis private consumption growth and real GDP growth are below half of those before the crisis. This is in contrast with the situation pre-crisis when rising household debt is positively correlated with high consumption and real GDP growth. This raises several policy-related questions for Estonia,

[1] Disclaimer: the views expressed in this paper are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

among them whether the post-crisis development is due to the pre-crisis booming household debt?

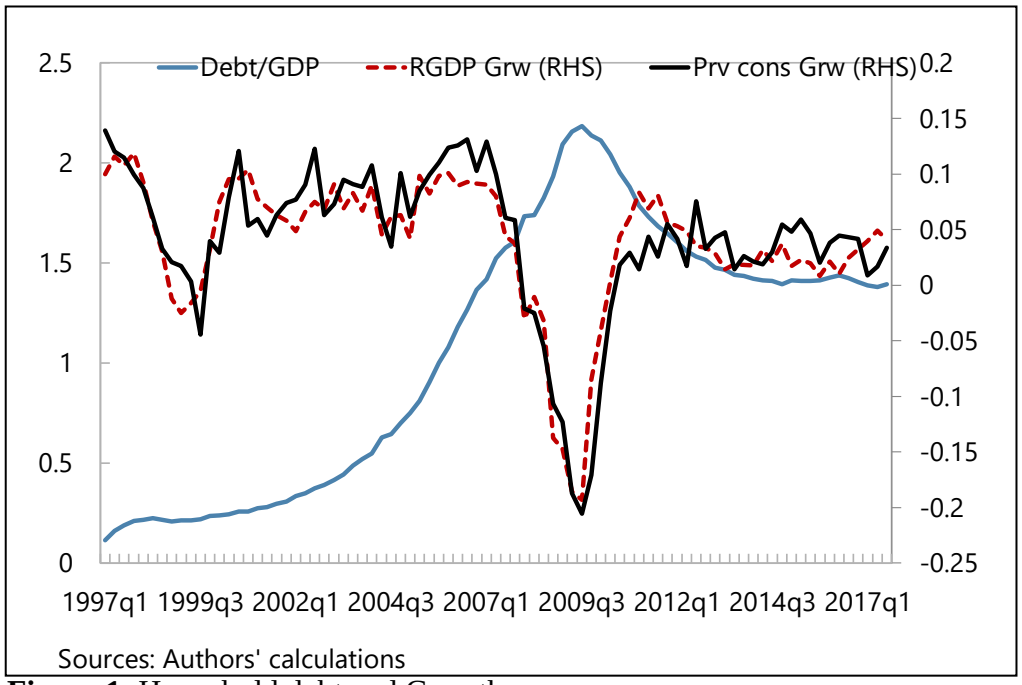


Figure 1: Household debt and Growth

Table 1 Household debt and consumption and GDP growth

	1997:1-2007:4	**2008:1-2017:3**	**2010:1-2017:3**
$corr(Debt, \Delta RGDP)$	0.42	-0.35	0.01
$corr(Debt, \Delta PrC)$	0.35	-0.40	-0.20
$corr(\Delta Debt, \Delta RGDP)$	0.80	-0.10	-0.25
$corr(\Delta Debt, \Delta PrC)$	0.83	-0.02	-0.15
Avg. household debt	56.6	163.7	154.9
Avg. y/y **RGDP grwth**	14.7	3.4	6.0
Avg. y/y **prv. con. grwth**	14.7	2.9	5.5
Avg. y/y **debt grwth**	35.1	2.5	0.6

The linkages between debt financing, in particular households, and economic activities have been a debate for policymakers, as well as academics. A large body of literature on the relationship between household debt and economic fluctuations has found that increased lending to households could help boost private consumption, housing investment, and, hence, could lead to higher economic growth (see among recent papers, IMF, 2017; Mian et al., 2017; Lombardi et al., 2017). However, high or rapidly increasing household debt could also be a source of financial vulnerability (IMF, 2017). Channels of vulnerabilities from higher household debt include debt overhang after negative shocks (Dynan, 2012; IMF, 2017) or high leverages (Jorda et al., 2016).

Research Questions

This paper examines the relation between household debt and growth of GDP and private consumption in Estonia. Specifically, we ask the following questions. What is the

relationship between rising household-debt-to-GDP and growth of real GDP and private consumption in the short run and medium run? What role do institutional factors play in the relationship?

Literature Review

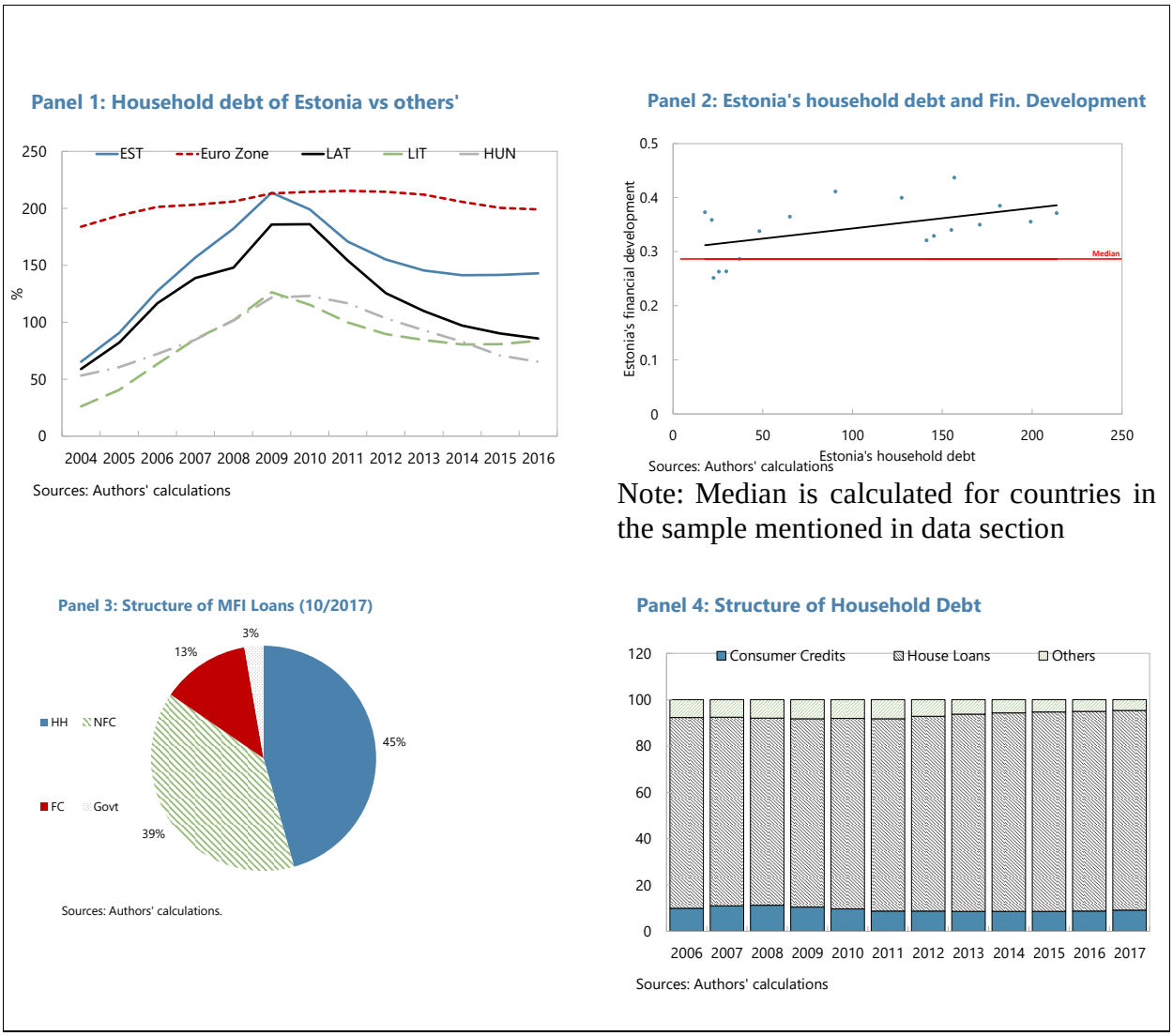
Recent theoretical and empirical studies shed more light on interactions between credit supply and economic fluctuations. Jorda et al. (2013) find that credit-intensive expansions tend to be followed by deeper recessions and slower recoveries and that financial factors play an important role in business cycle. Bordalo et al. (2016) provide theoretical and empirical results supporting the view that investor optimism would bring expansion of credit and investment, and later lead to a crisis when their optimism fades. Justiniano et al. (2015) argue that the relaxation of lending constraints behind the significant expansion of the supply of mortgage credit would be the origin of the bust of housing boom preceded the Great Recession in the US. Bahadir and Gumus (2016) find that expanding household credit is strongly related to economic expansion, real exchange rate appreciations and trade deficits. Krishnamurthy and Muir (2016) find that credit supply expansion precedes a crisis and that recessions that accompany financial crises are severe and protracted. Schmitt-Grohe and Uribe (2016) show that a combination of a currency peg and free capital mobility creates a negative externality that causes overborrowing during booms and high unemployment during contractions. The 2017 Global Financial Stability Report by the IMF shows that increases in household debt tend to be associated with higher economic growth and lower unemployment, but the effects are opposite in three to five years. It also finds that country characteristics and institutions can mitigate the risks associated with rising household debts. Lombardi et al. (2017) have similar conclusions in that rising household debt boosts consumption and GDP growth in the short-run and slow growth in the long-run. They also find that long-run effects on consumption tend to be magnified when the household debt-to-GDP ratio exceeds 80 percent. Mian et al. (2017) have the same conclusion regarding lower GDP growth in medium run being associated with higher household debt. They also find that the link is stronger for countries with less flexible exchange rate regimes. Moreover, countries with a household debt cycle to be in sync with that of the world experience a sharper decline in growth after a rise in domestic household debt.

Recent studies offer contrasting views on the relationship between household debt, aggregate demand, and macro-financial stability. The balance sheet view (see Eggertsson and Krugman, 2012; Korinek and Simsek, 2016) predicts that adverse shocks to highly indebted households would force them into rapid deleveraging, hence depressing aggregate demand. Moreover, nominal rigidities would amplify this process further. As a result, debt deflation spiral and stress to bank capital and balance sheets would harm the rest of the economy and give rise to financial instability and a decline in economic activity. The cash-flow view (see, Laibson, 1997; Meier and Sprenger, 2010; Baron and Xiong, 2017) suggest that short-sighted or over-optimistic households tend to borrow excessively to fund their current consumption. The sources of short-sightedness or over-optimism could be due to hyperbolic discounting or rising house prices. Changes in these behaviors would exert adverse effects on economic performance and financial stability.

In summary, the relationship between household debt, future growth, and financial stability is complex due to involvement of various factors mentioned above. The relationship is likely positive when rational forward-looking household behavior combines with binding borrowing constraints and macroeconomic policies. In other cases, such as excessive supply of credit for non-productive consumption, or over-optimism about investment returns, they would likely yield a negative relationship in the future.

Development of Household Debt in Estonia

The ratio of household debt to GDP in Estonia is lower than euro zone peers but higher than that for other economies with similar level of development. Household debt in Estonia declined from its peak of slightly over 200 percent of GDP in 2009 (Figure 2, panel 1). However, the debt level in relation to GDP is still high. The debt ratio reached 142 percent of GDP in 2016 while that of euro zone peers, Latvia, and Lithuania are 199 percent, 85 percent, and 83 percent, respectively. The private debt is positively correlated with the country's overall financial development (Figure 2, panel 2). This relationship would be helpful to Estonia in term of likely reducing negative effect of household debt on real GDP growth as later empirical results show.



Note: Median is calculated for countries in the sample mentioned in data section

Figure 2 Household Debt Development in Estonia

Mortgage loans constitute the largest component in Estonia's total household debt. Data in October 2017 show that loans to households account for 45 percent of total loans of monetary financial corporations in Estonia (Figure 2, panel 3). Among the three major components of household loans, mortgages amount to 83 percent and this share is very stable over time (Figure 2, panel 4). Most household loans are long-term and are denominated in euros. Long-term house loans make up approximately 77 percent of total long-term loans. Half of the remaining debt is consumer credit, which could be used to smooth short-term consumption and income fluctuations.

Changes in the household-debt-to-GDP ratio are mainly driven by changes in loans rather than changes in GDP. Real household loans grew at an annual rate of about 16 percent during 2004-2010 and -1.5 percent during 2011-2016. In contrast, Estonia's average annual real GDP growth rates are consistently higher than those of the euro area and many other countries during the same periods, especially during the latter (Table 2).

Table 2 Annual GDP growth rates of Estonia and Euro area

	2004-2010	2011-2016
Estonia	**2.28**	**3.41**
Euro area	2.04	1.61
Euro area, excluding Estonia	2.02	1.51
Finland	1.63	0.28
Sweden	2.14	2.25
Latvia	2.78	3.22
Lithuania	3.31	3.49
Czech Republic	3.42	1.86
Hungary	1.22	1.89
Poland	4.60	2.98
Russia	4.62	1.11

Source: WEO October 2017 database

Variable-rate housing loans are predominant (Figure 3). A large share of home loans, about 90 percent on average, has variable interest rates, exceeding the euro zone's average (Bank of Estonia, 2017). While the Euribor, on which mortgage rates are based, has been trending downward, it could rise again when the prospect of higher growth in the euro area and other countries is realized.

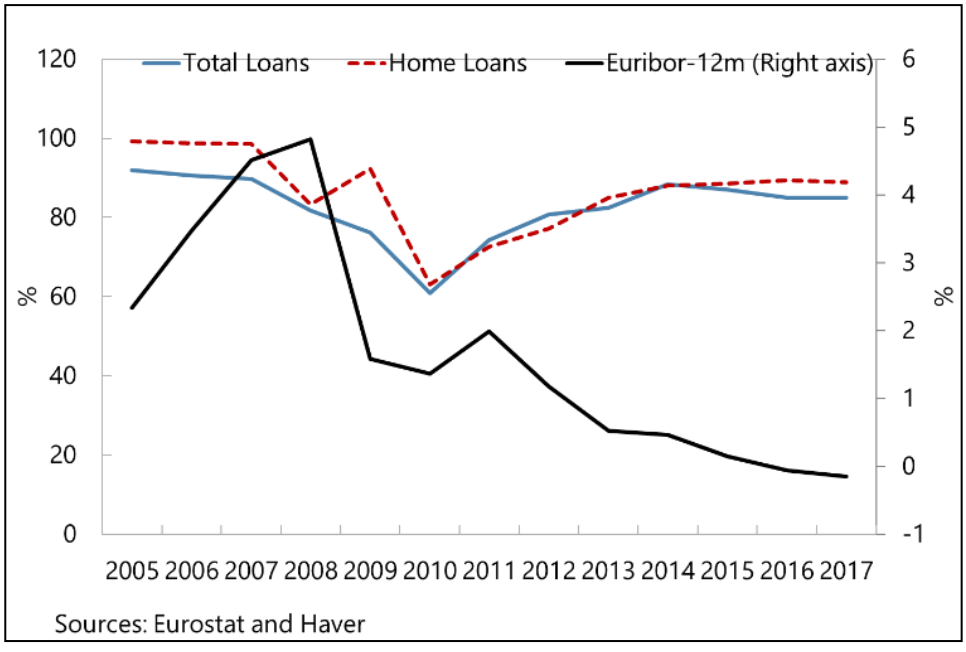


Figure 3 Shares of Rate-Varying Loans in Total and Home Loans

Relation between growth of household loans and wages vary over time (Figure 4). Household loans grew on average twice as fast as wages since 2005. This is, however, driven by a large difference between the two prior to 2009. Between 2005 and 2009,

household borrowing grew at 23 percent per year on average while wages grew at a much slower rate of 6 percent. The situation reversed in 2010 when growth of wages overtook that of loans. This possibly reflects a curb in financing real estate-related development in the banking sector after the global financial crisis.

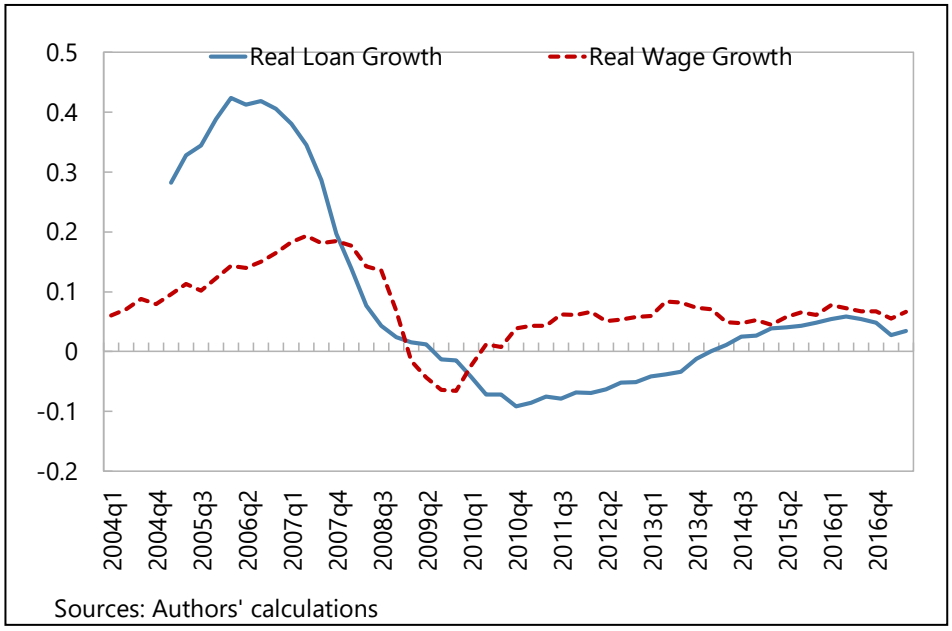


Figure 4 Loan and Wage Growth

Research Methodology

Empirical Model: the local projections method[2] allows us to trace impulse response functions for the path of GDP and consumption growth following a change in household debt ratio. The empirical approach consists of estimating local projection of GDP growth or consumption growth at each period of interest by a least square regression or a panel regression. Specifically, let Δy_t indicate real GDP growth or real consumption growth in period t. The reduced-form linear projection is as follows:

$$\Delta y_{t+h} = \alpha_h + \beta_h shock_t + \psi_h(L)\mathbf{Z}_{t-1} + \varepsilon_{t+h},$$

where $h = 0, 1, 2...$; $\mathbf{Z}_{t-1}$ denotes vector of control variables; $\psi_h(L)$ denotes lag polynomial, ε_t may be serially correlated or heteroskedastic. The coefficient β_h gives the response of Δy_{t+h} to the shock at horizon h. Shocks in this case refer to the lagged changes in household debt ratio. Note that, except for horizon $h = 0$, the error term ε_{t+h} will be serially correlated because it will be a moving average of forecast errors from t to $t+h$. Hence, standard errors need to incorporate corrections for serial correlation, such as a Newey-West (1987) correction.

In Estonia's case, there are several advantages from adopting this method over alternatives, such as reduced-form or structural VARs. These include: (1) accommodating sharp changes in series of household debt, GDP growth and private consumption growth; (2) having no restrictions on the dynamic pattern of responses like VARs do; (3) being more robust to misspecification; (4) being flexible with other nonlinear specifications; (5) providing simple, analytic, and joint inference for impulse response coefficients. The disadvantage of the

[2] For more on the local projections method, see Jordà (2005).

model is that it is more suitable for assessing short-term responses to a shock on the interested variable. Long-run responses tend to oscillate.

Empirically, there are technical issues with implementing the above model for Estonia alone. First, endogeneity and identification of independent variables (i.e. mortgage and non-mortgage variables moving together) are an important concern. Second, it is difficult to choose an appropriate set of controls in the equation, given the involvement of various domestic factors mentioned in the literature review section. To address these issues, we apply the model using panel data regressions with a sample of central and eastern European countries (CEE). We follow an approach similar to those in Mian et al. (2017) and IMF (2017) in that shocks are measured by three-year differences and control variables include corporate-debt-to-GDP ratios and lagged GDP growth rates. Our empirical form of the above equation is as follows:

$$\Delta_3 y_{i,t+h} = \alpha_{i,h} + \beta_{h,HH}\Delta_3 HH_{i,t-1} + \beta_{h,NFC}\Delta_3 NFC_{i,t-1} + Z_{i,t-1}\Gamma_h + \varepsilon_{i,t+h},$$

where $\Delta_3 y_{i,t+h}$ denotes the rolling three-year growth of GDP or consumption at horizon h, $h = 0,...,4$; $\Delta_3 HH_{i,t-1}$ denotes lagged three-year difference in household debt ratio; $\Delta_3 NFC_{i,t-1}$ denotes lagged three-year difference in non-financial corporation debt-to-GDP ratio; $Z_{i,t-1}$ denotes higher-order lags of dependent variable and one-year lag of household and non-financial corporate debt ratios.

Data used in the research are from BIS and Haver Analytics, covering the periods from 1995 to 2016. Countries in the sample include Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia. These countries are selected due to their regional proximity, similar economic histories and levels of development. Financial development index is based on Svirydzenka (2016). The index is a combination of several sub-indices that summarize how developed financial institutions and financial markets are in terms of their depth (size and liquidity of markets), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainably revenues, and the level of activity of capital markets). These indices allow users to identify where deficiencies in financial development lie or which aspects of financial development affect macroeconomic performance.

Research Results

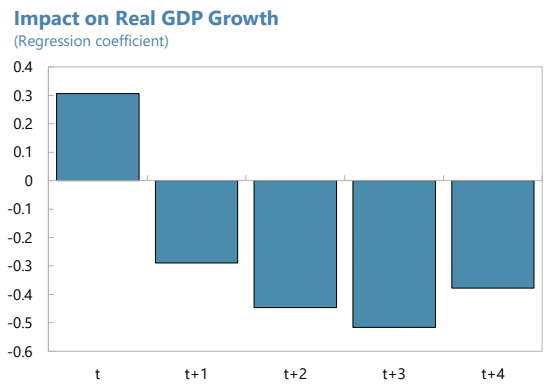
Increases in household debt in these countries are associated with slower GDP and private consumption growth in the medium run. Increases in household debt also have a contemporaneous relationship to real GDP and private consumption growth, in line with recent empirical studies (see Mian et al., 2017; IMF, 2017). Specifically, a 5 percent increase in household-debt-to-GDP ratio over a three-year period forecasts a 2.5 percent decline in real GDP in three years in the future (Figure 5, panel 1, and Table 3). The increase in the ratio also predicts a 1.5 percent boost to GDP growth contemporaneously. Similarly, a 5 percent higher household debt ratio is linked to a 5 percent decline in real private consumption in three years ahead and a 2.5 percent increase in contemporaneous consumption growth (Figure 5, panel 2, and Table 3). The results also indicate that private consumption responds stronger than real GDP both in the short term and the medium term. This result suggests that as more households participate in credit markets (i.e. larger household debts) the future decline in private consumption growth may lead to slower economic growth, resulting in risks to financial stability of these countries to be higher in the

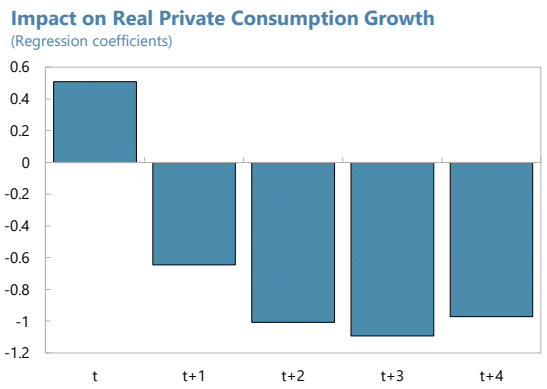
future. Similar exercises run for government consumption show that it does not respond as private consumption does.

Results from an additional exercise show that outcomes for Estonia alone appear to follow similar patterns mentioned above. The exercise is to re-run the above model where we include a dummy for Estonia that interacts with changes in household debt. Table 4 shows that the coefficients with Estonia dummy are all statistically insignificant, implying there is no meaningful difference between Estonia and the overall result.

Both mortgage and non-mortgage debt significantly influence the contemporaneous response of real GDP growth. The results also indicate that mortgage debt mostly drives the responses of real GDP (Figure 5, panel 3, and Table 5). These results appear to not support the view that accumulating both types of credits would be less risky for the financial system because households could tap to their assets when facing with shocks.

Financial development could reduce the adverse impact of household debt on real GDP growth. IMF (2017) finds that country-specific factors may play a role in alleviating the relationship between higher household debt and future GDP growth. We run several panel regressions[3] where we interact various institutional factors with three-year changes in household debt. Table 6 shows the results. We see that overall financial development and the depth of financial institution and financial market play an important role in reversing the negative effect of rising household debt on future real GDP growth (Figure 5, panel 4, and Table 6). The reason is that after accounting for the effects of these factors, the net effects, measured by the sum of gross and marginal effects of household debts on real GDP growth, become positive. The results indicate that financial institution efficiency would be a factor that needs to be addressed.





[3] The estimation form is as follows

$$\Delta_3 y_{i,t+h} = \alpha_{i,h} + \beta_{h,HH}\Delta_3 HH_{i,t-1} + \beta_{h,HHx}\Delta_3 HH_{i,t-1} \times I_{it} + \beta_{h,I} I_{it} + \beta_{h,NFC}\Delta_3 NFC_{i,t-1} + Z_{i,t-1}\Gamma_h + \varepsilon_{i,t+h}$$

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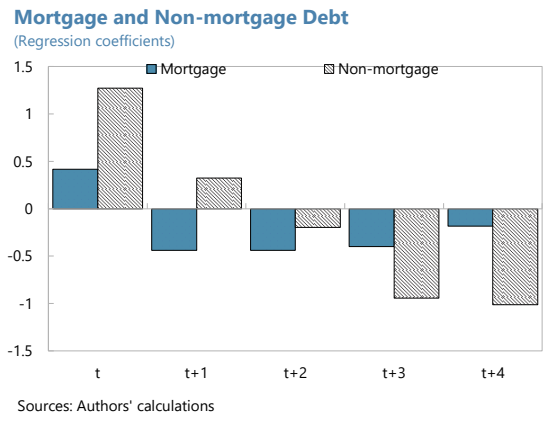

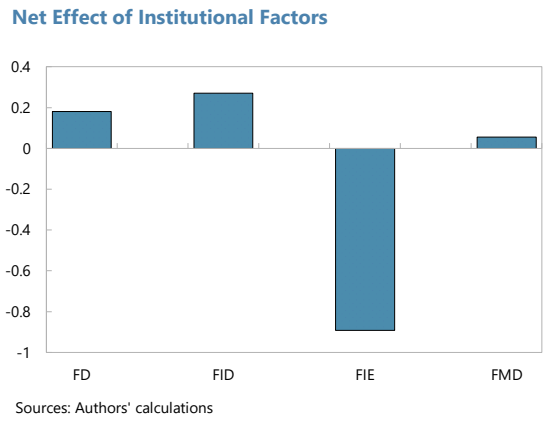

Note: FD: overall financial development, FID: financial institution depth, FIE: financial institution efficiency, FMD: financial market depth

Figure 5 Effect of Household Debt on Real GDP and Private Consumption Growth

Table 3 Real GDP and private consumption regression

	Dependent variable: three-year GDP growth					Dependent variable: three-year priv. consumption growth				
VARIABLES	t	t+1	t+2	t+3	t+4	t	t+1	t+2	t+3	t+4
Household debt	0.306**	-0.290**	-0.447***	-0.516***	-0.378**	0.509**	-0.645***	-1.008***	-1.093***	-0.972***
	(0.154)	(0.112)	(0.136)	(0.179)	(0.173)	(0.237)	(0.176)	(0.187)	(0.255)	(0.232)
Corporate debt	0.0660	0.0621	0.00533	-0.0936*	-0.143**	0.168**	0.258***	0.185**	0.0381	-0.0711
	(0.0536)	(0.0542)	(0.0561)	(0.0557)	(0.0588)	(0.0840)	(0.0798)	(0.0740)	(0.0787)	(0.0899)
$Z_{i,t-1}$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	168	168	158	148	138	168	168	158	148	138
R-squared	0.752	0.694	0.722	0.741	0.717	0.627	0.606	0.675	0.697	0.675

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4 Real GDP and private consumption regression with Estonia dummy

	Dependent variable: three-year GDP growth					Dependent variable: three-year priv. consumption growth				
VARIABLES	t	t+1	t+2	t+3	t+4	t	t+1	t+2	t+3	t+4
Household debt	0.404***	-0.222**	-0.431***	-0.552***	-0.395**	0.629**	-0.571***	-1.005***	-1.115***	-0.960***
	(0.154)	(0.109)	(0.122)	(0.165)	(0.162)	(0.252)	(0.200)	(0.189)	(0.260)	(0.228)
Household debt X EST	-0.285	-0.188	-0.0408	0.0884	0.0439	-0.347	-0.202	-0.00774	0.0555	-0.0302
	(0.174)	(0.218)	(0.253)	(0.277)	(0.271)	(0.245)	(0.284)	(0.311)	(0.369)	(0.337)
Corporate debt	0.0678	0.0632	0.00582	-0.0950*	-0.144**	0.170**	0.259***	0.185**	0.0372	-0.0705
	(0.0530)	(0.0536)	(0.0559)	(0.0561)	(0.0595)	(0.0838)	(0.0794)	(0.0740)	(0.0791)	(0.0898)
$Z_{i,t-1}$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	168	168	158	148	138	168	168	158	148	138
R-squared	0.761	0.698	0.723	0.742	0.717	0.634	0.609	0.675	0.697	0.675

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5 Mortgage and non-mortgage regression

	Dependent variable: three-year GDP growth				
VARIABLES	t	t+1	t+2	t+3	t+4
Mortgage debt	0.416*	-0.439***	-0.439**	-0.398**	-0.183
	(0.228)	(0.144)	(0.168)	(0.191)	(0.192)
Non-mortgage debt	1.273***	0.323	-0.198	-0.943***	-1.012***
	(0.290)	(0.265)	(0.238)	(0.254)	(0.256)
Other controls	Y	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y	Y
Observations	113	113	103	93	83
R-squared	0.763	0.688	0.709	0.737	0.708

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6 Panel Regression for Four-Year-Ahead Growth Regression on Household debt and Policy Interaction Variables

	Dependent variable: three-year GDP growth			
VARIABLES	t+4, D = FD	t+4, D = FID	t+4, D = FIE	t+4, D = FMD
Household debt	-0.719***	-0.660***	0.776	-0.470**
	(0.248)	(0.191)	(0.639)	(0.183)
D x Household debt	0.900**	0.931***	-1.668*	0.525**
	(0.415)	(0.312)	(0.954)	(0.223)
Other controls	Y	Y	Y	Y
Country fixed effect	Y	Y	Y	Y
Time fixed effect	Y	Y	Y	Y
Observations	138	138	138	138
R-squared	0.725	0.732	0.727	0.726

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: FD: overall financial development, FID: financial institution depth, FIE: financial institution efficiency, FMD: financial market depth

Conclusions and Policy Implications

The analysis above shows that increases in household debt tend to give a boost to short-run growth in Estonia but this may come at the expense of medium-term growth performance. Household debt increases are positively associated with higher real GDP and private consumption growth in the short term. However, periods with rising household debt appear to be followed by slower GDP growth later. This result is consistent with other recent empirical studies on this topic. It also appears to support the evidence of growth situation in Estonia mentioned at the beginning of this study. For most part, house loans seem to be the main driver of responses of real GDP growth to rising household debt. However, non-mortgage also contributes to the responses contemporaneously and in the medium-term. Overall financial development and the depth of financial market and financial institutions likely help to counter adverse impacts of rising household debt on economic activity.

The analysis also suggests two areas that Estonia could consider several policy actions: continued support for financial development and improving efficiency of financial institutions. A simple correlation between financial development and economic growth in Estonia indicates they are positively correlated. Estonia is in an advantageous position to support the development of its financial system as it is a euro area member, and its financial system is highly integrated within the area and the EU. Moreover, Estonia has competitive edge in terms of digitalization level and information technological literacy, hence, facilitating regulation and implementation of innovative financial services in Estonian financial market. Studies of efficiency of Estonian financial sector also support the second policy action suggestion. For instance, Yildirim and Philipatos (2007) conclude that Estonia has one of the least cost-efficient banking markets in CEE region due to its concentrated financial structure and lack of competition. Liuhto et al. (2007) show that foreign banks' market participation markedly reduced profitability and operational efficiency of domestic banks due to intensified competition. However, the study also indicates that the wide-spread use of electronic channels and modern banking techniques improved cost efficiency of the system. Estonia could improve further the efficiency of its financial sector by relying on its competitive edge mentioned earlier.

Estonia already lent its supports to the efficiency improvement process via its macro-prudential policies. Such policy is helpful in curbing household leverage. Since Estonia already gets major macro-prudential settings appropriately in its recent Eesti Pank Act, there is no need for departure from the current policies. It will be important though to keep up its continued efforts in assessing financial risks on a regular basis to adjust the policy settings as needed.

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