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Dmitry Kulikov, Annika Paabut,
Karsten Staehr

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Abstract

This paper ascertains the determinants of household saving in Estonia based on a microeconometric analysis of household budget surveys from 2002 to 2005. Higher income leads to more saving, but the effect is largest for unanticipated income shocks. Ownership of real estate does not affect saving, while possession of durable goods like cars is associated with lower savings. A number of variables reflecting the households' financial exposure are of importance. Deposits, other forms of financial assets and access to liquidity reduce household saving. Surprisingly, debt and leasing liabilities and existing debt servicing payments also lead to lower savings. Young and in particular older households have a higher propensity to save than middle-aged households, while higher education is associated with lower savings. The results are robust to changes in the specification of the saving measure and the choice of estimation method.

JEL Code: D12, D14, D22

Keywords: household saving, saving hypotheses, financial exposure

Authors' e-mail addresses: dmitry.kulikov@epbe.ee, annika.paabut@epbe.ee, karsten.staehr@epbe.ee

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Non-technical summary

This paper presents a micro-econometric analysis of the saving behaviour of Estonian households. The cross-sectional analysis is based on data from the Estonian Household Budget Survey for the years 2002–2005. The analysis focuses on the impact of variables like income, wealth and financial exposure on the saving rate of households. The study of the determinants of household saving in Estonia is important when assessing the financial stability of households and their ability to adapt to economic and financial shocks. The study of household saving behaviour may also help to explain total national saving and the current account balance.

The saving rate for each household is calculated from income and consumption data in the Estonian Household Budget Survey. The saving rate is regressed on a large range of household specific variables, including regular and temporary income, proxies for wealth and financial exposure as well as household specific control variables. The estimations are undertaken using Ordinary Least Squares supplemented with Least Absolute Deviations, Bootstrap and Instrumental Variables estimators as robustness checks.

The analysis of cross-sectional variation of household saving in Estonia produces results that are largely in accordance with previous findings in the empirical literature on middle-income transition economies. The saving rate depends positively on regular household income, but more strongly on temporary income. These findings are consistent with theories of consumption smoothing. Households receiving income from self-employment have lower saving propensities. This finding is surprising given that business-related income generally exhibits larger variability than other sources of income. Other variables reflecting the labour market status of households have no discernable effect on the saving rate.

Among the measures of non-financial assets, empirical results suggest that home ownership or a secondary real estate have no statistically significant effect on the saving behaviour. This may be the result of the rapid changes in the housing market during the sample years 2002–2005, or the fact that home ownership and property ownership are widespread among households in Estonia. The possession of a range of durable consumer goods, in particular cars, reduces household saving. The rapid expansion of the ownership of cars and other durable goods has gone hand in hand with less saving.

Turning to the financial exposure of households, somewhat contradictory results emerge. The accumulation of deposits and other forms of financial assets leads to less saving as would be expected from theories of consumption smoothing. However, debt and leasing liabilities also affect household saving

negatively, which is at odds with the same theories. Similarly, there are contradictory results for variables capturing households' access to liquidity and their debt servicing payments: households with a relatively easy access to liquidity save less than other households, but households with large debt servicing payments are also found to save less. The underlying reasons for the lack of feedback from liabilities and debt servicing payments to the saving behaviour of households are unknown at this stage of research.

Miscellaneous control variables affect the saving rate in easily interpretable ways. The young and the elderly households appear to save more than the middle-aged households. A similar relationship has been found for other transition economies using cross-sectional data from the mid-1990s. The finding likely reflects differences in thrift across generations of Estonian households. Higher levels of education lead to lower saving. This result has been found in other studies as well and may be the consequence of households with higher education expecting higher and/or stable income streams in the future. In this interpretation, the education variables are proxies of non-financial wealth.

Contents

1. Introduction

This paper seeks to assess how different characteristics of Estonian households affect their saving behaviour. We estimate household-specific saving relationships based on four years of data from the Estonian Household Budget Survey. Household saving is explained by variables capturing income and income variability, various measures of wealth and proxies for credit access as well as control variables like household composition, education and employment status.

The analysis of the determinants of household saving in Estonia is important for several reasons. First, household saving potentially comprises a substantial contribution to national saving and, hence, an understanding of household saving behaviour helps to explain macroeconomic performance. Second, while it is well known that household saving behaviour in developed and developing countries differs substantially, little is known about household saving in transition economies (Attanasio and Banks, 2001). Third, Estonia, along with other fast-growing transition countries in Central and Eastern Europe, has substantial current account deficits. The raises the issue of the sources of these deficits and whether they are sustainable over time (Kutos and Vogelmann, 2005). A thorough understanding of household saving behaviour plays an important role in answering these questions. Fourth, household saving is important for financial stability and is itself affected by credit availability and financial conditions (IMF, 2005:Ch. 3). The resilience of the household sector to income and financial shocks depends on the accumulation of resources in the sector.

Saving entails an intertemporal reallocation of resources. Theory provides a number of motives for such reallocation by a household (Browning and Lusardi, 1996; Attanasio and Banks, 2001).[1] Models of intertemporal choice predict that households save more if they receive higher income (in particular if the income shock is temporary), if future income becomes more uncertain or if stocks of accumulated net financial and non-financial assets increase. Liquidity constraints, non-individualistic preferences, etc. can affect saving behaviour in complex ways. In addition to variables like income, income shocks, wealth and financial exposure, saving preferences will generally also depend on a range of characteristics such as the size and composition of the household as well as the age and education of individuals in the household.

[1] Browning and Lusardi (1996) list nine motives: the precautionary motive, the life-cycle motive, intertemporal substitution, the improvement motive (save to make consumption increase over life-time), the independence motive (save for unspecified uncertainties), the enterprise motive, the bequest motive, the avarice motive ("accumulate for the sake of accumulation") and, finally, the down payment motive.

Microeconometric analysis comprises an important tool for assessing the importance of different economic variables and household characteristics on the decision to save. Such analyses may also help shed light on the motive(s) underlying the decision to save. Cross-country studies are occasionally employed for the same purpose.

For *high-income countries*, like the US, most studies indicate that households smooth their consumption (Browning and Lusardi, 1996; Poterba, 1994). There is, however, no consensus as to whether or not household consumption exhibits excess sensitivity to income shocks, i.e. whether consumption varies more in response to income variations than intertemporal smoothing would suggest. No robust results have been achieved concerning the effect of liquidity constraints on household saving. Saving exhibits a hump-shaped relationship with respect to age; often, households typically have low or negative saving rates during the start and the end of their lifecycle. Households with children and in particular lone parent households have, ceteris paribus, lower saving propensities than other households.

In *developing countries*, variables such as income and wealth also play an important role in determining household saving. Measures for financial deepening and international financial integration affect the saving propensity positively and play a more important role in developing countries than in high-income countries (Schmidt-Hebbel et al., 1996; Muradoglu and Taskin, 1996). This may suggest that liquidity constraints are particularly important in developing countries. Urbanisation typically leads to lower levels of saving, which may be a result of urban incomes being more stable than rural incomes and therefore necessitating less precautionary saving.

Household saving behaviour in *transition economies* has only been analysed in a few microeconometric studies.

Denizer et al. (2002) use household budget data from Bulgaria, Hungary and Poland from the mid-1990s and show that saving is a positive function of income, but is unaffected by the source of income. Saving is higher in case of households that do not own their own home or selected consumer durables, possibly because households without credit access save to buy these items. Unemployment does not affect the saving behaviour. Guariglia and Kim (2004) use a panel of Russian households to test the precautionary saving hypothesis. Their measure of earnings uncertainty significantly increases household saving, although only for households where the head holds merely one job. The middle-aged save less than the elderly and the young. Foley and Pyle (2005) estimate models of household saving in Russia and find that households smooth saving in lieu of temporary income shocks. The young and the elderly save more than the middle-aged, while the possession of household

durables leads to reduced saving.

This paper comprises a microeconometric analysis of the determinants of household saving in Estonia based on data from the Estonian Household Budget Survey (HBS). The paper contributes to the literature on household saving in at least three ways. First, it is to our knowledge the first study to estimate household saving for Estonia and, overall, only a few studies have dealt with saving behaviour in transition economies. Second, we assess the impact of income and income variability, which are of particular importance in a fast-growing and rapidly changing economy like Estonia's. Third, we seek to assess the effect on household saving of variables that capture its financial and non-financial asset position as well as its access to credit.

One reason for the limited literature on the determinants of household saving in transition countries is the lack of appropriate data, in particular, datasets containing information on household income, savings and wealth, preferably for the same households over an extended period of time. Such datasets are not readily available in most transition countries, including Estonia.

In this paper we rely on the Estonian Household Budget Survey covering four years (2002–2005) and comprising approximately 12,500 observations. This cross-sectional dataset contains information about net (or after-tax) household monthly income and monthly consumption expenditure, from which a measure of household saving can be calculated. The HBS includes a large number of background variables such as age, gender, household size, education attainment, employment status, place of residence etc. A number of variables capturing earnings uncertainty and access to borrowing are also available.

Still, there are several limitations to the data available from the HBS. First, in 2002 Estonia completed its far-reaching pension reforms (Raudla and Staehr, 2003). The first pillar applies to all taxpayers and stipulates that future state pension payouts will depend directly on the taxpayer's accumulated social security contributions. The second pillar implies that most taxpayers deposit a part of their social security contribution plus their own contribution into an individual retirement account. No data on the accumulation of pension assets via the first and second pillar is available in the HBS.[2] Second, a number of potentially important background variables of assets positions, net wealth and earning prospects are only available in rudimentary form or are lacking completely in the dataset. For instance, the dataset contains a variable indicating whether a household owns or rents its primary residence, but in the case of ownership the value of the real estate is absent from the dataset. We seek to

[2] Attanasio and Deleire (2002) show that UK households finance a large part of the contributions to tax-favoured retirement accounts by lowering other means of saving.

exploit all available information in the survey to the fullest extent, but some additional variables, e.g. those containing households' net wealth position, would be beneficial for the study. Third, the HBS is a cross-sectional survey and although data for four years is available, the panel structure of the dataset is very limited. This implies, for instance, that the income profiles over time of individual households are unknown, which restricts the type of hypotheses that can be tested, in particular those related to intertemporal substitution.[3]

In sum, the use of the HBS to derive saving measures and estimate household saving relations has a range of advantages and drawbacks, and the results obtained should be interpreted in light of the particular properties of the dataset. Other recent studies employing data from cross-sectional household budget surveys include Suruga and Tachibanaki (1991), Gibson and Scobie (2001), Butelmann and Gallego (2001), Harris et al. (2002) and Orbeta (2006).

The rest of this paper is structured as follows. Section 2 presents an overview of the macro-level picture of aggregate saving in Estonia since 2002. Section 3 introduces the Estonian Household Budget Survey and presents variable definitions and summary statistics. Section 4 reports the results of a micro-econometric analysis of the saving behaviour of Estonian households. Section 5 undertakes some robustness checks and extensions of the results from Section 4. Section 6 considers the saving behaviour of various subgroups of Estonian households. Finally, Section 7 concludes and offers some policy implications.

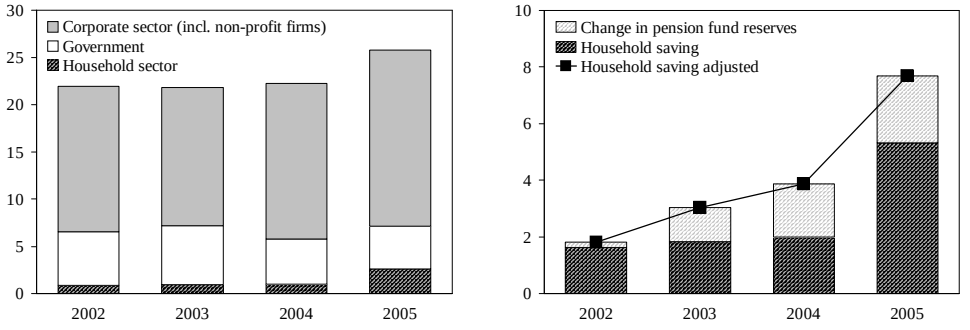
2. Saving, wealth and financial exposure in Estonia

This section discusses selected economic developments in Estonia in 2002–2005, i.e. within the sample period of the empirical analysis of household saving in Sections 4–6. The overview serves as a backdrop for the interpretation of the econometric results and allows some comparison with developments at the macro-level. The period 2002–2005 has been characterised by rapid changes in the income, wealth and financial exposure of households.

The National Accounts measure household saving residually as the net-of-tax income earned by the household sector less all expenditures except real estate purchases and debt-related payments. Figure 1(a) shows that household saving as measured in the National Accounts constitutes only a small part of

[3] Browning and Lusardi (1996) argue that explicit testing of the importance of different saving motives requires not only a panel dataset, but indeed a panel with a long time dimension.

gross national saving. The bulk of gross saving derives from the corporate sector, which is also the sector using up the most capital. Household saving in Estonia increased markedly in 2005, but still makes up a substantially smaller share of GDP than in most western EU countries (Eurostat, 2007). The low rate of household saving is one factor behind the substantial current account deficits in Estonia (Weber and Taube, 1999; Kutos and Vogelmann, 2005).



(a) Gross saving rates by institutional sector as a percent of GDP

(b) Gross saving rates in the household sector as a percent of disposable household income

Figure 1: Gross saving rates in Estonia based on National Accounts data, 2002–2005

Sources: Eurostat (2007), authors' calculations.

When considering the economic situation among households, it is customary to calculate the rate of household saving as a percentage of household *disposable* income, i.e. household income *net* of income tax and social security contributions. This is also the measure employed in the microeconometric analyses in this paper. Figure 1(b) shows the gross household saving ratio as a percentage of net disposable income in the household sector. The figure also shows the *adjusted* household saving rate, which takes into account changes in the net equity of households in pension fund reserves. This adjustment comprises the part of the households' social security contributions that is accumulated in pension funds to which households have a definite claim. In Estonia, this entails the accumulation of assets under the second and third pillars of the pension system. This form of household saving has gained importance in recent years.

Developments in household saving have occurred amid rapid changes in income, employment opportunities, stocks of non-financial wealth (including property wealth) and the financial exposure among households.

The Estonian economy has expanded rapidly with annual GDP growth

amounting to 8.4% on average during the period 2002–2005. Wages and other forms of household income have increased along with GDP. Reductions in the personal income tax rate and a higher tax-free threshold have also contributed to growth in disposable income in the household sector. The disposable income of the household sector as measured in the National Accounts grew in real terms by 9.1% in 2002, 5.8% in 2003, 5.3% in 2004 and 9.7% in 2005 (Eurostat, 2007; Eesti Pank, 2007; authors' calculations). Rapid economic growth has coincided with higher employment and lower unemployment. The survey-based unemployment rate among persons aged 15 to 74 fell from 10.3% at the end of 2002 to 7.9% at the end of 2005 (Eesti Pank, 2007).

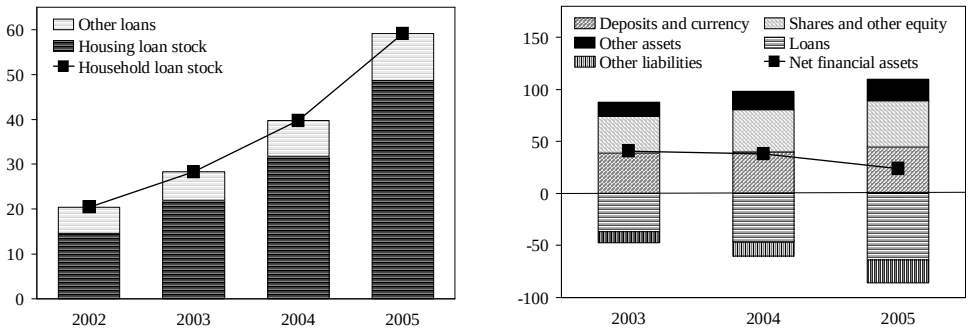
The main component of non-financial household wealth is the possession of residential property and other forms of property. Rapid price increases have been accompanied by a boom in the construction of new buildings and the renovation of existing stock. The growth rate of the value of housing stock was 28.7% in 2002, 12.6% in 2003, 29.5% in 2004 and 28.8% in 2005, which means that annual growth averaged 25% over the period 2002–2005 (Paabut and Kattai, 2007). Evidently, for many households, increases in housing prices have only shown up in the form of unrealised capital gains.[4] Estonian households have also eagerly accumulated other forms of non-financial assets during the period; the sale of new and used cars as well as of other durable goods has seen significant growth.

Partly mirroring the growth of non-financial assets, Estonian households have also accumulated substantial *financial* assets and liabilities during the years 2002–2005. Figure 2(a) shows the outstanding loans to Estonian households *awarded by Estonian financial institutions* during the period. The rapid growth of household debt as a share of disposable income is noticeable. Housing loans comprise the bulk of debt, and their share in total loans has increased over the years. The share of households that save to make a down payment before buying a house or an apartment amounted to 12% in 2005 (Eesti Pank, 2006:32).

Figure 2(b) shows the financial assets and liabilities of Estonian households for the period 2003–2005. The stock of other liabilities (which includes car leases) has gained importance over the period. The stocks of loans and other liabilities have grown markedly, and this is also the case for the stocks of deposits, equity and other assets. The financial exposure of households has increased over the three-year period, while the net financial balance for households has deteriorated in both 2004 and 2005.

When assessing the overall financial exposure of Estonian households, it

[4]Unrealised capital gains can still affect household saving. See also Ludwig and Slok (2004) for a discussion of different wealth effects on household saving.



(a) Household loans granted by Estonian financial institutions as a percent of disposable household income (end of year)

(b) Financial assets and liabilities of households as a percent of disposable household income (end of year)

Figure 2: Financial assets and liabilities of Estonian households, 2002–2005

Sources: Eesti Pank (2006), Statistics Estonia (2007), authors' calculations.

should be noted that although household debt has been growing rapidly, it is still low compared to the levels observed in most Western European countries.[5] Furthermore, the Estonian Government has no net debt and the country's households thus carry no implicit debt burden stemming from the servicing and eventual repayment of government debt.

3. Data and variables

The empirical part of this paper is based on the Estonian Household Budget Survey (HBS) dataset, which Statistics Estonia has collected annually since 1995. This paper makes use of the most recent surveys, covering the period from 2002 to 2005. Earlier surveys covering the period before 2002 relied on different data collection methodologies, making it difficult to compile comparable datasets to carry out empirical analysis.

The primary goal of the HBS is to collect detailed information on income and expenditure among Estonian households across time, regions, and social and ethnic groups. Thus, the survey includes comprehensive background information about each interviewed household, both as a whole and member by member. The data on income and expenditure is subdivided into detailed categories, permitting the end users of the survey to obtain a comprehensive picture of how each sampled household manages its financial resources.

[5] At the end of 2005, the ratio of debt to annual disposable income amounted to 234% in Denmark, 133% in Sweden and 89% in Finland (Eesti Pank, 2006:33).

The overall sampling methodology of the HBS is based on regional stratification. The sampling coverage ranges from 6% to 27.7% across the three sampling regions, which cover 14 counties and the two largest cities in Estonia. The full annual survey sample of Estonian households is divided into 12 non-overlapping sub-samples, which are then interviewed twice during each calendar month within one year. The bulk of background information about households is collected during the first interview, after which income and expenditure data for the month is recorded during the second interview.

The annual survey sample has a rolling panel structure, where half of the households from the previous year are re-sampled and the other half are randomly drawn from the population register file. The newly drawn households are then re-sampled in the following year. The HBS dataset provided by Statistics Estonia for this paper includes information on re-sampled households, but since the empirical methodology in Section 4 is based on cross-sectional analyses, the panel dimension of the data has not been exploited.[6] ESA (2003) provides a detailed overview of the methodology of the Estonian HBS from 2002 onwards.

The main limitation of the HBS from the perspective of this paper is the absence of detailed information on household wealth in monetary terms. In particular, there is little information in the survey about the financial wealth of households in the form of saving accounts, financial investments, accumulated pensions and other types of wealth. Where available, such variables are restricted to some pre-specified intervals, making it difficult to assess the precise value of assets. Indicators of non-financial wealth (e.g. real estate ownership and different types of durable goods) are available, but monetary valuations of these assets are not collected. Along the same lines, the information on different types of household liabilities is partial and at best limited to interval assessments. The survey also lacks data on *changes* in the stocks of monetary and non-monetary household wealth during the interview month, including changes in housing wealth, capital gains, accumulated pension savings etc.

Using income and expenditure data for individual households in the survey, this paper employs the following flow-based definition of household saving:

$$S = Y - C,$$

The variable Y is the household's disposable income in EEK for the survey month. Importantly, Y excludes any wealth-related proceeds from e.g.

[6] The resulting panel structure of the dataset is rather limited, giving only two observations per household in two adjacent years. However, even this limited panel data structure may lead to improvements in the empirical models when compared to the pure cross-sectional analysis.

liquidated financial investments, sales of land and real estate, loans obtained etc. For most households in the sample, Y includes only regular wage income and transfers (including pension), but for a smaller share of the households in the sample business and property related income components of Y are also important. The variable C denotes household consumption in EEK for the interview month, where any wealth-related expenditure is excluded. The variable C would normally include expenditure on food, clothing, transport, housing and education, but might in some cases also comprise larger expenditure items like durable goods and holidays. Ideally, any interest payments on outstanding household loans would also be a part of consumption. However, the interest part of loan repayments is not recorded separately in the HBS, and is therefore included in C.[7]

The variables for income (Y) and consumption (C) during a particular month may be subject to a variety of idiosyncratic variations, such as extra income from bonuses and overtime work and one-off large expenditures on travel, education or household appliances. This variability will spill over to the corresponding saving figure S, and may be difficult to account for using the limited set of available explanatory variables in empirical models. The HBS has a number of variables to assess *regular* monthly income and consumption figures for individual households. In particular, the dataset has a separate variable for the regular monthly income of a household, denoted by REGY. In addition, there are dummies indicating whether the actual household income for the survey month was at its regular level. If not, the household is asked to indicate whether its income for the survey month was higher or lower than the regular monthly figure. Similarly constructed dummies are available for the households's consumption during the survey month.

The household saving rate is defined for $Y > 0$ as:

$$\text{SRATE} = \log(Y) - \log(C).$$

A small share of households that reported negative or zero income Y, usually related to losses in their private business activities, was excluded from the analysis.[8] The log-difference of income and consumption leads to a relatively symmetrical distribution of the SRATE, in contrast to the simple saving rate

[7]The definition of micro-level household saving used in this report in its conception follows the definition of household saving in the National Accounts, cf. Eurostat (2003). Still, a number of definitional differences exist, implying that household saving measures based on national accounts and household budget surveys are not immediately comparable. In the microeconometric literature on household saving, the simple definition of S as difference between money income and consumption flows is adopted for example in Foley and Pyle (2005) and Denizer et al. (2002).

[8]Around 115 households had negative or zero monthly incomes in the original data and

S/Y that is bounded by 1 from the right. Mathematically, SRATE is a close approximation of the simple saving rate S/Y for a numerically small value of the latter, while the difference between the two gets larger in the tails of the distribution of S/Y.[9] Due to the predominance of negative and relatively small positive observations of S, the defined saving rate variable provides a good approximation of the simple saving rate. Furthermore, the marginal effects of the covariates on the simple saving rate S/Y can easily be computed when SRATE is used as the dependent variable in the linear regression model.

Table 1 displays summary statistics for income, consumption expenditure and saving variables discussed above. There are large variations in the average income, consumption and saving of households in Estonia during the period of study. All variables exhibit strong growth in nominal terms over the years 2002 to 2005. The growth in the saving rate is very pronounced as well increasing from its 5.5% mean in 2002 to over 15% in 2005. The standard deviation statistics in Table 1 point to a large variation of the distributions of income, consumption and saving variables across the households in the sample.

Table 1: Means and standard deviations of income, consumption and saving variables

	2002	**2003**	**2004**	**2005**	**2002–2005**
Y	6,526.6 *(4,794.0)*	7,177.1 *(6,274.9)*	7,836.6 *(6,980.1)*	8,849.3 *(7,569.5)*	7,412.9 *(6,604.5)*
C	6,258.9 *(5,742.0)*	6,525.5 *(5,674.8)*	6,986.2 *(6,167.9)*	7,781.0 *(7,003.5)*	6,789.4 *(6,153.3)*
S	267.7 *(4,228.4)*	651.6 *(4,340.0)*	850.4 *(5,175.3)*	1,068.4 *(5,351.8)*	623.5 *(4,711.7)*
SRATE	0.056 *(0.529)*	0.103 *(0.530)*	0.122 *(0.568)*	0.151 *(0.572)*	0.098 *(0.548)*
No. of obs.	5,189	2,217	2,116	2,984	12,506

Notes: The means and standard deviations of *Y, C* and *S* are shown in EEK per month. Standard deviations are shown in parentheses under the sample means of the corresponding variables.

Beyond the monthly household income, the Estonian Household Budget Survey contains a number of other income measures that will be employed in the empirical analyses. REGLY denotes the (logarithmic) monthly income net of taxes and wealth-related earnings deemed regular or typical by the household. The difference between the actual monthly disposable logarithmic income LY and its regular counterpart REGLY is denoted by TEMPLY (there-

were excluded from the sample used in the empirical part of this study. Further 104 observations were excluded due to some missing data. The sample used to estimate empirical saving models in Section 4 has over 12,500 observations.

[9]The saving rate SRATE can be expressed as a function of the simple saving rate S/Y in the following way: SRATE = – log(1 – S/Y).

fore, LY = REGLY + TEMPLY). Thus, TEMPLY has the interpretation of an unusual or transitory income shock comprising that part of income that the household deems to be temporary for the interview month. The rationale for this decomposition of income into regular and transitory components is that the intertemporal smoothing of consumption may lead to different effects of the two income variables on the household saving rate.

Figure 3 shows scatter plots of the regular and temporary income variables against the saving rate for each year in this sample. The left panels (a) show the logarithmic regular income REGLY against the saving rate SRATE, while the right panels (b) show the temporary logarithmic income TEMPLY against SRATE. The figures confirm that the unconditional effects of the two income variables on the saving rate are different for the Estonian households sampled in the HBS.

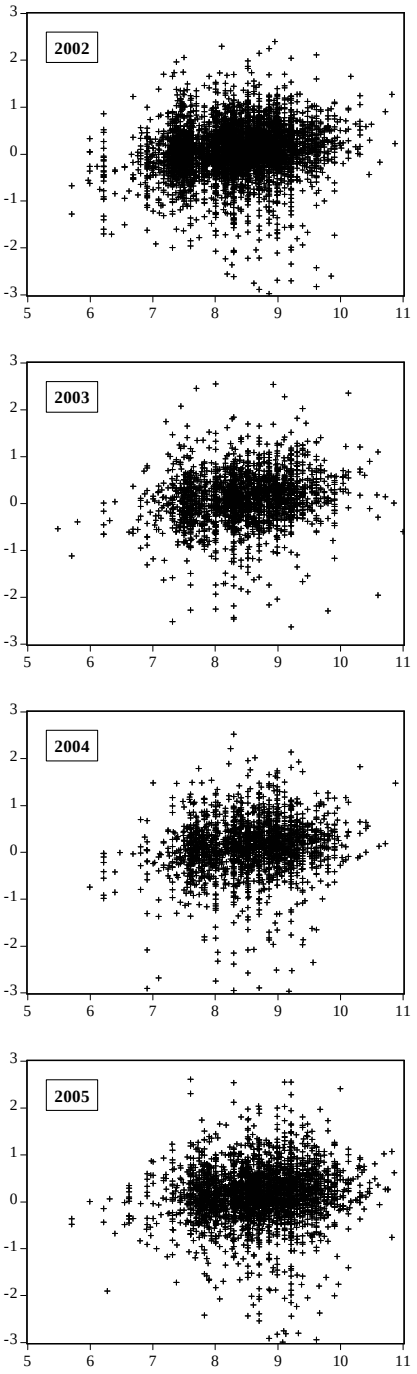
Apart from the saving and income variables, a range of variables capturing the wealth and financial positions as well as various household characteristics are used in the empirical models. The names and definitions of all variables used are given in Table 2. Some descriptive statistics of the variables are presented in Appendix 1.

The monthly disposable income in EEK that a household deems sufficient for its "normal subsistence" is denoted by NORMY. This figure is collected from the interviewed household along with its regular monthly income REGY. The logarithm to NORMY will be employed as an instrument in instrumental variable estimations in Section 5.

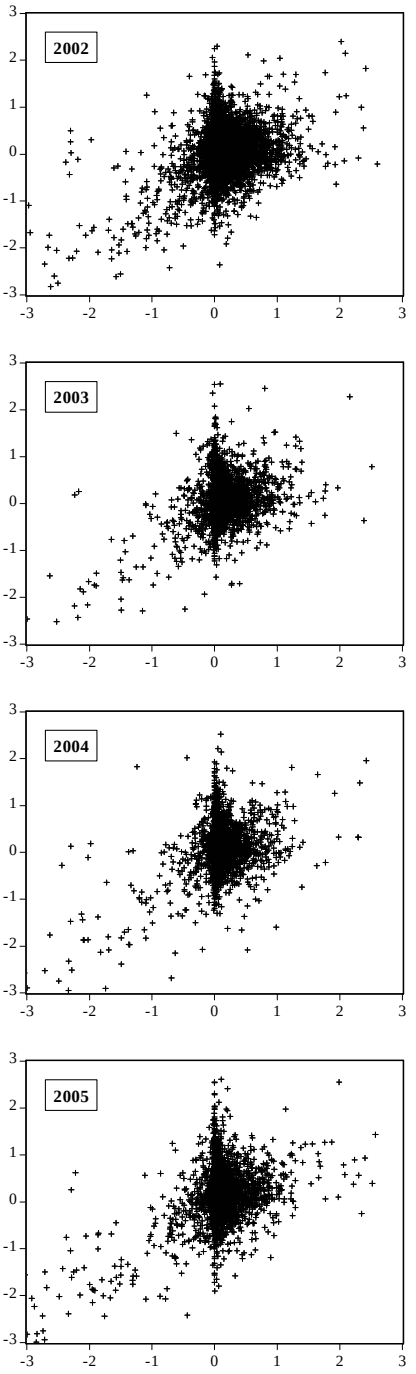
The variable DEBTSERV is defined as the share of the household disposable income Y used to service its loans. If no debt service payments are observed during the survey month, the value of DEBTSERV is zero. The debt service payments include both repayments of the principal and the interest components. There is no information in the HBS about the nature of debt service payments; in particular, the type of the loan from which it is derived or how regularly these debt-servicing payments are carried out.

The variable LIQUID is designed to gauge the availability of cash for immediate use by the household, including the possibility of consumer credit. The variable ranges from the minimum value of zero, when no cash or consumer credit up to 1,000 EEK is accessible for use by the household, to the maximum value of 6, indicating that the household has up to 15,000 EEK in cash for immediate use. The intermediate values of LIQUID reflect access to certain combinations of cash and consumer credit between 1,000 and 15,000 EEK.

The variables DEPOSITS, SECURIT and OTHERA are interval measures of various categories of financial assets possessed by a household. The fi-



(a) Log regular income REGLY against the saving rate SRATE



(b) Log income shock TEMPLY against the saving rate SRATE

Figure 3: The log regular income and the log income shock against the saving rate, 2002–2005

Sources: Estonian Household Budget Surveys, authors' calculations.

Table 2: Definitions of variables used in the empirical models of household saving behaviour

Variable	Definition
S; SRATE	Monthly saving in EEK, difference between monthly income and consumption; saving rate defined as the log difference between monthly income and consumption
Y; LY	Monthly household income in EEK excluding taxes and wealth-related earnings, all zero and negative incomes observed excluded; log of Y
REGY; REGLY	Regular monthly household income in EEK excluding taxes and wealth-related earnings; log of REGY
TEMPLY	Temporary income defined as difference between LY and REGLY
NORMY; NORMLY	Monthly income in EEK needed for household's normal subsistence; log of NORMY
BELOWY	Dummy = 1 if net income is lower than the regular monthly level
ABOVEY	Dummy = 1 if net income is higher than the regular monthly level
SELFEMPL	Dummy = 1 if the business-related income of the household is different from zero
INACTIVE	Dummy = 1 if all adult household members are not currently on the labour market
UNEMPL	Dummy = 1 if one or more adult household members are unemployed
PARTEMPL	Dummy = 1 if not all adult household members are currently employed
HARDSHIP	Dummy = 1 if the household's economic condition is worse now than one year ago
DEBTSERV	Debt servicing payments relative to *Y*
LIQUID	Liquidity level of an individual household; larger values indicate better liquidity
DEPOSITS	Household's saving deposits[a)]
SECURIT	Household's investments in financial securities[a)]
OTHERA	Other types of financial assets[a)]
DEBT	Household's loans[a)]
LEASE	Household's lease obligations[a)]
OTHERL	Other types of financial liabilities[a)]
RENTING	Dummy = 1 if the household lives in a rented dwelling
REALEST	Dummy = 1 if the household owns real estate in addition to its primary residence
NEWCARS	Number of cars less than 5 years old owned by the household[b)]
OLDCARS	Number of cars over 5 years old owned by the household[b)]
FRIDGE	Dummy = 1 if the household owns a fridge
DISHWASH	Dummy = 1 if the household owns a dishwasher
ADULTS	Number of household members aged 16 and above
KIDS15	Number of kids, 15 years or younger
AGE; AGE2	Age of the household head centred around the sample mean 51.2 and divided by 100; square of AGE
FEMALE	Dummy = 1 if the household head is a woman
NONEST	Dummy = 1 if Estonian is not the primary or secondary language of the household
SECSCH	Dummy = 1 if the highest level of education among the adult household members is secondary
VOCEDUC	Dummy = 1 if the highest level of education among the adult household members is vocational (including vocational secondary education)
HIGHEDUC	Dummy = 1 if the highest level of education among the adult household members is higher (including university level and higher vocational education)
TALLINN	Dummy = 1 for households with primary residence in Tallinn
CITY	Dummy = 1 for households with primary residence in a town with over 50,000 inhabitants

Notes: Additional variables not shown in the table comprise monthly and yearly dummies and regional dummies. The regional dummies are defined according to the five-level regional classification of Statistics Estonia.

[a)] Intervals: 1 – none, 2 – up to 1,000 EEK, 3 – between 1,000 and 5,000 EEK, 4 – between 5,000 and 15,000 EEK, 5 – over 15,000 EEK.

[b)] In 2002 this variable equals 1 if there is at least one car in the household, and 0 otherwise.

nancial liabilities of the household are given by the interval variables DEBT, LEASE and OTHERL. The HBS was not designed to collect exact monetary values of the household's financial assets and liabilities; hence the variables above are just coarse.

4. Empirical implementation and results

The methodology for the empirical analysis of the saving behaviour of households in Estonia has been adopted from a number of earlier studies of household saving decisions based on cross-sectional data. Among those, Sugura and Tachibanaki (1991) present an analysis of the saving behaviour of Japanese households employing survey data. They use standard linear regression techniques to explain the cross-sectional variation of the saving rate by a number of indicators related to the financial standing and wealth of households, including income, home ownership status, indebtedness and the financial assets to income ratio. They control for various household characteristics, such as age, size and educational attainment. They find that most of the regressors related to household finances have statistically significant effects in explaining saving behaviour.

Gibson and Scobie (2001) presents a cohort analysis of household saving in New Zealand using a series of cross-sectional surveys over the period 1983 to 1998. They show that the saving behaviour of households to a large extent depends on the birth year of its adult members; different cohorts in the population have different saving behaviour. Along with the cohort effects, Gibson and Scobie (2001) use a set of additional conditioning variables to examine the individual saving rates of different households. Among these regressors are gender, ethnicity, education and employment status of the household head, as well as indicators related to family size and the number of children. The households' financial position is captured by a set of regressors on mortgage-related payments. The study finds that almost all household characteristics included contribute significantly to explaining their saving behaviour.[10]

This paper utilises a similar research methodology, whereby the conditional expectation of the household saving rate SRATE is modelled as a linear function of four broad categories of explanatory variables: 1) variables related to household income and its predictability, including indicators of the labour market status of household members; 2) measures of both financial and non-financial wealth; 3) household characteristics such as gender, age, ethnicity and education; 4) calendar and regional dummies.

[10]Other recent studies using data from cross-sectional household budget surveys include Harris et al. (2002) and Orbeta (2006).

In the first group of explanatory variables, two income variables are of primary interest, namely regular income and the "transitory income" shock. In order to attain an appropriate econometric specification of the empirical saving model, the two income terms on the right-hand side of the regression model are expressed as logarithms of the respective level variables, i.e. as REGLY and TEMPLY. Also the dummies SELFEMPL, INACTIVE, PARTEMPL and UNEMPL are in the first group of covariates related to household income and its sources. These variables reflect the type of employment and the current labour market status of household members. Additionally, the variable HARDSHIP captures the household's subjective assessment of its economic situation.

The second group of regressors includes variables capturing financial and wealth-related heterogeneity across the households in the sample. There is a multitude of possible channels through which financial and wealth-related variables can influence saving, giving rise to a variety of possible interpretations of the estimated partial effects. Furthermore, as pointed out in Section 3, the HBS lacks many important wealth variables measured directly in EEK. This potentially serious data limitation suggests the use of a large set of indirect controls for the wealth position of each household in the sample; although, evidently, the correlation of the wealth proxies included with the unobserved wealth of households remains unknown.

The wealth measures in the empirical saving model include dummies for the ownership of real estate (RENTING, REALEST), possession of durable goods (NEWCARS, OLDCARS, FRIDGE, DISHWASH), interval variables reflecting levels of different types of financial assets and liabilities (DEPOSITS, SECURIT, OTHERA, DEBT, LEASE, OTHERL) as well as a proxy for the household's access to liquidity (LIQUID). Finally, DEBTSERV denotes the debt servicing payment as a share of income. Arguably this variable may also be correlated with credit availability or the (unobserved) wealth of the household.[11]

The household characteristics in the third set of regressors are designed to control for the unobserved heterogeneity of the saving behaviour at the micro level. The latter may be a result of a particular household's history, the social and economic environment in which the individual members were brought up, their attitude towards economic risks, and a number of other unobserved factors. Given the cross-sectional nature of the dataset, where only one observation per individual household is available for empirical modelling, there is

[11] Wealthier households may have easier access to bank credit, including large mortgage loans, which would result in a non-zero value of DEBTSERV. On the other hand, the effect of this variable on SRATE can be interpreted as reflecting financial stress of the household's budget.

a need to control for the cross-household heterogeneity to the fullest possible extent. The set of household characteristics included as control variables consist of a standard selection of regressors: household size, gender, age, ethnicity and dummies for the level of educational attainment (ADULTS, KIDS15, AGE, AGE2, FEMALE, NONEST, SECSCH, VOCEDU, HIGHEDU).

The final group of explanatory variables consists of calendar dummies and regional controls that might further help to explain the variability of saving behaviour at the micro level. Unlike the set of household characteristics, the time of the interview and arguably the geographical location of each household in Estonia are likely to be exogenous explanatory variables in the proposed saving model.

Table 3 shows the results when the saving rate SRATE is regressed in the set of explanatory variables discussed above. Section 2 highlighted the marked changes in the Estonian economy during the period 2002–2005 as witnessed by strong income growth, increasing property prices and improved financial intermediation. These rapid changes suggest that the observations for each of the four years 2002–2005 cannot *a priori* be treated as belonging to one sample. We therefore start by estimating the model separately for each of the four years 2002–2005 and compare the results for individual years with the result for the sample covering all four years.

Comparing the results in Columns (3.1)–(3.4) it is clear the microeconomic determinants of household saving changed very little during the four years from 2002 to 2005. All coefficients that are significant for the full sample 2002–2005 have identical signs across the four years and many of them are also statistically significant in the annual models. This stability is noteworthy in light of the rapid development of the Estonian economy during the period. We therefore mostly describe the results for the sample covering all four years.

Column (3.5) shows the results for the combined sample comprising all four years, 2002–2005. To allow for shifts in the unexplained saving rate across the four years, annual dummies are included (of which one is excluded to avoid perfect multicollinearity). A number of variables that are insignificant or merely marginally significant when only one year is used, are significant when observations for all four years are included. The use of more than 12,000 observations imply that the coefficients can be estimated with greater precision, making it easier to determine which variables help to explain the saving behaviour of Estonian households and which variables are likely to be of no importance.

The estimations reveal that both income variables are important determinants of the saving rate — both in the statistical and economic sense. It is noticeable that temporary income shocks have a substantially larger effect on

Table 3: Determinants of the household saving rate SRATE, 2002–2005

	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)
	2002	**2003**	**2004**	**2005**	**2002–005**
REGLY	0.408***	0.371***	0.495***	0.409***	0.417***
	(0.018)	*(0.030)*	*(0.030)*	*(0.026)*	*(0.022)*
TEMPLY	0.579***	0.563***	0.648***	0.643***	0.608***
	(0.022)	*(0.033)*	*(0.034)*	*(0.027)*	*(0.014)*
SELFEMPL	-0.151***	-0.182***	-0.209***	-0.178***	-0.176***
	(0.015)	*(0.024)*	*(0.025)*	*(0.022)*	*(0.010)*
PARTEMPL	-0.024	0.0028	-0.0085	-0.0088	-0.011
	(0.016)	*(0.026)*	*(0.026)*	*(0.023)*	*(0.011)*
INACTIVE	-0.021	0.014	0.023	0.030	0.0037
	(0.025)	*(0.040)*	*(0.039)*	*(0.035)*	*(0.016)*
UNEMPL	-0.041	-0.110*	-0.041	-0.079	-0.031
	(0.032)	*(0.057)*	*(0.065)*	*(0.056)*	*(0.024)*
HARDSHIP	-0.032**	-0.068***	-0.0046	-0.048**	-0.038***
	(0.014)	*(0.024)*	*(0.024)*	*(0.022)*	*(0.0099)*
DEBTSERV	-0.323***	-0.142**	-0.135**	-0.206***	-0.193***
	(0.084)	*(0.072)*	*(0.060)*	*(0.036)*	*(0.032)*
LIQUID	-0.031***	-0.012	-0.040***	-0.015*	-0.025***
	(0.0059)	*(0.0096)*	*(0.0095)*	*(0.0081)*	*(0.0038)*
DEPOSITS	-0.015**	-0.0076	-0.027***	-0.018**	-0.016***
	(0.0062)	*(0.0086)*	*(0.0095)*	*(0.0081)*	*(0.0039)*
SECURIT	-0.0054	-0.016	0.022	0.0092	-0.0014
	(0.010)	*(0.016)*	*(0.019)*	*(0.014)*	*(0.0069)*
OTHERA	-0.016**	-0.025**	-0.016	-0.026**	-0.021***
	(0.0075)	*(0.011)*	*(0.012)*	*(0.010)*	*(0.0049)*
DEBT	-0.017***	-0.017*	-0.015*	-0.025***	-0.019***
	(0.0062)	*(0.0092)*	*(0.0089)*	*(0.0073)*	*(0.0038)*
LEASE	-0.034***	-0.018	-0.062***	-0.029***	-0.035***
	(0.0091)	*(0.014)*	*(0.014)*	*(0.011)*	*(0.0058)*
OTHERL	0.015	0.035*	-0.014	-0.020	0.0066
	(0.015)	*(0.018)*	*(0.022)*	*(0.022)*	*(0.0093)*
RENTING	0.026	-0.0012	-0.025	-0.032	0.0041
	(0.021)	*(0.033)*	*(0.037)*	*(0.040)*	*(0.015)*
REALEST	-0.00087	-0.027	0.013	0.012	-0.00093
	(0.022)	*(0.035)*	*(0.035)*	*(0.034)*	*(0.015)*
NEWCARS	-0.135***	-0.029	-0.119***	-0.124***	-0.109***
	(0.034)	*(0.055)*	*(0.044)*	*(0.038)*	*(0.021)*
OLDCARS	-0.090***	-0.063***	-0.091***	-0.071***	-0.079***
	(0.015)	*(0.019)*	*(0.020)*	*(0.017)*	*(0.0088)*
FRIDGE	-0.061**	-0.094**	-0.168***	-0.207***	-0.111***
	(0.030)	*(0.046)*	*(0.046)*	*(0.050)*	*(0.020)*
DISHWASH	-0.073*	-0.102	0.145*	-0.044	-0.035
	(0.044)	*(0.076)*	*(0.075)*	*(0.050)*	*(0.028)*
ADULTS	-0.071***	-0.050***	-0.073***	-0.047***	-0.062***
	(0.0081)	*(0.013)*	*(0.012)*	*(0.012)*	*(0.0055)*
KIDS15	-0.054***	-0.059***	-0.050***	-0.056***	-0.054***
	(0.0084)	*(0.012)*	*(0.014)*	*(0.012)*	*(0.0055)*
AGE	0.309***	0.270***	0.404***	0.250***	0.316***
	(0.060)	*(0.091)*	*(0.101)*	*(0.091)*	*(0.040)*
AGE2	0.824***	0.650	0.789***	0.645	0.716***
	(0.258)	*(0.419)*	*(0.425)*	*(0.404)*	*(0.175)*
FEMALE	-0.026*	-0.065***	-0.025	-0.0015	-0.027***
	(0.014)	*(0.022)*	*(0.022)*	*(0.019)*	*(0.0090)*
NONEST	0.058***	0.023	0.072**	0.053*	0.051***
	(0.019)	*(0.031)*	*(0.033)*	*(0.028)*	*(0.013)*
SECSCH	-0.050***	-0.110***	-0.076***	-0.084***	-0.074***
	(0.015)	*(0.023)*	*(0.024)*	*(0.021)*	*(0.0097)*
VOCEDU	0.026*	0.0097	0.054**	0.048**	0.032***
	(0.014)	*(0.022)*	*(0.023)*	*(0.019)*	*(0.0092)*
HIGHEDU	-0.115***	-0.098***	-0.113***	-0.110***	-0.111***
	(0.015)	*(0.024)*	*(0.023)*	*(0.021)*	*(0.0098)*
TALLINN	0.025	-0.051	0.050	0.043	0.021
	(0.034)	*(0.058)*	*(0.053)*	*(0.055)*	*(0.023)*
CITY	-0.0073	-0.0085	-0.025	-0.037	-0.019
	(0.022)	*(0.034)*	*(0.034)*	*(0.033)*	*(0.014)*
No. of obs.	5,189	2,217	2,116	2,984	12,506
R^2	0.282	0.287	0.363	0.341	0.307

Notes: OLS estimation with robust standard errors shown in brackets below the coefficient estimates. The superscripts ***, ** and * indicate that the null hypothesis of the coefficient being equal to 0 is rejected at, respectively, the 1%, 5% and 10% confidence level. Included in the regressions, but not shown in the table, are monthly dummies, regional dummies, a constant and for Column (3.5) also annual dummies.

the saving rate than regular income. The point estimates are respectively 0.417 of the coefficient of REGLY and 0.608 of the coefficient of TEMPLY. This statistically significant difference is consistent with theories predicting consumption smoothing, cf. Section 1.[12]

The receipt of entrepreneurial income (SELFEMPL) appears to have a large negative effect on the saving rate. This result is surprising given that entrepreneurial income generally exhibits large variability. The finding may, however, to some extent reflect underreporting of this easily concealable type of income, provided that consumption is not similarly underreported (Pissarides and Weber, 1989). Another possibility is that this group of households has better access to credit in ways that are otherwise unaccounted for among the explanatory variables.

The estimated coefficients of the variables indicating the labour market status of a household are all statistically insignificant. This applies to the variables indicating that not all household members work (PARTEMPL), that all household members are inactive in the labour market (INACTIVE) and that one or more adult household members are unemployed (UNEMPL). Thus, there is no indication that the labour market affiliation *per se* affects the decision to save.

The dummy variable indicating that a household perceives its economic situation to have deteriorated during the last year (HARDSHIP) enters with a significant and negative coefficient. Households who believe that they are currently facing economic hardship react by reducing their saving.[13]

Among the wealth-related measures, the coefficient of the debt service ratio (DEBTSERV) is statistically significant but attains a *negative* sign. Taken literally this implies that given the additional debt servicing burden, Estonian households tend to reduce their saving as measured by the difference between the disposable income and consumption expenditure excluding debt servicing payments. This result may not be as counterintuitive as it appears at first sight: the likely explanation is that higher debt servicing costs may capture some unobserved household characteristics, like access to credit and/or capital gains

[12]The construction of the left-hand side variable of the model implies that the semi-elasticities of the income variables with respect to the simple saving rate S/Y will depend on the initial simple saving rate. If a household has an initial simple saving rate equal to the sample average, then a 10% increase in regular income will lead to a 3.7 percentage point increase in the simple saving rate. In contrast, a 10% increase in the income shock will lead to a 5.3 percentage point increase in the simple saving rate. The increase in the saving rate resulting from an increase in income will be smaller if the saving rate is initially above the average.

[13]The result is broadly in line with the finding in Guariglia and Kim (2004) that Russian households with a positive assessment of their current situation (relative to the future) save more than other households.

on real estate or other debt-financed property.

Debt servicing implies that a household has access to credit and is therefore able to decouple income and spending. We have experimented with a dummy variable taking the value 1 for households with DEBTSERV > 0. In most estimations (not shown), the dummy attained a negative and significant coefficient estimate supporting the hypothesis that the debt-servicing variable essentially picks up the effects of credit availability. The negative coefficient estimate may also, however, reflect wealth effects: households with a significant debt servicing burden have in many cases bought real estate that has seen very rapid price increases, cf. Section 2. Thus, the negative coefficient for DEBTSERV might simply reflect the effect of wealth increases otherwise unaccounted for in the group of wealth-related explanatory variables.

The coefficient for our measure of the household's ability to raise resources immediately (LIQUID) is significant in estimation (3.5). Easy access to liquidity reduces the saving rate, while scarce liquidity encourages saving.[14]

Turning now to the ordinal indices of households' financial assets and liabilities, an interesting pattern emerges. The coefficients for the indices of deposits (DEPOSITS) and other financial assets (OTHERA) are statistically significant and have negative signs. Larger accumulated financial assets bring about lower household saving. It is noteworthy that the variables DEPOSITS and LIQUID are closely and positively correlated (the correlation coefficient for the full four-year sample is 0.51). Clearly, households with relatively large deposits also have a relatively copious liquidity situation.

The liability indices capturing household debt (DEBT) and lease obligations (LEASE) also affect saving negatively and in a statistically significant way. This result may be surprising insofar as it implies that existing liabilities do not make the household free resources by reducing consumption relative to disposable income, but on the contrary leads to reduced saving. The result, however, is consistent with the finding that the debt servicing rate affects saving negatively. There is substantial correlation between the debt-servicing rate DEBTSERV and the two liability variables DEBT and LEASE.[15]

The variable indicating that a household rents its residence (RENTING) and the variable indicating the possession of real estate besides the household's residence (REALEST) are both insignificant. The result that real estate

[14]This result would be consistent with, for instance, the down payment motive or the precautionary motive (Browning and Lusardi, 1996).

[15]If DEBTSERV is regressed on DEPOSITS, SECURIT, OTHERA, DEBT, LEASE and OTHERL, then all three liability indices enter significantly at the 1% level and with positive signs, while the asset indices attain insignificant coefficient estimates. The result strengthens the assumption that the indices of financial assets and liabilities are useable indicators of the financial exposure of a household.

ownership has no impact on the consumption decisions of households may be surprising in light of real estate potentially comprising a large share of non-financial household wealth. One possible explanation focuses on the illiquidity of non-financial wealth in the form of real estate. If financial markets are less developed, households might find it difficult to transform property wealth into liquid assets available for current consumption expenses. Another possible explanation is that real estate ownership implies that many different channels (e.g. intertemporal substitution, the bequest motive, the down payment motive) affect household consumption and that the net effect of real estate ownership on saving from all these different channels is indistinguishable from zero.

The coefficients for the two variables of car ownership (i.e. respectively NEWCARS, OLDCARS) are negative and significant at the 1% level. The coefficients for the dummy variables indicating ownership of a refrigerator (FRIDGE) and a dishwasher (DISHWASH) are negative, although only significant at conventional levels in the first case. Denizer et al. (2002) also find that the possession of durable goods reduced saving in a number of transition countries in the mid-1990s. Foley and Pyle (2005) reach as similar conclusion using more recent data for Russia.

There are several possible explanations for this result. First, Denizer et al. (2002) argue that the absence of consumer credit markets may compel households to save before buying durable consumer products. Consequently, the ownership of a durable good indicates that the household does not need to save for the down payment or the full purchase price of this particular good (the down payment motive). This explanation, however, may be less applicable in the Estonian case, especially at the end of the full sample period when consumer credit became widespread.

Second, a purchase of a durable good is counted as consumption expenditure and will, ceteris paribus, lower saving in the month of the purchase. In the case of cars and refrigerators, which most households possess, a certain proportion of households will likely buy these goods during the interview month and, hence, register the purchase expenditure and the ensuring ownership of the good. Experimentation has shown, however, that this "purchase effect" can at most explain a very small proportion of the effect of durable good ownership on saving.[16]

Third, durable goods, in particular cars, may in many cases constitute a

[16]Model (3.5) in Table 3 was re-estimated for the subset of households who stated in the HBS that their consumption spending was "normal" during the month. This presumably excludes households that engage in major purchases of durable goods during the month. Still, all results were qualitatively unchanged. The main noticeable effect was that the estimated coefficient for the variable FRIDGE was reduced slightly in numerical terms.

large part of household wealth and the negative sign might then be the result of a wealth effect on saving. Fourth, even if the wealth of a used car or refrigerator is rather limited, the ownership of such durable goods may be an indicator of otherwise unobserved forms of wealth which affect saving negatively. Finally, car ownership in particular entails substantial expenses paid for petrol, insurance, etc. which may lead car-owning households to reduce their saving.

Turning briefly to the household characteristics that are not directly related to income or wealth measures, the coefficients for a number of variables are significant in the model. The number of adults and children below the age of 15 in a household affect the saving rate negatively; more household members strain resources in the household and reduce saving. The negative coefficient for the variable KIDS15 may also reflect that children will support their parents at later stages of life and this will reduce the need for saving (Orbeta, 2006). Still, the marginal effects from ADULTS and KIDS15 are broadly similar.

The age variables are statistically significant, implying a U-shaped relationship between age and saving in the cross-section of Estonian households. The lowest saving rate is found for households where the age of the household head is approximately 29 years. Comparing two households headed by persons being respectively 29 and 65 years old, the saving rate SRATE is, ceteris paribus, 9.2 percentage points higher for the older household. There are several probable explanations for the relatively high saving rate among the elderly. First, the elderly might save more relative to younger households due to a bequest motive (Browning and Lusardi, 1996). Second, Estonia has emerged from decades of communist rule and a subsequent transition to a market economy; the relatively high saving propensity among older-generation households may be due to a habitual thrift or a perception of economic vulnerability in the new economic environment.

Households headed by a woman, ceteris paribus, save less than households headed by a man. Households that are headed by non-Estonians have a higher saving rate than those headed by Estonians. These results are, however, not very robust to sample changes, cf. the differing significance levels across the years and the analyses presented in Section 5.

The higher the level of the household's education, the less it saves, other things being equal. This may reflect that households with higher education expect an increasing or less uncertain future income and, thus, bring their consumption forward. The fact that higher education is, ceteris paribus, associated with less saving is a result typically found in microeconometric analyses of saving behaviour (Browning and Lusardi, 1996).

To recapitulate, Column (3.5) in Table 3 presents the baseline estimation of the saving behaviour of Estonian households in 2002–2005. Higher regular income, in particular higher unexpected or transitory income, leads to an increased propensity to save. Households that are partly or wholly self-employed save relatively little, but other variables capturing the labour market status of the household are unimportant. Turning to measures of financial exposure, loan service payments affect saving negatively, possibly because such payments imply credit access or accumulated wealth. Access to liquidity affects saving negatively. Deposits and other forms of financial assets as well as debt and leasing liabilities all lead to reduced household saving. The possession of cars and possibly also of other durable consumer products is associated with lower saving, while household's ownership of its residence or other real estate has statistically an insignificant effect on saving. A number of control variables, including family size, gender, age and educational attainment, also help explain the saving rate at the micro level.

5. Robustness

This section explores some aspects of the econometric specification of the baseline empirical saving model in Table 3. The baseline model relies on the Ordinary Least Squares (OLS) estimator to make statistical inference about the coefficients of the assumed linear relationship between the household saving rate and a set of explanatory variables, among which coefficients of income and wealth-related covariates are of main interest. The OLS estimators may suffer from bias and inconsistency issues whenever the actual data generating mechanism deviates from the statistical assumptions under which the OLS estimator provides its desired properties.

There are several potential issues with the empirical saving model in Section 3 that may lead to statistical problems and therefore need to be examined. The first issue relates to the presence of outliers and influential observations in the data. This issue is gauged using two approaches: by having the model re-estimated using one of the robust statistical estimators, and by computing standard errors of the estimated coefficients using the bootstrap technique. The second potential issue relates to the possible endogeneity of one or more of the right-hand side variables in the baseline specification (3.5) in Table 3. An instrumental variables (IV) approach will be used to address this issue.

Baseline specification (3.5) is repeated as (4.1) in Table 4 for easy comparison. The estimated residuals reveal excess kurtosis, indicating the possible presence of outliers and non-Gaussian model errors. The importance of this type of misspecification can be gauged by re-estimating the model using one

of the available robust regression methods. In Column (4.2) of Table 4 the estimated coefficients and standard errors from the Least Absolute Deviations (LAD) estimator of the baseline model are reported. This type of estimator is considerably less sensitive to the presence of outliers than the OLS estimator used in Section 4. Compared to the baseline model in (4.1), the estimated standard errors are larger for some of the coefficients, but no reduction in the number of statistically significant coefficients is detected.

There are substantial differences in the marginal effects of the two income terms REGLY and TEMPLY on the saving rate variable SRATE between the baseline specification in (4.1) and model (4.2) in Table 4. The point estimates of the coefficients of both the regular income term REGLY and the transitory income component TEMPLY are lower and their estimated standard errors are smaller in (4.2) than in the baseline model. The marginal effects of most of the other explanatory variables estimated by the LAD method are also smaller, but not statistically different from their OLS counterparts.

Another approach to assess the impact of outliers, excess kurtosis and other types of deviation from Gaussian model disturbances on the estimated coefficients and corresponding standard errors in a linear regression model is by employing the bootstrap technique. Bootstrap mean estimated coefficients and corresponding standard errors of the baseline saving specification are shown in Column (4.3) of Table 4. They are based on 300 samples drawn randomly with replacement from the original dataset of 12,500 observations. Apart from the standard error of the REGLY variable and the coefficients of the AGE and AGE2 regressors, there are no notable differences across (4.1) and (4.3).

Overall, there are no economically significant differences in the determinants of saving behaviour between the baseline model in Column (4.1) and the same model estimated by the LAD in (4.2) and the bootstrap method in (4.3), lending support to the previous conclusions about the importance of income, asset variables, liquidity and debt servicing on the saving rates of Estonian households.

Apart from the problem of influential observations, there is another cause for concern when looking at the baseline results (4.1). Due to the large sample size and relatively small number of estimated coefficients, the OLS standard errors of all coefficient estimates are relatively small, potentially leading to inflated significance levels.[17] This becomes apparent by comparing the full sample model (4.1) to models (3.1) to (3.4) in Table 3, which are estimated separately for each year of the sample data. While significance levels for many coefficients of interest remain similar across all four annual models and the

[17] An overview of the issues related to significance tests in large samples is given in McCloskey and Ziliak, 1996.

Table 4: LAD, bootstrap and IV estimation results of the empirical saving model

	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)
	Baseline	**LAD**	**Bootstrap**	**Bootstrap**	**IV**
REGLY	0.417***	0.377***	0.418***	0.418***	0.383***
	(0.022)	*(0.012)*	*(0.013)*	*(0.024)*	*(0.015)*
TEMPLY	0.608***	0.544***	0.607***	0.606***	0.484***
	(0.014)	*(0.011)*	*(0.013)*	*(0.029)*	*(0.034)*
SELFEMPL	-0.176***	-0.140***	-0.176***	-0.176***	-0.164***
	(0.010)	*(0.011)*	*(0.010)*	*(0.021)*	*(0.011)*
PARTEMPL	-0.011	0.0036	-0.012	-0.012	-0.013
	(0.011)	*(0.012)*	*(0.011)*	*(0.020)*	*(0.011)*
INACTIVE	0.0037	-0.0084	0.0030	0.0015	0.0041
	(0.016)	*(0.018)*	*(0.018)*	*(0.033)*	*(0.017)*
UNEMPL	-0.031	-0.038	-0.030	-0.034	-0.039
	(0.024)	*(0.025)*	*(0.024)*	*(0.045)*	*(0.024)*
HARDSHIP	-0.038***	-0.040***	-0.038***	-0.038	-0.042***
	(0.0099)	*(0.011)*	*(0.0098)*	*(0.0215)*	*(0.010)*
DEBTSERV	-0.193***	-0.195***	-0.198***	-0.200**	-0.216***
	(0.032)	*(0.029)*	*(0.034)*	*(0.080)*	*(0.038)*
LIQUID	-0.025***	-0.019***	-0.026***	-0.026***	-0.021***
	(0.0038)	*(0.0038)*	*(0.0039)*	*(0.0078)*	*(0.0040)*
DEPOSITS	-0.016***	-0.012***	-0.017***	-0.017**	-0.016***
	(0.0039)	*(0.0043)*	*(0.0040)*	*(0.0080)*	*(0.0040)*
SECURIT	-0.0014	-0.0002	-0.0019	-0.0025	-0.0009
	(0.0069)	*(0.0082)*	*(0.0071)*	*(0.015)*	*(0.0070)*
OTHERA	-0.021***	-0.021***	-0.021***	-0.021**	-0.019***
	(0.0049)	*(0.0064)*	*(0.0049)*	*(0.0097)*	*(0.0051)*
DEBT	-0.019***	-0.014***	-0.019***	-0.019**	-0.016***
	(0.0038)	*(0.0041)*	*(0.0037)*	*(0.0075)*	*(0.0039)*
LEASE	-0.035***	-0.025***	-0.035***	-0.036***	-0.033***
	(0.0058)	*(0.0064)*	*(0.0054)*	*(0.0112)*	*(0.0058)*
OTHERL	0.0066	0.012	0.0067	0.0053	0.0050
	(0.0093)	*(0.011)*	*(0.0099)*	*(0.020)*	*(0.0097)*
RENTING	0.0041	-0.011	0.0048	0.0013	0.0026
	(0.015)	*(0.017)*	*(0.015)*	*(0.030)*	*(0.015)*
REALEST	-0.0009	-0.006	0.0002	-0.0002	-0.0007
	(0.015)	*(0.017)*	*(0.015)*	*(0.030)*	*(0.015)*
NEWCARS	-0.109***	-0.128***	-0.110***	-0.106**	-0.107***
	(0.021)	*(0.021)*	*(0.019)*	*(0.042)*	*(0.021)*
OLDCARS	-0.079***	-0.072***	-0.080***	-0.080***	-0.078***
	(0.0088)	*(0.0093)*	*(0.0092)*	*(0.018)*	*(0.0090)*
FRIDGE	-0.111***	-0.084***	-0.111***	-0.115***	-0.103***
	(0.020)	*(0.021)*	*(0.021)*	*(0.039)*	*(0.020)*
DISHWASH	-0.035	-0.045	-0.036	-0.031	-0.024
	(0.028)	*(0.031)*	*(0.026)*	*(0.061)*	*(0.028)*
ADULTS	-0.062***	-0.059***	-0.062***	-0.062***	-0.054***
	(0.0055)	*(0.0058)*	*(0.0056)*	*(0.011)*	*(0.0059)*
KIDS15	-0.054***	-0.048***	-0.054***	-0.054***	-0.049***
	(0.0055)	*(0.0063)*	*(0.0054)*	*(0.011)*	*(0.0057)*
AGE	0.316***	0.272***	0.320***	0.323***	0.308***
	(0.040)	*(0.043)*	*(0.043)*	*(0.085)*	*(0.041)*
AGE2	0.717***	0.905***	0.738***	0.750**	0.747***
	(0.175)	*(0.189)*	*(0.165)*	*(0.358)*	*(0.176)*
FEMALE	-0.027***	-0.023**	-0.026***	-0.028	-0.023**
	(0.0090)	*(0.0099)*	*(0.0087)*	*(0.018)*	*(0.0091)*
NONEST	0.051***	0.046***	0.052***	0.052*	0.047**
	(0.013)	*(0.015)*	*(0.013)*	*(0.027)*	*(0.013)*
SECSCH	-0.074***	-0.070***	-0.073***	-0.075***	-0.071***
	(0.0097)	*(0.011)*	*(0.0098)*	*(0.017)*	*(0.0098)*
VOCEDU	0.032***	0.026***	0.032***	0.031	0.036***
	(0.0092)	*(0.010)*	*(0.0092)*	*(0.019)*	*(0.0093)*
HIGHEDU	-0.111***	-0.107***	-0.110***	-0.111***	-0.107***
	(0.0098)	*(0.011)*	*(0.0097)*	*(0.019)*	*(0.010)*
TALLINN	0.021	0.022	0.020	0.024	0.019
	(0.023)	*(0.026)*	*(0.021)*	*(0.044)*	*(0.024)*
CITY	-0.019	-0.014	-0.020	-0.018	-0.017
	(0.014)	*(0.016)*	*(0.014)*	*(0.028)*	*(0.015)*
No. of obs.	12,506	12,506	12,506	3,120	12,417
$\boldsymbol{R^2}$	0.307	0.122	0.307	0.307	0.297

Notes: See text for the description of the estimated models. The superscripts ***, ** and * indicate that the null hypothesis of the coefficient being equal to 0 is rejected at, respectively, the 1%, 5% and 10% confidence level. Included in the regressions, but not shown in the table, are monthly dummies, regional dummies and a constant.

full sample model, other coefficients exhibit changes in both magnitude and statistical significance from model to model, even though the sample sizes are relatively large for all five models in Table 3. This may indicate that the effects of some explanatory variables in the household saving model change across the observation period in a statistically significant way, and that the annual dummies included do not pick up all the time heterogeneity in the model.

In order to examine this issue in detail, Column (4.4) of Table 4 reports bootstrap confidence intervals and mean coefficient estimates of the baseline saving model shown in Column (4.1). The bootstrap design is similar to the one in Column (4.3) apart from the size of 300 synthetic samples, which is equal to 3,120 observations, matching the average sample size of the annual models (3.1) to (3.4) in Table 3. The most important differences between the baseline specification and the bootstrap results are the statistically insignificant effects of the HARDSHIP, FEMALE and VOCEDU dummies, and substantially reduced significance level of NONEST. All of these variables have changing levels of significance in the annual models (3.1)–(3.4), but are statistically significant in the full sample model (shown both in Columns (3.5) and (4.1)). Note that these variables still have statistically significant effects in the full sample bootstrap model (4.3). On the other hand, all primary economic determinants of saving, such as household income, wealth, liquidity and debt servicing variables, retain their statistical significance with the bootstrapped standard errors.

The robustness checks performed so far are conditional on the exogeneity of the right-hand side variables with respect to the model errors. The set of scenarios where this assumption may be violated is broad, and includes simultaneity, omitted variables and measurement errors of the variables included. All of these are of concern in the empirical model of household saving estimated in Section 4.

Only one of the exogeneity issues is examined in this section, namely the potential correlation of the income variable LY with the model error in the saving model in Section 4. The endogeneity of LY may result from measurement errors and/or the possible simultaneity of the decisions on income and saving. In order to shed light on the importance of the potential endogeneity problems, an instrumental variables (IV) approach is employed. Specifically, the variable TEMPLY is instrumented using the variables ABOVEY, BELOWY and NLY in addition to all other right-hand side regressors in the baseline specification.[18] The underlying assumption is that all explanatory variables except TEMPLY (but including REGLY) are exogenous with respect to the model errors. Column (4.5) in Table 4 shows that the IV estimator leads to a substan-

[18]Recall the definition of TEMPLY in Section 3 as TEMPLY = LY – REGLY.

tially smaller estimated marginal effect of transitory income on the household saving rate, lending preliminary evidence of the potential endogeneity of LY. The estimated effects of other covariates in (4.5) do not differ in statistical terms from the baseline model (4.1). As always in IV estimation, these results are conditioned on the particular choice and quality of the instruments.

While no other economically significant differences apart from the transitory income effect between (4.5) and (4.1) are discovered, there are other potential endogeneity issues in the baseline model of household saving. As mentioned earlier, there might be reason to believe that a number of potentially important covariates are missing due to the lack of data. Another important issue is related to the unobserved household-specific effects on the saving rate that might be correlated with the included explanatory variables. A thorough analysis of these questions is outside of the scope of this paper.

6. Sub-samples

The analyses in Sections 4 and 5 considered all households together and only discussed possible differences in the results across different sample years and estimation methods. There are, however, reasons to consider the consequences of dividing the sample into sub-samples based on the different characteristics of households in order to analyse possible differences in behaviour across different sub-groups. Table 5 presents the results of dividing the 2002–2005 sample into sub-groups based on income and income source. Column (5.1) repeats the baseline estimation from Column (3.5) for easy reference.

The bulk of overall saving is undertaken by a relatively small group of mainly high-income earners. The saving behaviour of this group heavily affects the total amount saved. Conversely, some low-income households exhibit substantial negative saving. Columns (5.2)–(5.4) show the saving behaviour of respectively low-income, middle-income and high-income households based on their log regular income.[19] The cut-off points between the groups are chosen so that they contain relatively similar numbers of households.

The splitting of the sample according to household income reveals a num-

[19]The cut-off points are chosen as follows. For each household, its adjusted or relative logarithmic regular income is calculated as REGLY minus its sample average for the particular year. (Nominal incomes grew rapidly during the four years 2002–2005. The adjustment prevents a disproportionate number of households from 2002 being included in the low income category and a disproportionate number of households from 2005 being included in the high income category.) Relative REGLY has a mean of 0. Low-income households are households with a relative REGLY lower than minus one half standard deviation; middle-income households have a relative REGLY within plus/minus one half standard deviation, and high-income households have a relative REGLY above one half standard deviation.

Table 5: Sub-sample results for the determinants of the household saving rate SRATE, 2002–2005

	(5.1)	(5.2)	(5.3)	(5.4)	(5.5)	(5.6)
	Baseline	**Low-income households**	**Middle-income households**	**High-income households**	**Income from self-empl.**	**No income from self-empl.**
REGLY	0.417***	0.399***	0.464***	0.432***	0.435***	0.398***
	(0.022)	*(0.030)*	*(0.038)*	*(0.025)*	*(0.016)*	*(0.019)*
TEMPLY	0.608***	0.509***	0.663***	0.630***	0.620***	0.585***
	(0.014)	*(0.031)*	*(0.021)*	*(0.015)*	*(0.016)*	*(0.026)*
SELFEMPL	-0.176***	-0.158***	-0.164***	-0.187***	..	..
	(0.010)	*(0.021)*	*(0.017)*	*(0.016)*		
PARTEMPL	-0.011	-0.027	-0.0042	0.0073	-0.0084	-0.014
	(0.011)	*(0.035)*	*(0.015)*	*(0.018)*	*(0.014)*	*(0.017)*
INACTIVE	0.0037	0.014	-0.047*	0.147**	0.019	-0.012
	(0.016)	*(0.028)*	*(0.025)*	*(0.069)*	*(0.021)*	*(0.026)*
UNEMPL	-0.031	-0.041	0.0035	0.132	-0.018	-0.044
	(0.024)	*(0.035)*	*(0.046)*	*(0.111)*	*(0.030)*	*(0.039)*
HARDSHIP	-0.038***	-0.033*	-0.049***	-0.034*	-0.025**	-0.051***
	(0.0099)	*(0.018)*	*(0.015)*	*(0.019)*	*(0.013)*	*(0.015)*
DEBTSERV	-0.193***	-0.166*	-0.205***	-0.166***	-0.202***	-0.179***
	(0.032)	*(0.093)*	*(0.032)*	*(0.042)*	*(0.039)*	*(0.051)*
LIQUID	-0.025***	-0.022**	-0.032***	-0.021***	-0.028***	-0.022***
	(0.0038)	*(0.0087)*	*(0.0056)*	*(0.0060)*	*(0.0049)*	*(0.0059)*
DEPOSITS	-0.016***	-0.022**	-0.011*	-0.015***	-0.012**	-0.021***
	(0.0039)	*(0.0097)*	*(0.0062)*	*(0.0058)*	*(0.0050)*	*(0.0064)*
SECURIT	-0.0014	-0.012	-0.0088	0.0012	-0.0018	-0.00026
	(0.0069)	*(0.026)*	*(0.013)*	*(0.0092)*	*(0.0084)*	*(0.012)*
OTHERA	-0.021***	-0.038*	-0.028***	-0.017***	-0.013**	-0.032***
	(0.0049)	*(0.023)*	*(0.0097)*	*(0.0063)*	*(0.0061)*	*(0.0081)*
DEBT	-0.019***	-0.012	-0.016**	-0.023***	-0.011**	-0.028***
	(0.0038)	*(0.012)*	*(0.0066)*	*(0.0049)*	*(0.0049)*	*(0.0059)*
LEASE	-0.035***	-0.034*	-0.029**	-0.036***	-0.041***	-0.031***
	(0.0058)	*(0.019)*	*(0.012)*	*(0.0070)*	*(0.0073)*	*(0.0093)*
OTHERL	0.0066	0.045**	-0.0080	0.0079	-0.0017	0.021
	(0.0093)	*(0.022)*	*(0.015)*	*(0.014)*	*(0.011)*	*(0.017)*
RENTING	0.0041	-0.0036	0.014	0.0095	-0.0049	0.0081
	(0.015)	*(0.025)*	*(0.023)*	*(0.032)*	*(0.023)*	*(0.020)*
REALEST	-0.00093	-0.0029	-0.0068	-0.0031	-0.025	0.034
	(0.015)	*(0.040)*	*(0.023)*	*(0.022)*	*(0.019)*	*(0.023)*
NEWCARS	-0.109***	-0.285***	-0.071*	-0.102***	-0.081***	-0.137***
	(0.021)	*(0.089)*	*(0.036)*	*(0.023)*	*(0.027)*	*(0.032)*
OLDCARS	-0.079***	-0.141***	-0.087***	-0.048***	-0.092***	-0.059***
	(0.0088)	*(0.025)*	*(0.013)*	*(0.012)*	*(0.011)*	*(0.015)*
FRIDGE	-0.111***	-0.111***	-0.066*	-0.047	-0.096***	-0.126***
	(0.020)	*(0.027)*	*(0.036)*	*(0.057)*	*(0.029)*	*(0.028)*
DISHWASH	-0.035	-0.067	-0.085	-0.028	-0.011	-0.057
	(0.028)	*(0.112)*	*(0.070)*	*(0.031)*	*(0.037)*	*(0.044)*
ADULTS	-0.062***	-0.070***	-0.068***	-0.053***	-0.071***	-0.051***
	(0.0055)	*(0.016)*	*(0.0089)*	*(0.0076)*	*(0.0069)*	*(0.0091)*
KIDS15	-0.054***	-0.034*	-0.059***	-0.054***	-0.056***	-0.059***
	(0.0055)	*(0.018)*	*(0.0088)*	*(0.0080)*	*(0.0067)*	*(0.0096)*
AGE	0.316***	0.263***	0.361***	0.288***	0.159***	0.432***
	(0.040)	*(0.075)*	*(0.067)*	*(0.081)*	*(0.040)*	*(0.061)*
AGE2	0.716***	0.940***	0.630**	0.516	0.769***	0.803***
	(0.175)	*(0.279)*	*(0.299)*	*(0.413)*	*(0.239)*	*(0.258)*
FEMALE	-0.027***	-0.039*	-0.049***	-0.0079	-0.013	-0.041***
	(0.0090)	*(0.021)*	*(0.014)*	*(0.015)*	*(0.011)*	*(0.014)*
NONEST	0.051***	0.0066	0.055***	0.088***	0.046**	0.047***
	(0.013)	*(0.026)*	*(0.021)*	*(0.022)*	*(0.023)*	*(0.016)*
SECSCH	-0.074***	-0.076***	-0.071***	-0.071***	-0.077***	-0.074***
	(0.0097)	*(0.018)*	*(0.014)*	*(0.019)*	*(0.012)*	*(0.015)*
VOCEDU	0.032***	0.021	0.024	0.056***	0.019	0.046***
	(0.0092)	*(0.020)*	*(0.015)*	*(0.015)*	*(0.012)*	*(0.014)*
HIGHEDU	-0.111***	-0.081***	-0.116***	-0.112***	-0.119***	-0.105***
	(0.0098)	*(0.021)*	*(0.015)*	*(0.017)*	*(0.013)*	*(0.015)*
TALLINN	0.021	-0.070	0.022	0.048	0.042	0.016
	(0.023)	*(0.052)*	*(0.037)*	*(0.036)*	*(0.034)*	*(0.035)*
CITY	-0.019	-0.013	-0.014	-0.019	-0.035*	-0.017
	(0.022)	*(0.028)*	*(0.024)*	*(0.024)*	*(0.020)*	*(0.021)*
No. of obs.	12,506	3,493	4,841	4,172	6,582	5,924
R^2	0.307	0.222	0.317	0.363	0.354	0.246

Notes: OLS estimation with robust standard errors shown in brackets below the coefficient estimates. The superscripts ***, ** and * indicate that the null hypothesis of the coefficient being equal to 0 is rejected at, respectively, the 1%, 5% and 10% confidence level. Included in the regressions, but not shown in the table, are monthly, annual and regional dummies.

ber of interesting results. First, the estimated coefficient for the income shock TEMPLY is substantially lower for low-income households than for middle and high-income households. In other words, low-income households smooth their consumption less when subjected to income shocks than better-off households. Second, the subjective assessment of being worse off at the time of the interview than one year before have broadly the same effect on the saving rate irrespective of income. Third, the debt service and liquidity variables have rather similar effects on the household saving rate across all three income groups. Fourth, the effects of financial assets and liabilities on household saving are by and large comparable across the income groups. There are, however, more statistically significant coefficients for the high-income households than for the two other groups, presumably because financial assets and liabilities are disproportionately held by the high-income households. Fifth, the possession of non-financial assets in the form of cars and refrigerators has a much stronger downward effect on saving in low-income households than in higher-income households.

In sum, it is clear that the saving response to measures of income and financial pressure as well as a range of control variables varies noticeably across households with different incomes. Overall, low-income households smooth their consumption less than higher-income households. This would correspond to the fact that low-income households on average report that they have few financial assets and liabilities, which again would fit the finding that the effects of these variables on saving among low-income households are either limited or statistically insignificant.

In the baseline estimation in Column (3.5) of Table 3, it was found that households receiving income from self-employment on average have a substantially lower saving rate than households with no such income. Column (5.5) shows the saving estimation for households that receive income from self-employment, while Column (5.6) presents the corresponding results for households without self-employment income. The differences in saving behaviour across the two groups are remarkably small. The indices of financial assets and liabilities and also those of car ownership attain somewhat different coefficient estimates, but no clear pattern emerges from the results. The effect of the age of the household head on saving appears to differ across households with and without income from self-employment.

Section 2 discussed the rapid changes in the real estate market in Estonia and their possible effects on financial opportunities of the household sector. Our empirical analyses in Section 4 yielded no reliable results with respect to ownership of the household's own home or of real estate besides their primary residence. These results may be surprising insofar as real estate is the main source of wealth for many households and also an important means of collat-

Table 6: Sub-sample results for the determinants of the household saving rate SRATE, 2002–2005

	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)
	Baseline	**Renting of home**	**Home ownership**	**No non-home real estate ownership**	**Non-home real estate ownership**
REGLY	0.417*** *(0.022)*	0.421*** *(0.040)*	0.419*** *(0.013)*	0.420*** *(0.013)*	0.409*** *(0.040)*
TEMPLY	0.608*** *(0.014)*	0.577*** *(0.041)*	0.611*** *(0.015)*	0.610*** *(0.015)*	0.570*** *(0.043)*
SELFEMPL	-0.176*** *(0.010)*	-0.142*** *(0.032)*	-0.176*** *(0.011)*	-0.172*** *(0.011)*	-0.215*** *(0.029)*
PARTEMPL	-0.011 *(0.011)*	0.036 *(0.038)*	-0.016 *(0.011)*	-0.016 *(0.011)*	0.045 *(0.037)*
INACTIVE	0.0037 *(0.016)*	0.068 *(0.053)*	-0.0030 *(0.018)*	0.0084 *(0.017)*	-0.044 *(0.055)*
UNEMPL	-0.031 *(0.024)*	0.0030 *(0.066)*	-0.037 *(0.025)*	-0.035 *(0.024)*	0.096 *(0.095)*
HARDSHIP	-0.038*** *(0.0099)*	-0.047 *(0.031)*	-0.037*** *(0.010)*	-0.033*** *(0.010)*	-0.114*** *(0.035)*
DEBTSERV	-0.193*** *(0.032)*	-0.040 *(0.042)*	-0.222*** *(0.029)*	-0.191*** *(0.032)*	-0.208 *(0.213)*
LIQUID	-0.025*** *(0.0038)*	-0.011 *(0.012)*	-0.027*** *(0.0040)*	-0.026*** *(0.0040)*	-0.016 *(0.012)*
DEPOSITS	-0.016*** *(0.0039)*	-0.030** *(0.014)*	-0.015*** *(0.0041)*	-0.017*** *(0.0042)*	-0.014 *(0.012)*
SECURIT	-0.0014 *(0.0069)*	0.016 *(0.031)*	-0.0016 *(0.0071)*	-0.00036 *(0.0077)*	-0.013 *(0.016)*
OTHERA	-0.021*** *(0.0049)*	-0.044* *(0.023)*	-0.021*** *(0.0051)*	-0.022*** *(0.0052)*	-0.0091 *(0.014)*
DEBT	-0.019*** *(0.0038)*	-0.017 *(0.012)*	-0.019*** *(0.0040)*	-0.019*** *(0.0040)*	-0.021* *(0.012)*
LEASE	-0.035*** *(0.0058)*	-0.0071 *(0.022)*	-0.037*** *(0.0060)*	-0.033*** *(0.0062)*	-0.056*** *(0.016)*
OTHERL	0.0066 *(0.0093)*	0.045* *(0.0263)*	0.0036 *(0.010)*	0.0086 *(0.0098)*	-0.025 *(0.027)*
RENTING	0.0041 *(0.015)*	..	..	0.0021 *(0.015)*	0.036 *(0.065)*
REALEST	-0.00093 *(0.015)*	-0.0015 *(0.063)*	-0.0017 *(0.015)*	..	..
NEWCARS	-0.109*** *(0.021)*	-0.102 *(0.089)*	-0.110*** *(0.021)*	-0.119*** *(0.022)*	-0.042 *(0.051)*
OLDCARS	-0.079*** *(0.0088)*	-0.108*** *(0.032)*	-0.078*** *(0.0092)*	-0.083*** *(0.0093)*	-0.036 *(0.028)*
FRIDGE	-0.111*** *(0.020)*	-0.030 *(0.035)*	-0.145*** *(0.025)*	-0.109*** *(0.020)*	-0.140 *(0.111)*
DISHWASH	-0.035 *(0.028)*	-0.203** *(0.080)*	-0.026 *(0.030)*	-0.048 *(0.031)*	0.107 *(0.068)*
ADULTS	-0.062*** *(0.0055)*	-0.096*** *(0.023)*	-0.061*** *(0.0057)*	-0.061*** *(0.0058)*	-0.076*** *(0.018)*
KIDS15	-0.054*** *(0.0055)*	-0.071*** *(0.019)*	-0.054*** *(0.0058)*	-0.055*** *(0.0056)*	-0.040* *(0.0055)*
AGE	0.316*** *(0.040)*	0.397*** *(0.119)*	0.293*** *(0.043)*	0.300*** *(0.042)*	0.532*** *(0.146)*
AGE2	0.716*** *(0.175)*	1.022** *(0.442)*	0.739*** *(0.194)*	0.718*** *(0.180)*	0.684 *(0.802)*
FEMALE	-0.027*** *(0.0090)*	-0.077*** *(0.028)*	-0.022** *(0.0095)*	-0.024*** *(0.0095)*	-0.050* *(0.029)*
NONEST	0.051*** *(0.013)*	0.051 *(0.038)*	0.049*** *(0.014)*	0.041*** *(0.014)*	0.134*** *(0.036)*
SECSCH	-0.074*** *(0.0097)*	-0.126*** *(0.030)*	-0.068*** *(0.010)*	-0.076*** *(0.010)*	-0.019 *(0.039)*
VOCEDU	0.032*** *(0.0092)*	0.049 *(0.030)*	0.030*** *(0.0096)*	0.026*** *(0.0097)*	0.091*** *(0.029)*
HIGHEDU	-0.111*** *(0.0098)*	-0.111*** *(0.032)*	-0.112*** *(0.010)*	-0.109*** *(0.010)*	-0.111*** *(0.033)*
TALLINN	0.021 *(0.023)*	-0.013 *(0.093)*	0.022 *(0.024)*	0.025 *(0.022)*	-0.011 *(0.074)*
CITY	-0.019 *(0.014)*	-0.068 *(0.048)*	-0.013 *(0.015)*	-0.022 *(0.016)*	0.021 *(0.040)*
No. of obs.	12,506	1,157	11,349	11,465	1,041
R^2	0.307	0.345	0.308	0.307	0.358

Notes: OLS estimation with robust standard errors shown in brackets below the coefficient estimates. The superscripts ***, ** and * indicate that the null hypothesis of the coefficient being equal to 0 is rejected at, respectively, the 1%, 5% and 10% confidence level. Included in the regressions, but not shown in the table, are monthly, annual and regional dummies.

eral for loans. Other analyses have shown that home-ownership is an important determinant of the saving behaviour of households (Suruga and Tachibanaki, 1991). It is unclear whether our results reflect data deficiencies, misspecification of the baseline model or genuine peculiarities of the Estonian economy. To examine the latter two issues in more detail, we have therefore split the sample into different sub-groups, where the first sample split is between renters (respectively RENTING = 1) and homeowners (RENTING = 0) and the second split is between households not owning real estate in addition to the primary residence (REALEST = 0) and households owning such real estate (REALEST = 0). The results are shown in Table 6.

The sub-group of Estonian households renting their own residence is small, leading to relatively large standard errors in Column (6.2). Taking into account the different number of observations, which the results in Columns (6.2) and (6.3) are based on, it is clear that there are few qualitative differences in the saving behaviour between renters and homeowners. The main differences concern renters reacting less strongly to debt servicing than homeowners, and female renters having on average a smaller propensity to save than female homeowners. Overall, home ownership appears to have very little effect on saving behaviour in Estonia.

Columns (6.4) and (6.5) show the results when the sample is split according to whether the household owns property besides its primary residence. Only approximately 8% of the households belong to this group, and the standard errors in Column (6.5) are therefore larger than in Column (6.4). Still, the qualitative results across the two sub-groups are largely similar. The main exceptions pertain to the effects of a worsened economic situation for the household (HARDSHIP = 1), ownership of different durable goods and the ethnicity dummy. The differences are, however, small taking into account the precision with which the coefficients are estimated.

The effect of age on saving was discussed in Section 4, where it was found that elderly households in the sample on average had a higher propensity to save than the middle-aged households. To shed additional light on this finding, the baseline estimation in (3.5) has been re-estimated for three groups of households separately, namely the young households (aged 16 to 29), the middle-aged households (aged 40 to 59) and the elderly households (above 60 years). The results are shown in Table 7.

By comparing Columns (7.2)–(7.4) it follows that there are small but noticeable differences in saving behaviour across the three groups of the households. The elderly households smooth consumption less in response to income shocks than in particular the middle-aged ones. The coefficient for the subjective measure of hardship is highly significant and of sizeable magnitude for

Table 7: Sub-sample results for the determinants of the household saving rate SRATE, 2002–2005

	(7.1)	(7.2)	(7.3)	(7.4
	Baseline	**Young (16–39 years)**	**Middle-aged (40–59 years)**	**Elderly (60 years or above)**
REGLY	0.417*** *(0.022)*	0.385*** *(0.024)*	0.448*** *(0.018)*	0.390*** *(0.027)*
TEMPLY	0.608*** *(0.014)*	0.585*** *(0.026)*	0.652*** *(0.018)*	0.510*** *(0.039)*
SELFEMPL	-0.176*** *(0.010)*	-0.126*** *(0.019)*	-0.185*** *(0.016)*	-0.187*** *(0.019)*
PARTEMPL	-0.011 *(0.011)*	-0.033* *(0.019)*	0.0054 *(0.015)*	-0.016 *(0.029)*
INACTIVE	0.0037 *(0.016)*	-0.018 *(0.050)*	0.042 *(0.032)*	-0.016 *(0.028)*
UNEMPL	-0.031 *(0.024)*	-0.022 *(0.046)*	-0.043 *(0.035)*	0.00039 *(0.048)*
HARDSHIP	-0.038*** *(0.0099)*	-0.035* *(0.021)*	-0.023 *(0.015)*	-0.057*** *(0.017)*
DEBTSERV	-0.193*** *(0.032)*	-0.161*** *(0.046)*	-0.248*** *(0.063)*	-0.198*** *(0.042)*
LIQUID	-0.025*** *(0.0038)*	-0.030*** *(0.0074)*	-0.020*** *(0.0059)*	-0.030*** *(0.0067)*
DEPOSITS	-0.016*** *(0.0039)*	-0.015* *(0.0081)*	-0.024*** *(0.0060)*	-0.0051 *(0.0070)*
SECURIT	-0.0014 *(0.0069)*	0.019 *(0.015)*	-0.0035 *(0.0093)*	-0.020 *(0.015)*
OTHERA	-0.021*** *(0.0049)*	-0.022*** *(0.0079)*	-0.020*** *(0.0067)*	-0.020 *(0.018)*
DEBT	-0.019*** *(0.0038)*	-0.017*** *(0.0057)*	-0.022*** *(0.0055)*	-0.0060 *(0.017)*
LEASE	-0.035*** *(0.0058)*	-0.037*** *(0.0091)*	-0.034*** *(0.0082)*	-0.037* *(0.020)*
OTHERL	0.0066 *(0.0093)*	-0.0012 *(0.014)*	0.018 *(0.013)*	-0.017 *(0.031)*
RENTING	0.0041 *(0.015)*	0.0050 *(0.024)*	-0.0060 *(0.027)*	0.045 *(0.028)*
REALEST	-0.00093 *(0.015)*	-0.0085 *(0.032)*	-0.0063 *(0.021)*	0.016 *(0.026)*
NEWCARS	-0.109*** *(0.021)*	-0.129*** *(0.035)*	-0.102*** *(0.029)*	-0.091 *(0.057)*
OLDCARS	-0.079*** *(0.0088)*	-0.059*** *(0.017)*	-0.082*** *(0.013)*	-0.093*** *(0.019)*
FRIDGE	-0.111*** *(0.020)*	-0.051 *(0.032)*	-0.148*** *(0.038)*	-0.158*** *(0.035)*
DISHWASH	-0.035 *(0.028)*	-0.042 *(0.039)*	-0.023 *(0.045)*	-0.100 *(0.079)*
ADULTS	-0.062*** *(0.0055)*	-0.039*** *(0.013)*	-0.070*** *(0.0074)*	-0.069*** *(0.014)*
KIDS15	-0.054*** *(0.0055)*	-0.064*** *(0.0086)*	-0.048*** *(0.0090)*	-0.093*** *(0.021)*
AGE	0.316*** *(0.040)*	-0.203 *(1.189)*	0.189 *(0.157)*	0.912* *(0.053)*
AGE2	0.716*** *(0.175)*	-0.503 *(2.856)*	-4.112* *(2.256)*	3.379*** *(1.244)*
FEMALE	-0.027*** *(0.0090)*	-0.031* *(0.018)*	-0.037*** *(0.013)*	-0.031* *(0.017)*
NONEST	0.051*** *(0.013)*	0.048* *(0.026)*	0.056*** *(0.020)*	0.034 *(0.023)*
SECSCH	-0.074*** *(0.0097)*	-0.063*** *(0.019)*	-0.070*** *(0.016)*	-0.080*** *(0.017)*
VOCEDU	0.032*** *(0.0092)*	0.055*** *(0.020)*	0.037*** *(0.014)*	0.0056 *(0.017)*
HIGHEDU	-0.111*** *(0.0098)*	-0.104*** *(0.021)*	-0.107*** *(0.015)*	-0.125*** *(0.018)*
TALLINN	0.021 *(0.023)*	0.053 *(0.045)*	0.0044 *(0.036)*	0.0083 *(0.042)*
CITY	-0.019 *(0.014)*	-0.043 *(0.028)*	0.012 *(0.023)*	-0.033 *(0.026)*
No. of obs.	12,506	3,076	5,438	3,991
R^2	0.307	0.357	0.369	0.182

Notes*:* OLS estimation with robust standard errors shown in brackets below the coefficient estimates. The superscripts ***, ** and * indicate that the null hypothesis of the coefficient being equal to 0 is rejected at, respectively, the 1%, 5% and 10% confidence level. Included in the regressions, but not shown in the table, are monthly, annual and regional dummies.

the elderly households, while it is less important for the other two groups. It is also noticeable that none of the measures of financial assets and liabilities are significant for the elderly households. The latter result may suggest that the elderly rely less on financial intermediation than other age groups in Estonia.[20]

7. Final comments

This study presents a micro-econometric analysis of the saving behaviour of a cross-section of Estonian households during the years 2002–2005. The underlying dataset is derived from recent waves of the Estonian Household Budget Surveys. Four main limitations of the data are acknowledged. First, the constructed saving measure includes interest payments on outstanding loans, which arguably should be treated as consumption spending. Second, no household-specific data is available on contribution to the first and second pillar pension schemes and this form of pension saving is therefore not included in the saving measure employed in the analysis. Third, the dataset lacks measures for many potentially important types of household assets and liabilities expressed in monetary terms. Fourth, the panel dimension of the dataset is too limited to be exploited in the empirical saving analysis, setting restrictions on the type and scope of issues that can be studied in this paper.

In spite of the limitations of the dataset, the results obtained and reported in Sections 4 to 6 are mostly in accordance with previous findings in the empirical literature on saving in middle-income transition economies, although some unexpected findings also arose. In line with Gibson and Scobie (2001), we find that a number of income and wealth related covariates along with controls for household characteristics make up a statistically and economically significant model explaining cross-sectional variation of the saving behaviour of households in Estonia. We will briefly review the main results and discuss some policy issues arising from the findings.

The saving rate depends positively on regular household income, but more pronouncedly on transitory income. These findings are consistent with theories of consumption smoothing. The estimated coefficients were relatively large; this is likely to be a result of the monthly observation period adopted by the Estonian Household Budget Survey. If an income shock leads to higher income during a particular month, then the part of the income that is not spent during the same month will be measured as savings. The marginal propensities

[20]Higher education in the group of elderly households leads to the same reduction of the saving rate compared to the middle-aged households. This result is surprising given that the value of the non-financial wealth (or human capital) captured by the education variable is likely to be smaller for the elderly than for the young and the middle-aged households.

to save out of regular and transitory income are thus not immediately comparable with results obtained using surveys with, e.g. annual periodicity. It should be noted that since the income variables enter in logarithmic form, the results should not be interpreted as indicating that average (economy-wide) income changes affect household saving. Even if the Estonian economy continues to expand rapidly, this may not lead to a higher household saving rate.

Households receiving income from self-employment have lower saving propensities. This finding is surprising given that proprietary income generally exhibits large variability, but the finding could reflect reporting problems concerning income and consumption. Otherwise the labour market status of a household has no discernable effect on household saving.

Among the measures of non-financial assets, the empirical results suggest no statistically significant effect on saving behaviour from the ownership indicators of household's home and other real estate. This finding conflicts with results from Japan, for example, where saving behaviour varies markedly across renters and homeowners (Suruga and Tachibanaki, 1991). The results for Estonia may be affected by the rapid changes in the housing market during the sample years, or the fact that home ownership and property ownership are widespread among households in Estonia as a result of the property restitution and privatisation that took place at the beginning of the 1990s.

The possession of a range of durable consumer goods, in particular cars, reduces household saving. This finding corresponds to similar findings in earlier studies of household saving in transition countries (Denizer et al., 2002; Foley and Pyle, 2005). The rapid expansion of the ownership of cars and other durable goods has gone hand in hand with less saving. It is, however, not straightforward to interpret this result or, indeed, establish the direction of causality.

Turning to the financial exposure of households, somewhat contradictory results emerged. Indices of deposits and other forms of financial assets are negatively correlated with saving as would be expected from theories where asset accumulation facilitates consumption smoothing. However, indices of debt and leasing liabilities also affect saving negatively, which would be at odds with the same theories. The results for these variables are, nevertheless, consistent with the corresponding results on the liquidity and debt servicing variables. Households with a relatively easy access to liquidity save less than those having lower liquidity levels. Households with debt servicing payments also appear to save less.

Taken at face value, the above results suggest that larger debts and/or debt servicing payments reduce household saving. A possible explanation of this apparently contradictory result is that the employed indicators for liabilities

and debt servicing are correlated with the unobserved credit access characteristics of the households in the sample. Easier credit access would lead to more consumption smoothing in anticipation of higher future real income. In this respect, the finding is in accordance with the macro background in Section 2: Estonian households have rapidly expanded their borrowing since 2002, which has also led to the continuing accumulation of financial liabilities.

The young and the elderly households appear to save more than the middle-aged households. A similar relationship has been found for other transition economies using cross-sectional data from the mid-1990s (Denizer et al., 2002). The finding should not be taken as contradicting the predictions of the life-cycle hypothesis, but most likely reflects differences in saving behaviour across generations in the cross-section of Estonian households.

Higher levels of education lead to lower saving. This result has been found in other studies as well and may be the consequence of households with higher education expecting higher and/or stable income streams in the future. In this interpretation, the education variables are proxies of non-financial wealth.

To conclude, household saving in Estonia has increased over the period 2002–2005, but so has the financial exposure of households. Income and wealth related covariates are found to be among the most important determinants of saving behaviour, but they alone are unlikely to explain the time trend in the macroeconomic picture of household saving. Other important variables, such as possession of durable goods and educational attainment, are similarly unlikely to explain the trend in saving over the years. The main results of this study should therefore be interpreted as describing *microeconomic* determinants of saving behaviour across different household sub-groups, rather than explaining trends in the saving behaviour of Estonian households over time.

The Estonian Household Budget Survey is a rich data source with many potential applications, and as such the dataset should be useful for further microeconometric work on the saving behaviour of households in Estonia. First, future extensions of this study may seek to incorporate the (limited) panel dimension of the dataset into the analysis. Second, it may be useful to investigate possible non-linear effects of variables affecting the saving rate, for instance by employing semi-parametric regression methods. Third, the possible joint determination of the households' income (employment) and wealth accumulation may be analysed in more detail using system estimation or instrumental variables estimation. Finally, the dataset may also continue to be a valuable basis for explicit testing of specific hypotheses of saving behaviour.

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Appendix 1. Descriptive statistics of variables

Variable	Mean	Median	Std. dev.	Minimum	Maximum
SRATE	0.099	0.105	0.549	-2.990	2.615
LY	8.615	8.641	0.785	4.605	11.534
REGLY	8.489	8.517	0.715	4.605	11.408
TEMPLY	0.126	0.077	0.433	-4.866	3.663
NORMLY	9.069	9.210	0.627	6.397	11.513
BELOWY	0.103	0.000	0.303	0.000	1.000
ABOVEY	0.158	0.000	0.365	0.000	1.000
SELFEMPL	0.526	1.000	0.499	0.000	1.000
PARTEMPL	0.232	0.000	0.422	0.000	1.000
INACTIVE	0.262	0.000	0.440	0.000	1.000
UNEMPL	0.049	0.000	0.215	0.000	1.000
HARDSHIP	0.268	0.000	0.443	0.000	1.000
DEBTSERV	0.038	0.000	0.164	0.000	7.500
LIQUID	2.199	2.000	1.760	0.000	6.000
DEPOSITS	1.996	1.000	1.314	1.000	5.000
SECURIT	1.120	1.000	0.580	1.000	5.000
OTHERA	1.241	1.000	0.862	1.000	5.000
DEBT	1.549	1.000	1.251	1.000	5.000
LEASE	1.188	1.000	0.768	1.000	5.000
OTHERL	1.047	1.000	0.403	1.000	5.000
RENTING	0.093	0.000	0.290	0.000	1.000
REALEST	0.083	0.000	0.276	0.000	1.000
NEWCARS	0.055	0.000	0.241	0.000	3.000
OLDCARS	0.451	0.000	0.576	0.000	5.000
FRIDGE	0.942	1.000	0.234	0.000	1.000
DISHWASH	0.024	0.000	0.154	0.000	1.000
ADULTS	2.229	2.000	1.045	1.000	9.000
KIDS15	0.462	0.000	0.846	0.000	9.000
AGE	-0.000	-0.012	0.158	-0.362	0.488
FEMALE	0.485	0.000	0.500	0.000	1.000
NONEST	0.242	0.000	0.428	0.000	1.000
SECSCH	0.627	1.000	0.484	0.000	1.000
VOCEDUC	0.511	1.000	0.500	0.000	1.000
HIGHEDUC	0.563	1.000	0.496	0.000	1.000
TALLINN	0.216	0.000	0.411	0.000	1.000
CITY	0.376	0.000	0.484	0.000	1.000

Notes: See definitions of the variables in Table 2. There are 12,506 observations for each of the variables shown, with the exception of NORMLY which is limited to 12,417 observations due to a number of missing variables in the dataset. Additional variables not shown in the table are monthly and yearly dummies and regional dummies.