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UNIVERSITY OF WARSAW

**Faculty of Economic Sciences**

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**WORKING PAPERS**

No. 13/2014 (130)

**ALEKSANDRA KOLASA  
BARBARA LIBERDA**

**DETERMINANTS OF SAVING IN POLAND:  
ARE THEY DIFFERENT THAN IN OTHER  
OECD COUNTRIES?**

WARSAW 2014



**Determinants of saving in Poland:  
Are they different than in other OECD countries?**

**ALEKSANDRA KOLASA**  
Faculty of Economic Sciences,  
National Bank of Poland  
University of Warsaw  
e-mail: aurbaniec@wne.uw.edu.pl

**BARBARA LIBERDA**  
Faculty of Economic Sciences,  
University of Warsaw  
e-mail: barbara.liberda@uw.edu.pl

**Abstract**

This paper studies the drivers of total private and household savings in Poland and compares them to those in developed countries. To this end, the two types of saving regressions are estimated: one based on an annual panel of OECD countries and the other using Polish quarterly time series. Compared to an “average” OECD country, the Polish private and household saving rates are more affected by the process of financial deepening. Moreover, they are also more sensitive to changes in government and corporate savings.

**Keywords:**

private savings, household savings, Poland, panel study, saving determinants

**JEL:**

E210, O160, O570

**Acknowledgments:**

This paper is based on the research project sponsored by the World Bank for the Country Economic Memorandum: Is Poland saving enough? We would like to thank Franziska Ohnsorge, Emilia Skrok, Mark Allen, Michał Gradzewicz, Constantino Hevia, Ryszard Kokoszcyński and the participants of World Bank workshop in Warsaw for valuable comments.

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## Introduction

Savings in Poland exhibit some interesting dynamics. While the private saving rate is slightly below the average of OECD countries and from the beginning of 2000 stays at the relatively stable level, one can observe a great movement in its sectorial structure. A significant decline in household savings has been compensated by a considerable increase in corporate savings. Eventually, the Polish household saving rate declined to one of the lowest level in the OECD countries.

The aim of this study is to investigate what has been driving Polish private and household savings in the last decade. We are also interested whether these are the same factors that also affected saving rates in developed countries.

To this end, we study the determinants of private and household saving rates in a following manner. First, we use annual panel data covering most of OECD countries to estimate the saving regressions. What we obtain is a set of variables that have a significant effect on private or household savings in an 'average' OECD economy. Second, we narrow the focus of our empirical study to Poland and estimate the same regressions, but this time relying only on Polish time series that are available at a quarterly frequency. A comparison of the saving determinants identified with these two approaches is aimed to show us whether Poland differs from other countries in terms of the behavior of its saving rates.

The early literature on macroeconomic determinants of savings is either devoted exclusively to developing countries or tries to cover the representation of countries at every level of development (Modigliani, 1970; Modigliani and Sterling, 1983; Schmidt-Hebbel et al., 1992; Carroll and Weil, 1994; Edwards, 1996; Masson et al., 1998; Loayza et al., 2000). More recent empirical investigations focus more on the selected groups of OECD or European countries (i.a. De Serres and Pelgrin, 2003; Mody et al., 2012) and only few concern the transition countries from Central and Eastern Europe (Denizer, et al., 2000, 2002, Liberda and Tokarski 1999; Schrooten and Stephan, 2005).

Our study adds to the literature in the following ways. First, we use most recent observations, in particular our dataset covers the global economic crisis that started in 2008. Second, in contrast to other studies, our panel contains a relatively large representation of post-communist countries, including Poland.

Beside the standard set of determinants we also test for wealth effects and quantify the response of household savings to changes in corporate savings. We find the latter to be significant and relatively big. Moreover, according to the private saving regression, real income, the government saving rate and productivity growth are the main drivers of the changes in private savings in OECD countries. On the other hand, the real interest rate, government saving and corporate saving together with cyclical factors have the major effect on the household saving rate. Interestingly, demographic changes (namely rising trends of the old dependency ratio) turn out to be insignificant.

In the second part of our study we focus exclusively on Poland. Once again we investigate saving determinants, this time using Polish quarterly data from the National

Accounts. To our knowledge, this is the first comprehensive study of Polish savings based on this dataset. We find that changes in the Polish private saving rates in the last decade were mostly driven by the developments of real private income and financial deepening (expressed as the M2 to income ratio). The former affected Polish private savings with a positive sign while an increase in the latter had a negative impact. Other significant determinants, which positively affected private savings, were consumer prices growth and the interest rate. Moreover, private savings were found to depend negatively on government savings.

During the first half of the first decade of the 2000s one can observe a substantial drop in the household saving rate in Poland, as well as in the real interest rate and inflation, bringing them closer to the levels observed in developed countries. During the second half of the last decade, changes in the Polish household saving rate were mostly driven by changes in the level of financial depth and by the household income growth rate. Moreover, household savings depended on government and corporate savings while the interest rate and growth in consumer prices turned out to be insignificant.

Comparing the results from panel regressions with the estimates based on Polish quarterly data, we find that the private and household saving rates in Poland were more affected by the process of financial deepening than in an 'average' OECD country. Moreover, they were also more sensitive to changes in government and corporate savings.

The rest of this paper is organized as follows. In section 1 we present the standard determinants of saving and provide a short overview of the related literature. Section 2 discusses the main descriptive statistics on Polish savings and compares them to other countries. Section 3 presents the results from the saving regressions estimated on the panel of OECD economies. Since these panel regressions do not exactly capture some important developments observed in Poland, in Section 4 we look closer at the determinants of Polish savings. Section 5 summarizes the differences between the main determinants of saving in Poland and other OECD countries.

## **1. An overview of saving determinants**

### **Theoretical dependencies**

Economic theories, such as the life cycle models and the theory of consumer choice, provide a wide range of possible determinants of saving which can be tested empirically. The variables implied by the theory are designed to describe households' choices. However, researches also use them to explain the behavior of the total private saving rate. This approach is justified by the fact that households eventually own firms and its empirical confirmation is seen in a relative stability of private savings over time in the US economy (the fact detected by Denison in 1958 and further explored by David and Scadding, 1974). Below we describe the standard set of determinants with their possible impact on the household (and hence also private) saving rate:

- Demographics – Life cycle models of consumers' behavior predict a significant decline in savings for relatively old individuals (Modigliani, 1986). Hence, one can expect a negative impact of an old dependency ratio on household savings. However, life cycle patterns obtained on micro level data neglect some of the predictions of standard life-cycle models, i.a. a retirement puzzle, and also differ greatly between countries.
- Income – a positive impact of an increase in an income level on the household saving rate results from the fact that richer individuals tend to save more. It is especially evident for poor countries, where a significant acceleration in income enable individuals who previously were on their biological minimum level to smooth their consumption via saving accumulation.
- (Productivity/income) growth rate – On the one hand, productivity growth positively affects household savings, because its beneficiaries – workers tend to save more. On the other hand, if agents are able to shift consumption inter-temporally and productivity increases permanently, they might be tempted to borrow against future (increased) income, which results in lower savings.
- Fiscal policy (public sector saving) – According to the Ricardian equivalence hypothesis, forward looking agents are fully aware of the fact that the current government borrowing will eventually be financed by deferred taxation. Hence, a fiscal deficit should translate into higher household savings if individuals are smoothing their consumption over time. Empirical studies have confirmed the significant negative relation between private and public saving rates, however the substitution between savings was imperfect (not one-for-one).
- Real interest rate – There are several channels through which the real interest rate can affect savings. First, there is a substitution effect: an increase in the real interest rate raises the cost of current consumption relative to future consumption and therefore provides incentives to save more. On the other hand, an income effect is caused by the fact that while the interest rate increases an individual can save less and still receive the same amount of money next period, which encourages him to reduce saving. Then, the human wealth effect is connected with the fact that changes in the interest rate also changes the present value of future labor streams of an individual. This effect acts in the same direction as the substitution effect. Eventually, the sign and strength by which the real interest rate may affect household savings is ambiguous and in fact in many empirical studies its impact on the private/household saving rate was found to be insignificant.
- Terms of trade – According to the Harberger-Laursen-Metzler effect, under the assumption that the marginal propensity to consume is less than unity, a deterioration in the terms of trade causes a drop in savings due to a decrease in real income. However, the predicted positive relationship between the terms of trade applies only to the short time and transitory shocks. In other cases, economic theories differ greatly on the effect of terms of trade on the saving rate.

- Macroeconomic uncertainty (usually measured by inflation) – The uncertainty an individual faces triggers his need to accumulate precautionary savings. In empirical studies on private and household savings, inflation was usually used as a proxy for the macroeconomic uncertainty. However, more recent experience has shown that a great economic distress does not necessarily have to be accompanied by high inflation. Hence, there is a need to use also other measures, such as GDP volatility.
- Financial depth/ financial liberalization – Since financial liberalization is a complex process, its influence on the household saving rate may vary significantly between countries. One direct result of financial liberalization or financial deepening is an increase in access to consumer credit which should affect savings negatively.
- Household wealth changes (so called wealth effect) – The valuation of assets changes an individual's wealth. If this change is treated as permanent, he or she can adjust his or her consumption-saving behavior accordingly. Hence, an increase in household wealth, for instance through an acceleration in property prices, could translate into lower savings.
- Other factors – such as social processes (for example urbanization) and macroeconomic cyclical fluctuations may also influence the aggregate savings.

### **Selected empirical literature**

There is a vast number of empirical studies on saving determinants. Since they are devoted to various countries and time periods, they often lead to different findings. In this section only a selection of the related literature is presented. Its aim is to show how the variables we discussed earlier can be tested empirically and what conclusions are often obtained.

Loayza et al. (2000) using a panel for more than sixty countries estimated private and national saving regressions with an extended robustness check to different measures of variables and different specifications. Their results showed i.a. the positive effect of an income level and income growth, and the negative effect of government saving on the private saving rate.

Bandiera et al. (2000) examined the impact of financial liberalization on savings in developing countries and found that the pattern of effects differs across countries. Since the impact of interest rates on saving in developing countries is usually insignificant, financial liberalization can decrease savings through the increased availability of consumer credit.

Horioka and Terada-Hagiwara (2012) analyzed trends of nominal and real domestic saving rates in twelve Asian economies during 1966-2007. They argued that the main determinants of savings in Asia are: the old dependency ratio, income levels and the level of financial sector development. Authors project roughly constant domestic saving rates in these economies for 2011-2030.

Denizer and Wolf (2000) explained the savings collapse during the transition in Eastern Europe by the elimination of involuntary savings and by a change in the equilibrium

savings after transition. They found some support for the hypothesis of consumption smoothing and for negative association of liberalization with savings.

Liberda and Tokarski (1999) estimated the determinants of saving function for fourteen OECD countries during 1971-1994 and used the results of estimation for simulating the rates of growth and rate of saving in Poland in the 1990s. The saving rate in OECD countries was positively affected by GDP growth and the balance of payments in GDP and negatively by the old dependency ratio. The rise of the budget deficit in GDP caused a decrease of national saving rate, which means that private savings did not offset the fall of public savings and the Ricardian equivalence did not work.

Schrooten and Stephan (2005) found similar results for EU-15 and EU-accession countries: persistent saving rates, income growth increasing savings, public savings crowding out private savings and foreign capital substituting domestic savings. The long-run effects of income growth and public savings were larger in the EU-15 than in the EU-accession countries.

A significant negative correlation between the private saving rate and the household net financial wealth observed for the number of developed countries might suggest a strong wealth effect, which by some was claimed to be the main driver of a decrease in the saving rates in 1990s. De Serres and Pelgrin (2003) tested this view by examining the fundamental (non-financial) determinants of the private saving rate using a panel of 15 OCED countries between 1970 and 2000. It turned out that these determinants explained very well the behavior of private saving during the analyzed period and the significant drop in the private saving rate in the 1990s can be rather attributed to, among others, a decrease in public sector debt.

Another work which deals with a possible wealth effect on saving is the empirical study of Salotti (2010). Using separate measures for financial and non-financial (tangible) wealth, she found that only the latter weakly and negatively influences household saving rate in developed countries, except for the United States where wealth did not affect household savings negatively.

Alessi, Angelini and Van Santen (2013) estimated the displacement effect of pension wealth on household savings in thirteen European countries, including Poland and Czech Republic, in the 2000s (SHARELIFE data). They found that the personal pension wealth is associated with a decline in non-pension wealth. Based on the same SHARELIFE data, Japelli and Padula (2013) found the positive effect of financial literacy on wealth and savings in 13 European countries.

Kool and Muysken (2013) added three cultural variables (thrift, trust and religiosity) to standard macroeconomic variables and found that they contributed to the explanation of cross country saving heterogeneity for thirty OECD countries during 1990-2010.

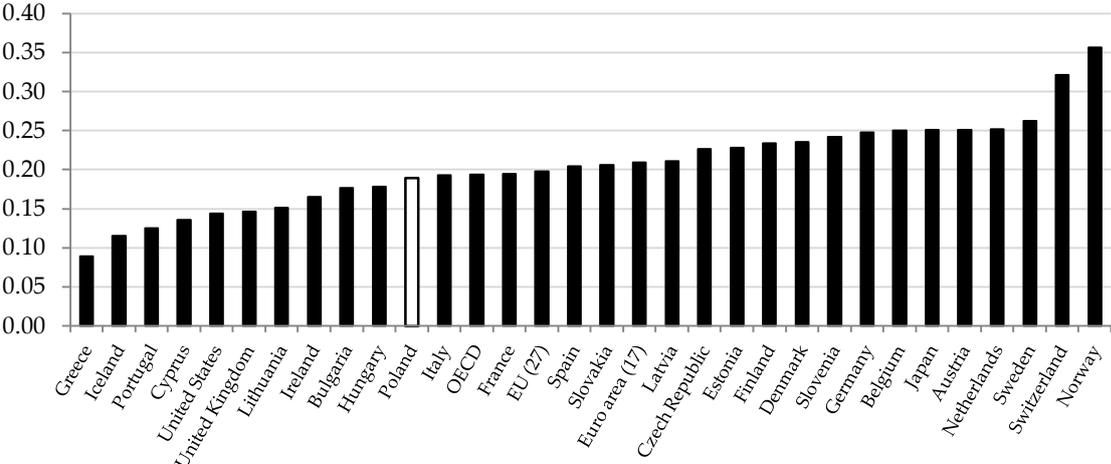
Mody et al. (2012) examined the role of the precautionary motive in the behavior of household saving rates in developed countries. They argued that two-fifths of the sharp increase in household saving rates between 2007 and 2009 was caused by the labor and GDP uncertainty.

Influenced by last financial crisis, Aizenman and Noy (2013) examined the impact of catastrophic shocks from 1900 onward on patterns of savings for a sample of 23 high-income countries during 1980-2010. They find evidence that experience of past crises tends to increase savings among households, but lead to decreased public sector saving.

**2. Polish savings – descriptive analysis**

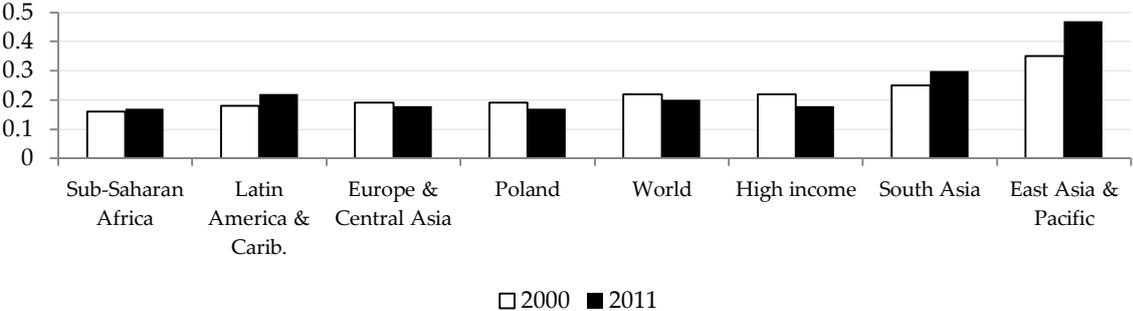
Polish savings in relation to GDP are low by comparison with countries of similar income level, but only slightly below the average of the OECD economies. During a period of 2000-2011 Poland saved on average less from GDP than many Central European neighbors of Poland (Czech Republic, Slovakia, Latvia and Estonia) as well as most of more advanced European and OECD countries. Poland’s gross savings to GDP ratio is higher than the historically formed levels of saving rates in the United States, United Kingdom and countries in financial distress, such as Greece, Iceland, Portugal, Ireland and Cyprus (see Figure 1). However, gross savings in relation to GDP in Poland are lower than the averages for countries in East Asia & Pacific, South Asia and Latin America during 2000-2011 (see Figure 2).

**Figure 1. Average Gross Savings in relation to GDP for a period 2000-2011**



Source: Calculations based on Eurostat, OECD.

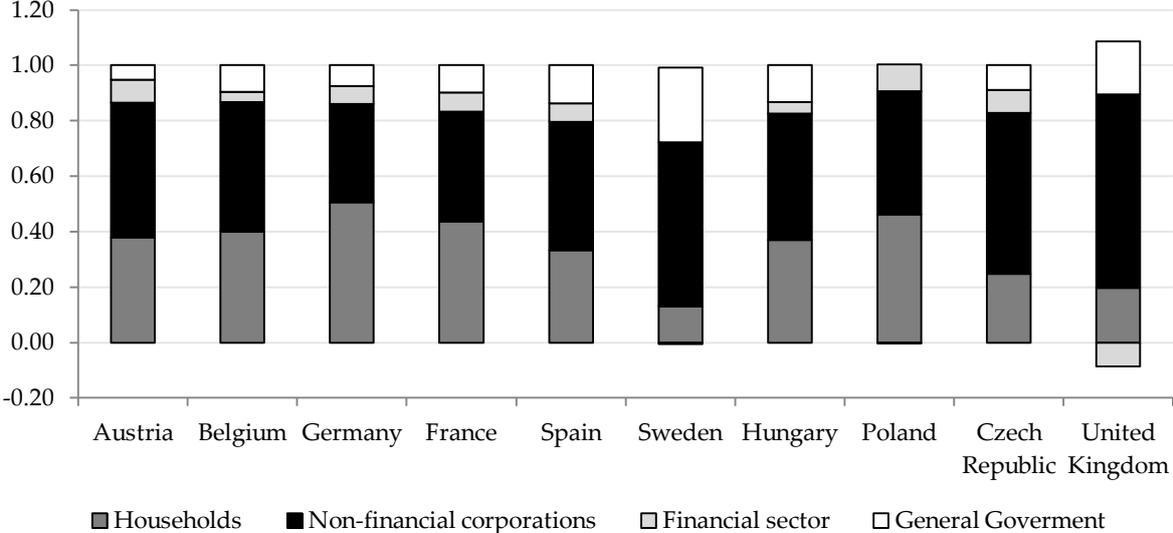
**Figure 2. Gross Savings in relation to GDP in 2000 and 2011 in world regions**



Source: Calculations based on WDI, 2013, WB.

Looking at the structure of gross savings by institutional sectors in 2000 in selected European economies (see Figure 3) one can observe that the nonfinancial corporate sector formed a higher share of total savings than the households, except for Germany, France and Poland. Most countries, except Poland, had positive government savings and financial sector savings. In Poland till 2001 households created more savings than the nonfinancial corporate sector.

**Figure 3 Structure of gross savings by sectors in 2000 (of total gross savings)**

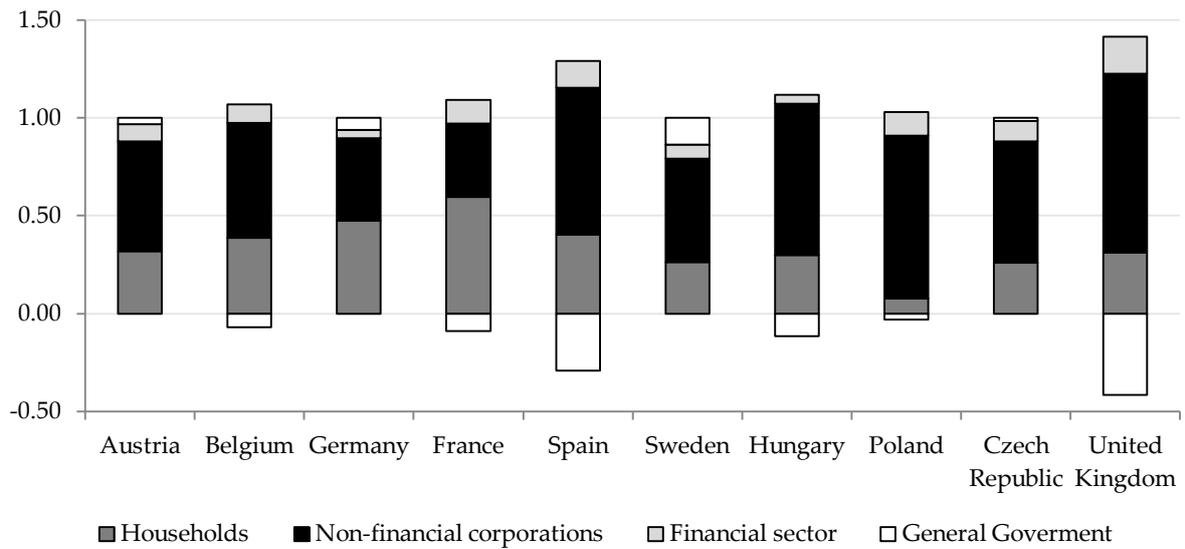


Source: Calculations based on Eurostat.

In 2011, after years of financial crisis, a change of the structure of gross savings is expressed in rising share of the nonfinancial corporate sector in total gross savings in a number of developed countries. Many economies reported negative government savings and a generally rising financial sector savings. Polish savings reflects a sharp decline in household savings since the early 2000s that has now brought the household saving rate to one of the lowest in the European Union (see Figure 4).

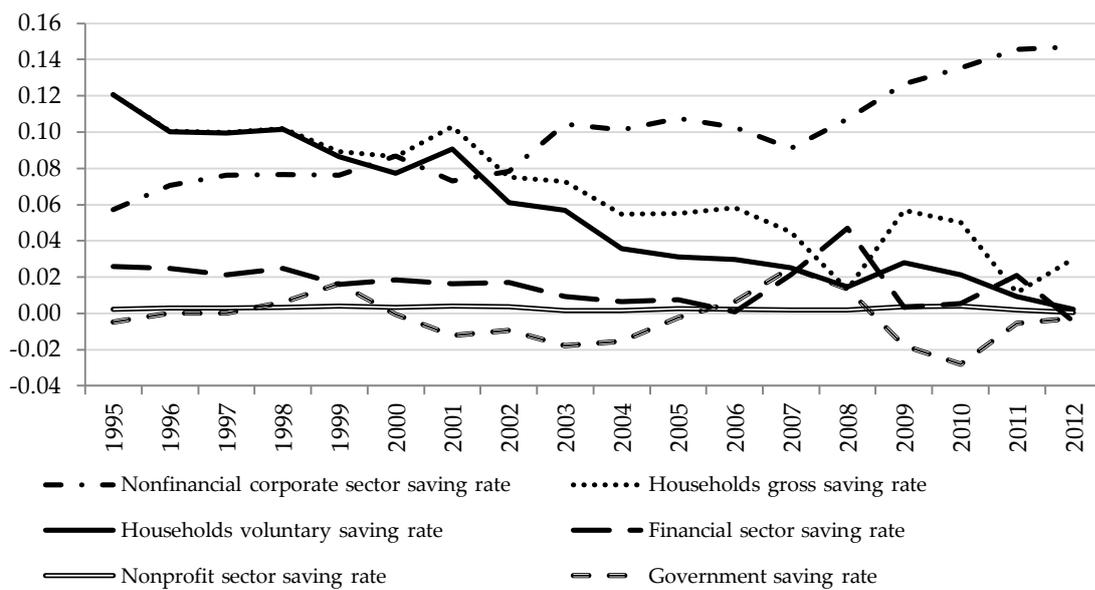
The change of the structure of gross savings in Poland between 2000 and 2011 was very profound. The corporate nonfinancial sector savings increased very fast and made a dominant share of total gross savings in 2011. The households’ gross savings, containing the increase of net equity in the pension funds, have been decreasing since 2001 in relation to total gross savings and, often, in nominal terms. Their share diminished to a bare 6 percent of total gross savings of the economy in 2011. The voluntary savings of households, without the increase of net equity in mostly mandatory pension funds, had fallen even more (to 5 percent of total savings) during 2001-2011.

**Figure 4 Structure of gross savings by sectors in 2011 (of total gross savings)**



Source: Calculations based on Eurostat.

**Figure 5 Savings of institutional sectors in Poland in 1995-2012 (in relation to GDP)**



Source: Calculations based on SNA/ESA95 for Poland, 1995-2011, CSO, Warsaw, Poland.

One can observe two offsetting trends in the behavior of Polish savings between 1995-2011: an increase in the nonfinancial corporate sector savings to GDP ratio and a decline in the share of household sector savings in GDP (see Figure 5). As a result, the total private savings to GDP ratio remained roughly stable during the analyzed period.

### 3. Determinants of saving rates in OECD countries – evidence from annual panel data

In this section we identify the main drivers of the private and household saving rates in the OECD countries. For this purpose, an annual panel of 28 countries is constructed. Among the major world economies such as the United States, Japan, Great Britain or Germany, it also contains six post-communist countries, namely the Czech Republic, Estonia, Hungary, Poland, the Slovak Republic and Slovenia. Due to limited availability of fully-comparable data, the panel is unbalanced with the average time dimension of 14 years (mostly from 1995 to 2011, for detailed description see Annex 1). Hence, the global recession that started in 2008 is covered by the dataset.

There are several approaches to estimate saving regression. One of them, used in many recent studies (i.a. Hüfner and Koske, 2010, Salotti, 2010), is to use a cointegration analysis which accounts for non-stationarity in the time series. Hence, it is possible to distinguish between long and short time effects. In this paper we do not follow this methodology, mainly due to the fact that our panel is unbalanced and has a relatively short time dimension. Instead, and similar to Loayza et al. (2000), the GMM dynamic system approach is used<sup>1</sup>, where all variables but the old dependency ratio, urbanization rate and terms of trade are treated as endogenous. The dependent variables, which are either private or household saving rates, are related to private or household disposable income and measured on a net basis.<sup>2</sup>

#### Private saving rate

Table 1 presents the results for the private saving regression. First, the private saving rate turns out to be highly persistent (the coefficient on its own lag is estimated between 0.77 and 0.80, depending on a subsample and specification). Other significant determinants of private saving are the following (based on the preferred specification (2)):

- The *terms of trade* and *urbanization rate* affect the saving rate positively.
- The *log of disposable income* and *labor productivity growth* have both positive effects on the dependent variable (similar to Loayza et al., 2000).

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<sup>1</sup> More precisely, the regressions use the one-step Arellano-Bover and Blundell-Bond system estimator, with the maximum lags of instruments equal to 10.

<sup>2</sup> Net savings are defined as gross savings minus depreciation (consumption) of fixed capital. This definition of savings is rather common in empirical research on household savings and used in this study in order to make its findings more comparable with the existing literature. The sensitivity analysis based on gross savings was also performed and is available upon request. Generally, the results for household savings were confirmed while there some differences could be noted in the private saving regressions. The biggest ones concern the effects of labor productivity growth and real income, which in the case of gross savings were found to be insignificant.

- The imperfect Ricardian effect is confirmed by a significantly negative coefficient associated with the *government saving ratio*. According to the estimates, 1 pp. increase in the government saving rate leads to a 0.09 pp. decrease in the private saving rate.
- An acceleration of the *consumer prices growth* significantly increases (precautionary) savings.
- As expected, the *domestic credit to private sector to private income* ratio and the *household financial net worth to private income* ratio, where the former is aimed to capture access to credit and the latter - the wealth effect, affect the saving rate with a negative sign.

**Table 1 Private saving regression, panel estimates**

			Only Europe*	Without post communist countries**
	(1)	(2)	(3)	(4)
$s_{t-1}^{Priv}$	.774 (28.63)	.773 (28.44)	.701 (22.83)	.804 (30.03)
log of terms of trade	.027 (3.31)	.028 (3.29)	.006 (0.53)	.046 (5.29)
log of labor productivity growth	.164 (3.09)	.186 (3.53)	.170 (2.96)	.220 (3.36)
urbanization rate	.053 (2.73)	.057 (2.77)	.102 (5.13)	.061 (3.42)
old dependency ratio	-.047 (-1.31)		-.290 (-5.36)	-.087 (-2.49)
unemployment rate	-.024 (-0.56)		.001 (0.02)	-.122 (-2.16)
log of real interest rate	-.045 (-0.93)		.005 (0.09)	-.125 (-1.88)
log of consumer prices growth	.086 (1.68)	.124 (2.53)	.159 (2.81)	-.087 (-1.04)
GDP volatility	.001 (1.95)	.001 (1.62)	.001 (1.81)	.002 (2.20)
M2 to private income	.003 (1.28)	.004 (1.72)	-.003 (-1.15)	.004 (1.60)
log of real private disposable income per capita	.028 (4.36)	.030 (5.12)	.0471 (6.20)	.0152 (2.26)
domestic credit to private sector to private income	-.006 (-2.31)	-.006 (-2.35)	-.006 (-2.36)	-.007 (-2.71)
household financial net wealth to private income	-.006 (-3.49)	-.007 (-3.78)	-.003 (-1.31)	-.006 (-3.35)
government saving to private income	-.090 (-4.61)	-.093 (-5.23)	-.095 (-4.23)	-.119 (-5.59)
const.	-.001 (-0.02)	-.013 (-0.25)	.215 (3.04)	-.129 (-2.28)
Sargan test (Prob > chi2)	0.1762	0.1721	0.0521	0.2172
Number of observations	376	378	289	300

z-statistics in brackets, method: GMM system estimator. Preferred specification (2)

\*See Annex 1 for data range \*\* European post-communist countries are heterogeneous but little evidence was found that they differ significantly from developed economies in the behavior of their saving rates.

Source: Own calculations

Another way of examining the importance of an individual exploratory variable is to incorporate its variance into the analysis. Similar to Bulir and Swiston (2006), we calculate a simple measure of the relative contribution of a given variable to the private saving rate, namely the product of its standard deviation calculated on the whole sample of countries

and the associated coefficient obtained from the regression.<sup>3</sup> The estimates are reported in Table 2 and should be interpreted in the following way.<sup>4</sup> For example, if the government saving rate increases by one standard deviation, the private saving rate drops by 0.39 pp. According to this measure, the real income, the government saving rate and the productivity growth are the main drivers of the changes in private saving rates in OECD countries.

**Table 2 The relative contribution to private saving rate of explanatory variables (in percentage points)**

Variable	standard deviation*coefficient
government saving to private income	-0.39
log of consumer prices growth	0.24
GDP volatility	0.15
urbanization rate	0.09
M2 to private income	0.17
log of terms of trade	0.25
domestic credit to private sector to private income	-0.29
household financial net wealth to private income	-0.17
log of real private disposable income per capita	0.65
log of labor productivity growth	0.33

Based on the specification (2) from Table 1.

While calculating standard deviations the means were extracted on the country level.

### Household saving rate

Then, we estimate a similar household saving regression with one additional exploratory variable, namely the corporate savings in relation to household disposable income (see Table 3). Theoretical justification of this variable follows from the Modigliani-Miller theorem (1958) by which households subsume a switch in corporate finance from retained earnings to debt issue in their budget decisions that lead to a switch from corporate to personal saving. The effect of corporate saving on household savings can be quite significant, f. ex. 0.4-0.7 for OECD countries in 1975-1995 (Callen and Thimann, 1997).

In case of household saving regression, a large degree of persistence is also detected. In line with the results of the private saving regression, the negative impact of government saving and the positive effect of terms of trade on the household saving rate are obtained.<sup>5</sup> Moreover, some of the variables insignificant in the private saving regression, including GDP volatility, the real interest rate and unemployment rate, turned out to be important

<sup>3</sup> In the model that we used, the differences in levels of exploratory variables between countries are captured by fixed effects. Hence, while calculating the standard deviations, the data are demeaned at the country level.

<sup>4</sup> If it is not mentioned otherwise, for the further analysis of the private saving rate the preferred specification (2) is used.

<sup>5</sup> If it is not mentioned otherwise for the further analysis of the household saving rate the preferred specification (3) is used.

drivers of the household saving rate. On the other hand, the household net wealth to income ratio, the domestic credit to income ratio, prices growth, real income, productivity growth and urbanization ratio, all statistically important while estimating the private saving rate, do not affect the household saving rate significantly.

Finally, the household saving rate does respond negatively to changes in the corporate saving rate, but the substitutability of saving is imperfect as 1 pp. increase in corporate saving rate leads to 0.078 pp. decrease in the household saving rate. This finding is robust to different specifications and provides an empirical confirmation of the so-called households 'piercing the corporate veil' effect.

**Table 3 Household saving regression, panel estimates**

	(1)	(2)	(3)	Only Europe*
$s_{t-1}^{hsh}$	.786 (33.71)	.757 (33.17)	.733 (35.82)	.753 (29.33)
log of terms of trade	.015 (2.13)	.016 (2.32)	.025 (3.97)	-.005 (-0.50)
log of labor productivity growth	-.047 (-1.07)	-.037 (-0.87)		-.008 (-0.16)
urbanization rate	.016 (1.04)	.034 (2.26)	.009 (0.59)	.077 (4.67)
old dependency ratio	-.008 (-0.27)	-.046 (-1.65)	-.043 (-1.50)	-.156 (-3.58)
unemployment rate	-.165 (-4.64)	-.159 (-4.72)	-.227 (-7.04)	-.148 (-4.07)
log of real interest rate	.206 (5.27)	.1505766 (3.93)	.149 (4.20)	.126 (2.82)
log of consumer prices growth	.024 (0.68)	-.001 (-0.01)	.056 (1.62)	-.036 (-0.98)
GDP volatility	.003 (6.49)	.0025 (6.06)	.003 (7.63)	.003 (5.67)
M2 to household income	.003 (1.88)	.004 (2.52)	.001 (0.98)	.003 (1.26)
log of real household disposable income per capita	.000 (0.37)	-.001 (-1.33)		.001 (0.38)
domestic credit to private sector to household income	-.003 (-1.47)	-.001 (-0.87)		-.002 (-1.01)
household financial net wealth to household income	-.002 (-0.96)	-.001 (-0.49)		.000 (0.09)
government saving to household income	-.084 (-5.58)	-.078 (-5.41)	-.099 (-6.96)	-.063 (-3.83)
corporate saving to household income		-.101 (-5.19)	-.078 (-4.16)	-.148 (-6.38)
Const	-.070(-1.97)	-.046 (-1.36)	-.089 (-2.84)	.027 (0.56)
Sargan test (Prob > chi2)	0.1783	0.1226	0.0671	0.1895
Number of observations	376	376	408	289

z-statistics in brackets, method: GMM system estimator. Preferred specification (3)

\*See Annex 1 for data range

For direct comparison of Ricardian effect and 'piercing the corporate veil' effect, the government and corporate savings are related to household income.

Source: Own calculations.

As in the case of the private saving rate, we try to quantify the relative contribution to the household saving rate of each explanatory variable (Table 4). It turns out that the one standard deviation change in the unemployment rate, the real interest rate, the government saving and the corporate saving to income ratio translates into the biggest change in the household saving rate.

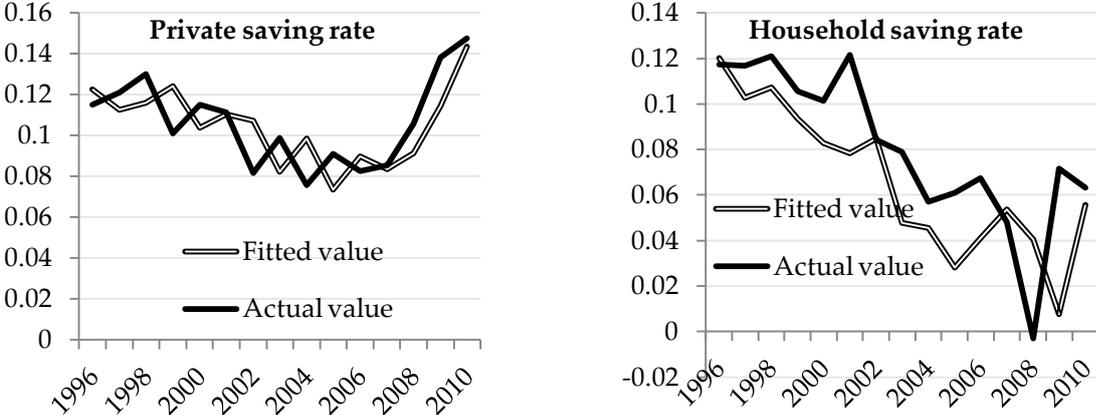
**Table 4 The relative contribution to household saving rate of explanatory variables (in percentage points)**

Variable	standard deviation*coefficient
government saving to household income	-0.28
log of consumer prices growth	0.16
GDP volatility	0.01
urbanization rate	0.03
M2 to household income	0.00
log of terms of trade	0.07
old dependency ratio	-0.12
unemployment rate	-0.64
log of real interest rate	0.42
corporate saving to household income	-0.22

Based on the specification (3) from Table 3.

While calculating standard deviations the means were extracted on the country level.

**Figure 6 Actual and fitted saving rates in Poland, coefficient from panel regression**



Based on the specification (2) from Table 1 and the specification (3) from Table 3.

However, the factors that were influencing Polish savings between 1995-2010 do not necessarily have to coincide with those in the ‘average’ OECD economy. Looking at Figure 6, one can see that the model does not capture the substantial drop in Polish household savings in 2008 or their increase observed in 2001. Therefore, in the next section we will focus exclusively on savings in Poland and estimate private and household saving regressions based on Polish quarterly time series.

#### 4. Determinants of saving in Poland – is there something more to learn?

The consistent Non-Financial National Accounts in Poland have a relatively short history. The data on savings start from 1995, which up to 2012 gives only 18 annual observations, which is definitely not enough to perform any meaningful econometric analysis. Therefore in this section we choose to rely on quarterly data, where we have comparable observations for the period of 1Q1999-4Q2012. One of the problems with quarterly data is their seasonality, which we eliminate with the TRAMO-SEATS method.

Our goal is to estimate private and household saving regressions. Since we want to make the results comparable to those in section 3, wherever possible, we chose a similar set of determinants.<sup>6</sup> One evident limitation is that data on net savings are not available at a quarterly frequency. Nevertheless, in the analyzed period the depreciation of fixed capital constituted a relatively stable share of income, hence using a gross measure seems to be justified.

Regarding the estimation method, we tested several of them and finally chose to rely on the OLS technique. First, we considered the cointegration analysis and therefore the existence of a unit root was tested for. It could not be rejected for the household (voluntary) saving rate, but it was strongly rejected for the total private saving rate. Since the time dimension is rather limited and for the sake of having the same approach in all regressions, finally it was chosen not to follow the cointegration approach.

The models were also tested for endogeneity of the selected variables (i.a. the non-financial corporate savings to income and M2 to income ratios), which may arise both from the construction of variables and the underlying economic processes. To do so, the equations with the GMM using the lagged values of endogenous variables as instruments were estimated. However, the exogeneity assumption could not be rejected for any reasonable level of significance, which brought us back to the OLS approach as the preferred method.

#### Private saving rate

Table 5 Private saving regression for Poland based on quarterly data

Sample	1Q1999-4Q2012	1Q1999-4Q2012	1Q1999-4Q2012
	(1)	(2)	(3)
Constant	-5.13 (-2.9)	-4.374 (-3.8)	-3.862 (-3.2)
Private saving rate (-1)	0.002 (0.0)	0.016 (0.2)	-0.001 (0.0)
Private saving rate (-2)	-0.055 (-0.5)	-0.050 (-0.5)	-0.090 (-1.7)
Private saving rate (-3)	-0.079 (-0.6)	-0.064 (-0.6)	-0.116 (-1.5)
Private saving rate (-4)	-0.105 (-0.6)	-0.153 (-1.3)	-0.048 (-0.3)
Dependency ratio	-0.349 (-0.6)		0.094 (0.2)
Government savings to private	-0.35 (-1.9)	-0.422 (-4.2)	-0.643 (-4.4)

<sup>6</sup> For the detailed description of the data sources and variable construction see Annex 2.

disposable income			
Household financial net worth to private disposable income	-0.002 (-0.3)		0.006 (1.2)
Log of real interest rate	0.791 (4.3)	0.813 (5.3)	0.828 (5.3)
Log of terms of trade	-0.025 (-0.3)		-0.085 (-1.5)
Log of consumer price growth	0.334 (3.0)	0.283 (4.1)	0.353 (4.9)
Log of real private disposable income	0.47 (2.9)	0.398 (3.9)	0.349 (3.2)
M2 to private disposable income	-0.081 (-2.1)	-0.081 (-2.6)	-0.066 (-1.7)
GDP volatility	0.001 (0.4)		0.003 (1.2)
Log of real private disposable income growth	0.110 (0.7)	0.079 (0.9)	0.111 (0.9)
Log of labor productivity growth	-0.099 (-0.7)		-0.127 (-1.2)
Unemployment rate	0.15 (0.8)		-0.031 (-0.2)
Credit to private sector to private disposable income	0.00 (0.0)		-0.003 (-0.3)
<hr/>			
Method	ols	ols	gmm
observation no.	52	52	52
Adjusted R-squared	0.664496	0.713202	
Jarque-Bera test (prob.)	0.6585	0.988	
Breusch-Pagan-Godfrey F-stat (prob.)	0.4126	0.2048	
chi-square - stat. (prob.)	0.3767	0.2024	
Breusch-Godfrey chi-square-stat (prob.)	0.2532	0.4232	
Ramsey RESET test F-stat (prob.)	0.5329	0.2742	
<hr/>			
instrument no.			32
number of lags			4
endogenous variables	Government savings to private disposable income, Household financial net worth to private disposable income Credit to private sector to private disposable income M2 to GDP, Log of private disposable income		
Endogeneity Test Difference in J-stats (prob.)			0.9625
Sargan test (prob.)			0.092
<hr/>			
t – statistics in brackets			
Preferred specification (2)			

From a wide range of possible determinants, those which appeared significant in explaining changes of the gross private saving rate (defined as the ratio of gross private savings to gross private disposable income) were chosen. According to the final estimates (see Table 5 and preferred specification (2)), the private saving rate was moderately persistent during the analyzed period and:

- depended positively on *real disposable income*,
- was affected by *consumer price growth* (used as a proxy of uncertainty and aimed to capture a precautionary motive) with a positive sign,

- negatively responded to *government savings to income* ratio (According to the regression, the private sector was aware of the consequences of running a public deficit, however the Ricardian effect was not perfect, i. e. 1 pp. increase in government saving rate translates into 0.42 rise in the private saving rate – the estimate much higher than the one obtained on the panel of OECD countries.),
- was affected positively by *real interest rate*,
- responded to changes in *M2 to income* ratio.

The real private income and M2 to income ratio have the highest relative contribution to changes in private saving rate (see Table 7).

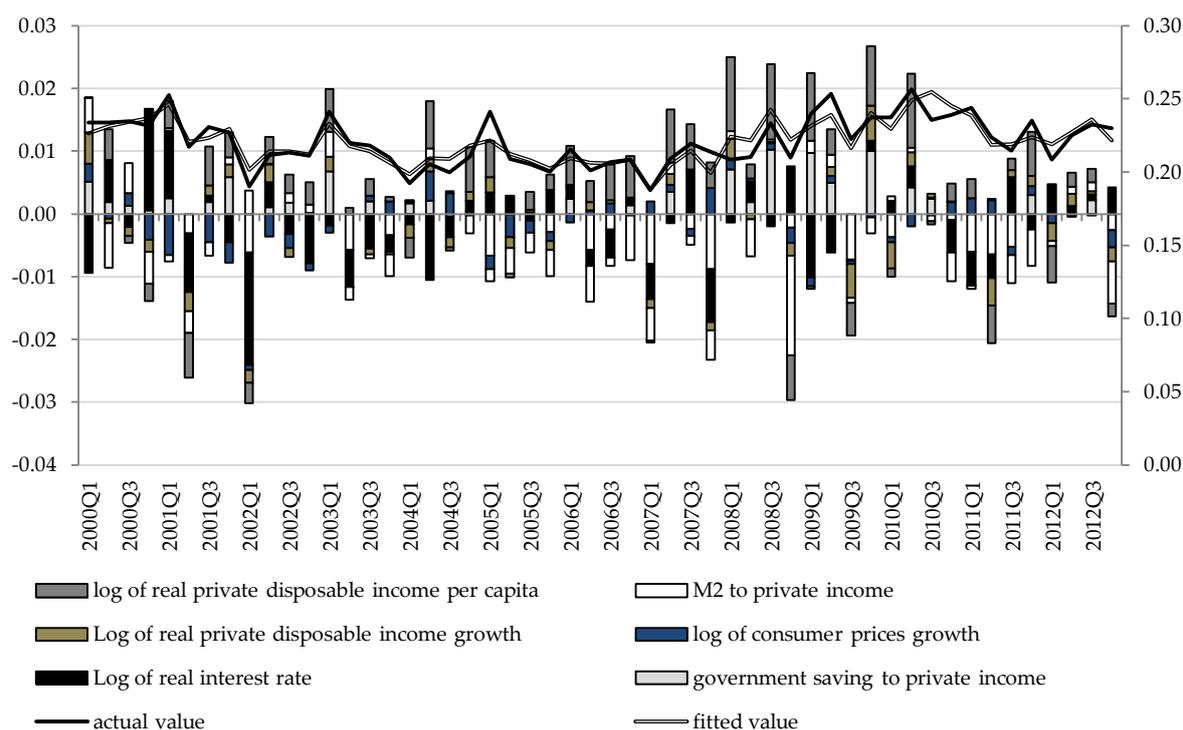
**Table 7 The relative contribution to private saving rate of explanatory variables (in percentage points)**

Variable	standard deviation*coefficient
government saving to private income	-0.78
log of real interest rate	2.30
log of consumer prices growth	0.65
log of real private disposable income growth	0.19
M2 to private income	-2.81
log of real private disposable income per capita	5.31

Based on the specification (2) from Table 5.

According to the estimates, at the early 2000s both high real interest rates and high CPI increased the private saving rate by app. 4 percentage points (see Figure 7). After 2003 the decrease in real interest rates lowered the private saving rate, especially after 2009. Furthermore, the two most important drivers of changes in the private saving rate were real income (which generally had positive impact) and the M2 to income ratio (which lowered the private saving rate through the whole analyzed period).

**Figure 7 Private saving rate in Poland and contribution to its changes**



## Household saving rate

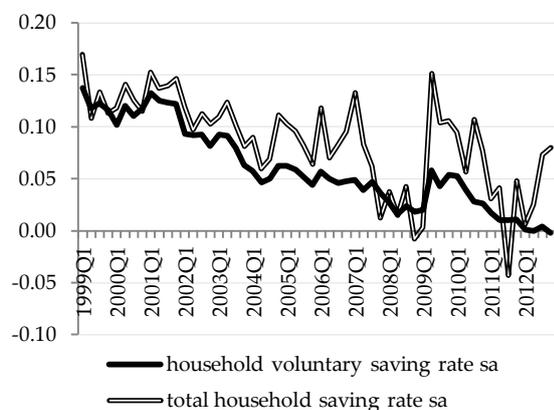
According to the SNA/ESA95 accounts, the household gross savings consist of two categories: ‘voluntary savings’, which are the difference between household gross disposable income and consumption, and the adjustment for the change in net equity of households in pension funds (if present in an analyzed country). The latter is added to the ‘household savings’ category in order to close the non-financial accounts (households are by definition owners of the pension funds). However, due to the fact that most of the transfers to the pension funds are mandatory, this definition of household savings might be quite misleading when one considers the process of accumulating capital as an independent decision of an individual to postpone consumption.

The presence of the adjustment for the pension funds category in the total household savings is particularly important in Poland. This position is responsible for great variation in quarterly data on total household saving (see Figure 8) and is recently the main driver of the whole category (in 2010 it constituted 57 percent of total household savings, in 2011 it was 21 percent and 95 percent in 2012).

The ‘adjustment for the pension funds’ component is highly correlated with the same position from financial accounts published by the National Bank of Poland (the correlation coefficient stands at 0.98). In the latter there are two main components: transactions (quite stable over time, with only one shift in levels after the last modification in the pension system in 2011) and changes in the valuation, which exhibit great variation. However, the changes in valuation are not particularly interesting while examining the long-term tendencies and real

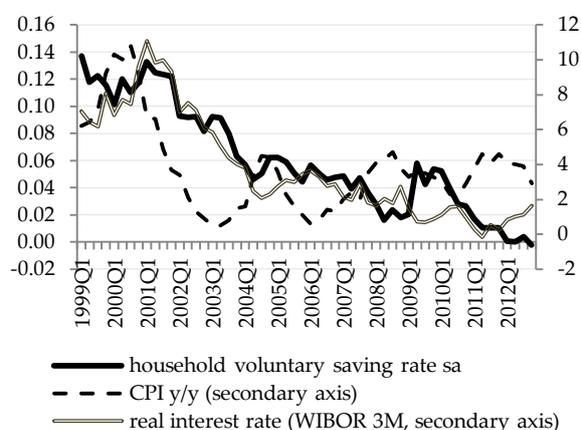
economic processes behind the behavior of household savings, which is of our particular interest. Hence, from now on, only the first component of household savings, namely voluntary savings, will be analyzed.

**Figure 8 Total household saving rate vs. household voluntary saving rate**



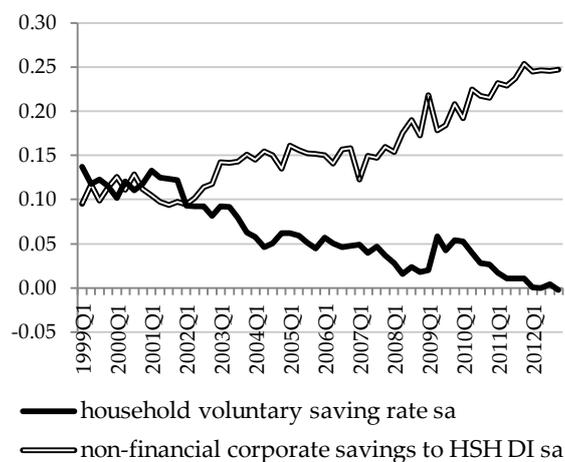
Source: Warsaw CSO data

**Figure 9 Household voluntary saving rate vs. selected determinants**



Source: Warsaw CSO data

**Figure 10 Household voluntary saving rate vs. corporate savings to household disposable income**



Source: Warsaw CSO data

Data were seasonally adjusted (subscript sa) using TRAMO-SEATS method.

For comparability, both household and corporate savings are related to household income.

**Table 7 Household saving regression for Poland based on quarterly data**

sample	1Q1999- 4Q2012	1Q1999- 4Q2012	1Q2004- 4Q2012	1Q1999- 4Q2012
	(1)	(2)	(3)	(4)
Constant	-0.136 (-0.2)	0.061 (3.7)	0.146 (4.7)	-0.366 (-1.3)
Household saving rate (-1)	0.465 (3.5)	0.485 (4.8)	0.33 (2.6)	0.457 (8.7)
Household saving rate (-2)	0.066 (0.4)	0.065 (0.6)	0.059 (0.4)	0.083 (1.6)

Household saving rate (-3)	-0.08 (-0.5)	-0.076 (-0.6)	-0.085 (-0.6)	-0.145 (-2.8)
Household saving rate (-4)	-0.199 (-1.3)	-0.142 (-1.3)	-0.203 (-1.7)	-0.221 (-4.4)
Dependency ratio	0.175 (0.3)			0.39 (1.8)
Government savings to household disposable income	-0.255 (-1.8)	-0.277 (-5)	-0.249 (-4.6)	-0.32 (-5.7)
Household financial net worth to household disposable income	-0.003 (-0.4)			-0.004 (-1.3)
Log of real interest rate	0.512 (3.1)	0.44 (4.6)	-0.424 (-1.7)	0.529 (8.2)
Log of terms of trade	0.008 (0.1)			0 (0)
Log of consumer price growth	0.119 (1.5)	0.161 (3.2)	-0.208 (-1.3)	0.136 (4.4)
Log of real household disposable income	0.018 (0.3)			0.034 (1.4)
M2 to household disposable income	-0.036 (-1)	-0.01 (-1.8)	-0.022 (-2.7)	-0.032 (-2.5)
GDP volatility	-0.001 (-0.2)			-0.002 (-1)
Log of real household income growth	0.129 (1.9)	0.157 (3.3)	0.13 (2.4)	0.097 (3.7)
Log of labor productivity growth	0.076 (0.5)			0.152 (2.9)
Unemployment rate	-0.103 (-0.6)			-0.155 (-2)
Non-financial corporate savings to household disposable income	-0.117 (-0.8)	-0.132 (-1.6)	-0.202 (-2.2)	-0.22 (-2.4)
Adjustment in pension funds to household disposable income	0.026 (0.3)			0.034 (1.2)
Credit to private sector to household disposable income	0.004 (0.1)			-0.005 (-0.4)
method	ols	ols	ols	gmm
observation no.	52	52	36	52
Coefficient covariance matrix				
Adjusted R-squared	0.960814	0.967425	0.911762	
Jarque-Bera test (prob.)	0.254	0.335	0.49	
Breusch-Pagan-Godfrey F-stat (prob.)	0.1460	0.4912	0.8425	
chi-square - stat. (prob.)	0.1732	0.4521	0.7780	
Breusch-Godfrey chi-square-stat (prob.)	0.0972	0.1185	0.0021	
Ramsey RESET test F-stat (prob.)	0.1338	0.5638	0.4983	
instrument no.				41
number of lags				4
endogenous variables				Government savings to household disposable income M2 to household disposable income Household financial net worth to household disposable income Non-financial corporate savings to household disposable income Adjustment in pension funds to household disposable income Credit to priv. sector to household disposable income Log of household disposable income
Endogeneity Test Difference in J-stats (prob.)				0.9975
Sargan test (prob.)				0.024
t-values in brackets. Preferred specification (3)				

**Table 8 The relative contribution to household saving rate of explanatory variables (in percentage points)**

Variable	standard deviation*coefficient
government saving to household disposable income	-0.67
log of real interest rate	-0.43
log of consumer prices growth	-0.24
log of real household income growth	0.37
M2 to household disposable income	-0.91
non-financial corporate savings to household disposable income	-0.79

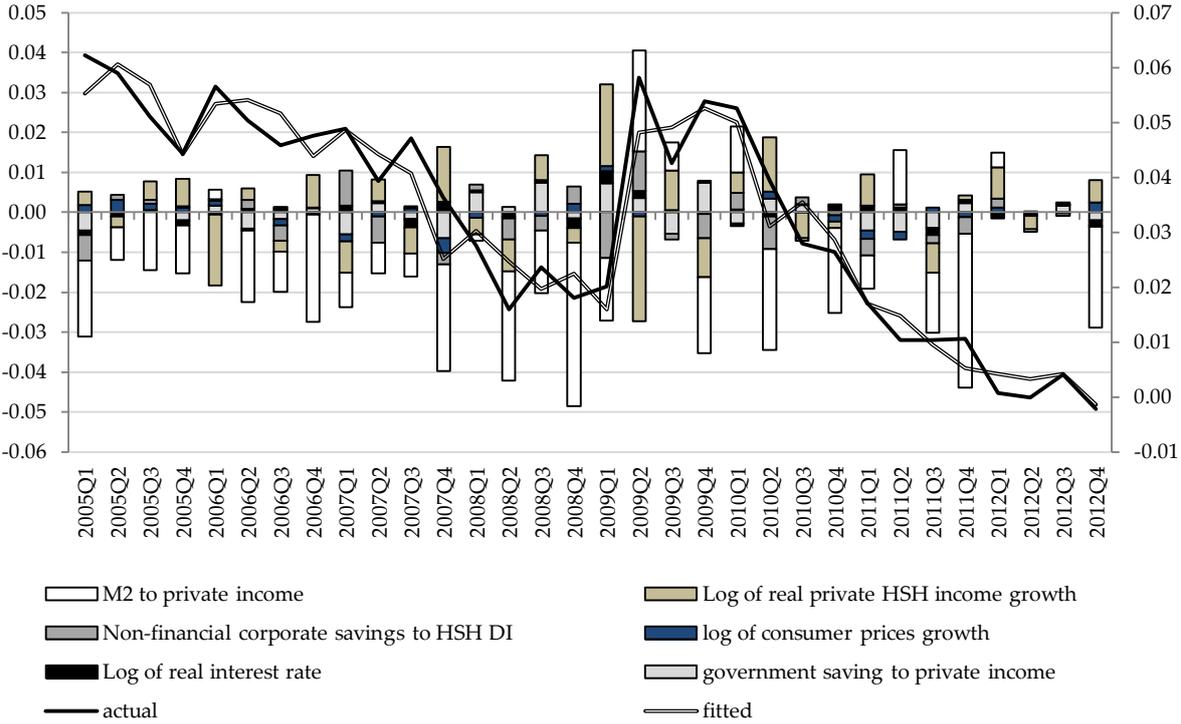
Based on the specification (3) from Table 7.

For direct comparison of Ricardian effect and 'piercing the corporate veil' effect, the government and corporate savings are related to household income.

The regression results shows (see Table 7 and specification (2)) that during the period 1Q1999-4Q2012 the household voluntary saving rate (expressed as a percentage of household gross disposable income) was mainly driven by the real interest rates, the real household income growth, the consumer prices growth and the government savings to GDP ratio. While the first three variable affected household savings positively, the last one had a negative effect.

The effect of non-financial corporate savings to GDP ratio turns out to be rather insignificant. However, while examining the household voluntary saving rate together with its selected determinants (see Figure 9), one can observe certain patterns of the analyzed variables. More precisely, at the beginning of 1999 the saving rate, consumer prices growth and the real interest rate stood at relatively high levels and then experienced a significant decline in the following years (up to the end of 2003). This process might be somehow associated with the transformation of the economy and its convergence to the levels observed in more developed countries. Therefore, to check the stability of the parameters, the household voluntary saving rate regression was repeated, this time using the sample restricted to the period 1Q2004-4Q2012. One can see (specification (3), from now on the preferred one) that both consumer prices growth and the real interest rate are no longer significant. Moreover, during the last 8 years the possible substitutability between household and corporate savings was detected in the data (see also Figure 10).

**Figure 11 Household saving rate in Poland and contribution to its changes**



Based on the specification (3) from Table 7.

When it comes to the contributions (Table 8 and Figure 11), the M2 to income ratio and the growth of household income are the most important variables.

**5. Is Poland saving differently?**

Comparing the results from panel regressions with the estimates based on Polish time series data we observe some differences in the way the explanatory variables affect both the private and household saving rates.

Most importantly, the response of Polish private and household savings to changes in financial depth (expressed as a ratio the M2 to savings) differs from that obtained from panel analysis in terms of both sign and magnitude. While the level of financial depth is one of the most important drivers of Polish savings and affects them with a negative sign, its effect on savings in an average OECD country is weakly positive for private savings and negligible for household savings.

Polish private and household savings also react more to changes in government savings. Moreover, the negative effect of changes in corporate savings on household savings (households ‘piercing the corporate veil’ effect) is stronger in Poland than in a typical OECD country.

In the case of private savings, the positive effect of private disposable income and consumer prices growth is relatively strong in Poland. There is also a number of variables, i.a. the real interest rate, the unemployment rate, GDP volatility, terms of trade, labor

productivity (or income) growth, the urbanization rate, domestic credit and household financial wealth, which are significant only either in regressions based on Polish time series data or in the OECD-wide panel analysis.

## **Conclusions**

In this article we investigate the determinants of the private and household saving rates in Poland and in the OECD countries. We find that the most important variables driving private and household savings are income and its growth, the interest rate, government savings and corporate savings. The last two affect the Polish saving rates substantially more compared to an 'average' OECD country. Moreover, in the case of Poland a key contribution to changes in the private and household saving rates comes from the process of financial deepening.

However, there are non-negligible differences in the way the explanatory variables affect the household and total private saving rates. These discrepancies can be probably attributed to different factors driving corporate savings, which are, in particular recently, a substantial part of total private savings. Hence, beside a standard analysis of the behavior of household or private savings with the focus on household-related determinants, more attention should be paid to a separate investigation of savings in the corporate sector.

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## Annexes

### Annex 1

#### Determinants of saving rates in OECD countries – evidence from an annual panel data

##### Data sources and variable construction

Household sector includes households plus non-profit institutions serving households.

Private net saving rate - private net savings divided by private net disposable income, source: OECD's Non-Financial National Accounts

Household net saving rate - Household net savings divided by household net disposable income, source: OECD's Non-Financial National Accounts

Household voluntary net saving rate - Household net savings minus adjustment for the change in net equity of households in pension funds (received minus paid, if reported) divided by household net disposable income, source: OECD's Non-Financial National Accounts

Corporate net saving to net household disposable income - source: OECD's Non-Financial National Accounts

Change in pension funds to net household disposable income - adjustment for the change in net equity of households in pension funds (received minus paid) to net household disposable income, source: OECD's Non-Financial National Accounts

Government net savings to net private/household disposable income - source: OECD's Non-Financial National Accounts

Domestic credit to private sector to net private/household disposable income - source: World Bank's World Development Indicators, the missing data for Austria, Belgium, France and Netherlands for 1998 were linearly interpolated.

Household financial net worth to net private/household disposable income - source: OECD's Financial Annual Accounts

Log of labor productivity growth - source: OECD's Database

Log of consumer prices growth - source: OECD's Database

Log of real 3 month interbank rate - deflated by consumer prices growth, source: OECD's Database

Log of real net private (household) disposable income per capita - Nominal net disposable income is deflated by the consumer prices deflator, divided by population and converted into US\$ using PPPs, source: OECD's Database

GDP volatility - The square root of the average annual instantaneous time-varying variance of quarterly data on year-on-year growth of real GDP based on a GARCH (1,1) estimation (G(0,1) for Slovakia, Poland and Spain) based on all available quarterly data on real GDP growth taken from OECD's Non-Financial National Accounts. For the description of the variable see Mody et al. (2012)

Old dependency ratio - Working Age (20-64) per Pension Age (+65), persons, source: OECD's Database

Urbanization ratio, urban population ( percent of total) source: World Bank Database

Money and quasi money (M2) as a percentage of net private/household disposable income, source: World Bank Database

Terms of trade – Logarithm of terms of trade index (2000 = 100), source: EIU

Unemployment rate - source: IMF Statistics

Data range

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country	from	to
Australia	1989	2010
Austria	1999	2011
Belgium	1999	2010
Canada	1989	2008
Czech Republic	1997	2011
Denmark	1995	2010
Estonia	2001	2011
Finland	1995	2010
France	1999	2011
Germany	1999	2010
Greece	2005	2010
Hungary	1996	2010
Ireland	2002	2010
Italy	1995	2010
Japan	2003	2010
Korea	2002	2010
Mexico	2003	2009
Netherlands	1990	2011
Norway	1995	2006
Poland	1996	2010
Portugal	1999	2011
Slovak Republic	1998	2008
Slovenia	2002	2010
Spain	2001	2010
Sweden	1995	2010
Switzerland	1999	2010
United Kingdom	1990	2011
United States	1989	2010

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## Annex 2

### Determinants of the saving rates in Poland – is there something more to learn?

Below the construction and the source of the are presented:

Private saving rate – gross private savings divided by gross private disposable income, source: GUS Non-Financial Quarterly National Accounts and EUROSTAT

Household voluntary saving rate – gross household savings minus adjustment for the change in net equity of households in pension funds (received minus paid) divided by gross household disposable income, source: GUS Non-Financial Quarterly National Accounts and EUROSTAT

Real gross private and household disposable income – current values are deflated by consumer price index, source: GUS Non-Financial Quarterly National Accounts, EUROSTAT and Statistical Bulletins

Dependency ratio - the ratio of economically active workers compared to inactive, source: GUS, BAEL

Real interest rate – Warsaw Interbank Offered Rate, three months, deflated by consumer price index, source: money.pl and GUS Statistical Bulletins

Labor productivity - economically active to GDP in constant prices from 2000, source: GUS, BAEL and EUROSTAT

GDP volatility - the square root of the instantaneous time-varying variance of quarterly data on year-on-year growth of real GDP (1Q1996- 4Q2012) based on a GARCH (0,1) estimation, source: OECD's Non-Financial National Accounts. For the description of the variable see A. Mody et. al, 2012.

Other variables:

gross government savings, gross non-financial corporate savings, adjustment for the change in net equity of households in pension funds, gross domestic product, source: GUS Non-Financial Quarterly National Accounts and EUROSTAT

household financial net worth, source: NBP Financial Quarterly National Accounts

terms of trade, consumer price index, source: GUS Statistical Bulletins

money supply M2, source NBP, Monetary and financial statistics

bank credit to non-financial private sector, source: Bank for International Settlements database

unemployment rate, source; EUROSTAT (seasonally adjusted series)



FACULTY OF ECONOMIC SCIENCES  
UNIVERSITY OF WARSAW  
44/50 DŁUGA ST.  
00-241 WARSAW  
[WWW.WNE.UW.EDU.PL](http://WWW.WNE.UW.EDU.PL)