WPS6531

Policy Research Working Paper 6531

Solow in Transition

Macro and Micro Determinants of Savings in Armenia

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The World Bank
Europe and Central Asia Region
Poverty Reduction and Economic Management Unit
July 2013

Policy Research Working Paper 6531

Abstract

This paper analyzes and reconciles macro and micro evidence on savings and factors that affect savings, as well as possible policy implications. At the aggregate level, the main question is how savings are affected by growth and macroeconomic policies and variables (fiscal policy, exchange rate, for example) and the breadth of financial markets. Some of these macro determinants can be reconciled with microeconomic evidence of the savings behavior of households. Using macroeconomic quarterly data and household survey data, the analysis explores the determinants of the savings rate at the macroeconomic and microeconomic levels, using the typical econometric models used in the literature (long-term co-integration relation and short-term error correction model for the macro determinants; linear multivariate models for the micro determinants). The long-term relationship indicates that a 10-percent increase in gross domestic product per capita would add 3.7 percentage points to the savings rate in the long run. The short-term relationship depicts a strong catch-up process to the long-run equilibrium, with quarterly changes in gross domestic product per capita and openness strongly correlated with quarterly changes in the savings rate. The characteristics of households that represent the volatility of expected income, such as education and access to borrowing or remittances, significantly impact saving rates. The macroeconomic and microeconomic analyses of the determinants of saving rates in Armenia point to three policy areas: the macroeconomic environment, the financial sector, and the role of remittances.

This paper is a product of the Poverty Reduction and Economic Management Unit, Europe and Central Asia Region. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The main author may be contacted at scoulibaly2@worldbank.org.

Solow in Transition: Macro and Micro Determinants of Savings in Armenia

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JEL classification: C5, D1, E2, O4

Keywords: Saving, Growth, Error Correction Model, remittances

Sector Board: Economic Policy (EP)

Acknowledgement: This paper was prepared as a background analysis for the Armenia Country Economic Memorandum, and benefited from many brainstorming discussions. The team of this broader study is gratefully acknowledged.

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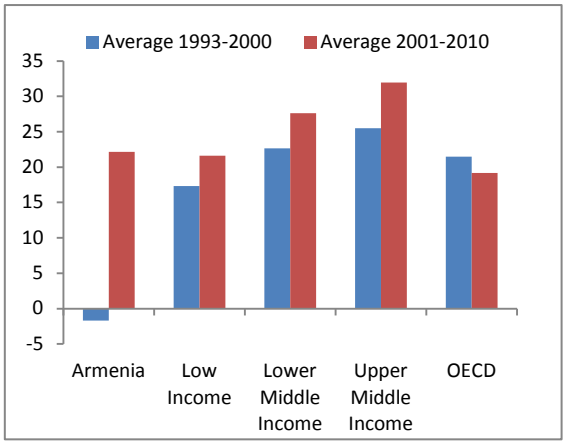
I. Introduction

Armenia's growth story from 2003 to 08 is that of an expatriate-financed construction boom that went bust once external financing dried up as a result of the world financial crisis. This small landlocked former Soviet republic, dependent to a large extent on Russia for energy supplies and on volatile remittances, is growing at sub-par rates, with a per-capita GDP roughly less than a third of neighboring Turkey. The pre-2009 high growth rates (and productivity) were mainly driven by resource exploitation and construction. So to move to a higher growth path, Armenia's most critical priorities are to diversify its economy and improve firm productivity in the tradable sectors to compete internationally. As a small open economy relying a lot on remittances from Russia and export of metals and minerals to some EU countries, Armenia can still grow fast, but such an outcome is not automatically ensured. It will require efforts to boost aggregate demand by keeping investment high and expanding exports, to increase productivity by allowing the reallocation of production factors to their most efficient use, and to extend the country's production frontier through the diversification of products and trading partners.

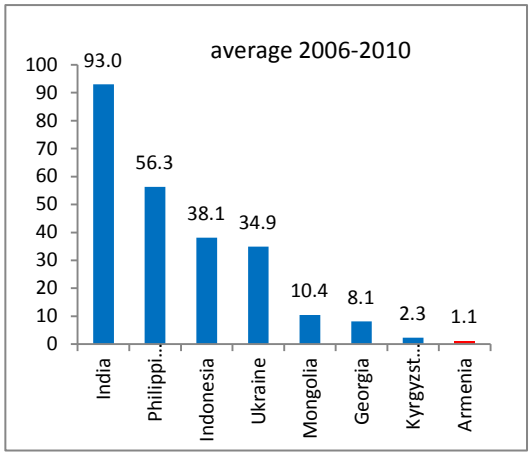
This paper focuses on the aggregate demand side, particularly investment, by looking at the determinants of the savings rate in Armenia. Armenia relies heavily on foreign savings to finance its investments. In 2010, about two-thirds of total investment was financed by foreign savings. Although some portion of foreign savings are channeled to Armenia as remittances and transfers, there are still major risks associated with external shocks that subject Armenia's growth to volatility and undermine the country's long-term growth outlook.

Figure 1: Armenia: Domestic Saving Performance, 2002-2011

a: Gross savings, percent of GNI



b: Market capitalization, percent of GDP



Source: Ministry of Finance, World Development Indicators and Staff calculations.

Armenia's domestic saving remains dominated by private saving (household and corporate) as public saving was relatively low during 2002-2011, with an average level of 1.65 percent of GDP compared to about 18.4 percent of GDP for private saving. It improved despite an almost inexistent capital market, with its aggregate saving rate remaining higher than that of the average low income country since 2001 (Figure 1, panel a). However, its average saving rate during 2001-2010 was only at par with the average of lower middle income countries during 1993-2000. The extremely low market capitalization during 2006-2010 (Figure 1,

panel b) combined with low public savings means that the main actors of Armenia's domestic saving so far have been households. Better understanding the determinants of aggregate and household savings can help to lay out a sensible saving policy to sustain growth.

Sustaining domestic savings at levels that allow investment financing without greatly relying on foreign savings is an important condition for the agenda of high and sustained growth. Yet, although a macroeconomic parameter, saving also depends on the optimization behavior of consumers as their income increases. This paper aims at analyzing and reconciling macro and micro evidence on savings and factors that affect savings in Armenia. We explore the determinants of the savings rate at the macroeconomic and microeconomic levels, using the typical econometric models used in the literature (Error Correction Models for the macro determinants and Linear Multivariate Models for the micro determinants). At both levels, empirical research has confirmed the predominant impact of income and future income on savings decisions, a result that is confirmed by Armenian data.

The rest of the paper is organized as follows. Section II presents the analysis of the macroeconomic determinants of aggregate saving, followed by that of the microeconomic determinants of household saving. Section III reconciles the findings for these two analyses and explores some policy implications for sustainable growth.

II. What Are the Determinants of Armenia's Savings Rate?

The theoretical and empirical literature on the determinants of saving has relied mainly on the life cycle hypothesis (LCH) according to which rational agents make their saving choices to smooth their consumption in order to maximize their inter-temporal utility (Modigliani, 1970). Saving then becomes for households, firms or governments an adjustment variable which depends on current and future economic context, as measured by either income or GDP. At the aggregate level households, firms and government make their saving decision according to their current and future income, which depends on the volatility of the economy. Another strand of the theoretical literature is based on the permanent income hypothesis (PIH) in which individual saving is assumed to react to expectations regarding the transitory or permanent nature of income inflows (Friedman, 1957). Browning and Lusardi (1996) provide a comprehensive list of motives, drawing on an early work by Keynes positing that a desire to save may respond to many factors, and is unlikely to be homogeneous.

These seminal models resulted in a number of predictions regarding optimal savings behavior. Both models of inter-temporal allocation of resources (LCH and PIH) predict that savings should respond positively to higher incomes, as well as to higher uncertainty in future income. Household characteristics such as education or employment types viewed as securing a more stable flow of income should also decrease savings (assuming a constant income level). Schmidt-Hebbel *et al.* (1996) present evidence that suggests that in developing countries the availability of financial instruments and the presence of liquidity constraints are important determinants of savings. More recent studies including Kulikov *et al.*, (2007) find that urbanization, potentially a proxy for income stability, and ownership of large durable goods such as vehicles and real estate negatively impacts saving rates.

Applications of these models in developing and emerging markets show that savings behavior depends upon a country's income levels. This is true both in terms of the level of determinants as well as the nature of the saving vehicles used. For example, non-financial vehicles such as land, livestock, machines and cash-holdings are frequently cited in household

savings strategies in low-income countries (see for example Kulikov *et al*., 2007, or Abdelkhalek *et al*., 2009.). Horioka and Wan (2007) suggest that educational levels along with fertility patterns, particularly number of children per working adult, are important predictors of households' saving. These findings are in line with those of Edwards (1996) who, using a panel of 36 countries, finds the level of determinants is the main explanation of lower savings rates in some Latin American countries.

II.1 The Macroeconomic Determinants of Armenia's Savings Rate

Most of the theoretical findings about the macroeconomic determinants of domestic savings have been drawn from the standard framework of consumption/savings developed by Modigliani. From the review of the literature, we can list the following determinants:

GDP per capita: As consumption tends to decrease with the level of income, i.e. the richer we are the lower is the share of consumption in the budget and the higher is the level of savings, the savings rate tends to be higher in countries with higher GDP per capita. Thus an increase in the GDP per capita is supposed to have a positive impact on the savings rate (Jongwanich, 2009).

Interest rate: According to the economic theory, the interest rate on deposit has an ambiguous effect on savings rate due to adverse effects of substitution (positive effect) and income effects (negative effect).[3] These effects are usually modeled in a two period consumption model (Obstfeld and Rogoff, 1996; Romer, 1996).

Inflation: Since inflation creates uncertainty in future income, this creates an incentive to raise savings to cope with that uncertainty. Jongwanich (2009) found a positive impact of inflation on private savings in Thailand in 2009, and Horiako and Wan (2007) found similar results in China in some cases.[4]

Real exchange rate: The impact of this determinant has been less explored in the economic literature. The Real Effective Exchange Rate (REER) measures how expensive domestic products are compared to foreign products, with a rise in the REER corresponding to an appreciation of the real exchange rate.[5] As the Armenian Central Bank does not target the real exchange, we cannot hypothesize regarding the sign of the effect of the REER on savings.[6]

Fiscal deficit: Theoretically an increase in the fiscal deficit is supposed to lead to an increase in saving, by virtue of the Ricardian Equivalence. However, given

[3] Let's consider an increase in the interest rate. If the initial level of assets is high, that increase in the interest rate will lead to a higher net return which could be used to consume more, hence an income effect. In this case a negative effect on savings rate will be seen. On the other hand, an increase in the interest rate raises the price of current consumption compared to future consumption, that is, an incentive to save more today in order to consume more later given the higher interest rate. This is the substitution effect which has a positive impact on savings. The final effect will depend on the relative strength of substitution and income effects.

[4] The positive correlation between inflation and savings rate is true for their specifications using pooled sample of urban and rural area households.

[5] In a simple model considering two goods (tradable and non-tradable) the REER also measures the resource allocation between the two sectors producing the two goods.

[6] Montiel and Servèn (2007) showed in there cross country analysis that there is a positive correlation between the real exchange rate and saving rate. However, this correlation cannot be interpreted as causality since there is an obvious endogeneity problem.

contradicting theoretical and empirical results assessment of this equivalence, we cannot infer a sign for the impact of public deficit on domestic savings rate. [7]

Given the short time span (key macro data available only for the period 2002-2011), we use macroeconomic quarterly data obtained from the Armenian Ministry of Finance. Table 1 presents the means of the main variables included in our estimation, separating the two periods 2002-2007 and 2008-2011 to capture before-after crisis differences. Figure 2 plots some correlations of the aggregate saving rate and some expected determinants.

Table 1: Means and Standard Deviations of Main Variables, 2002-2007 and 2008-2011

Variables	Mean (Standard Deviation)	
	2002-2007	**2008-2011**
Savings rate	7.24% (*0.028*)	4.42% (*0.039*)
GDP per capita (thousands AMD)	167.6 (*15.0*)	256.5 (*20.4*)
Real Exchange rate	100.9 (*2.9*)	128.1 *(2.2*)
Time Deposit rate	6.5 (*0.34*)	8.2 (*0.30*)
Remittances (%GDP)	19.1%(*0.013*)	18.3% (*0.005*)
Openness: (export+import)/GDP	0.75 (*0.04*)	0.64 (*0.03*)

Sources: Armenian Ministry of Finance and authors' calculations.

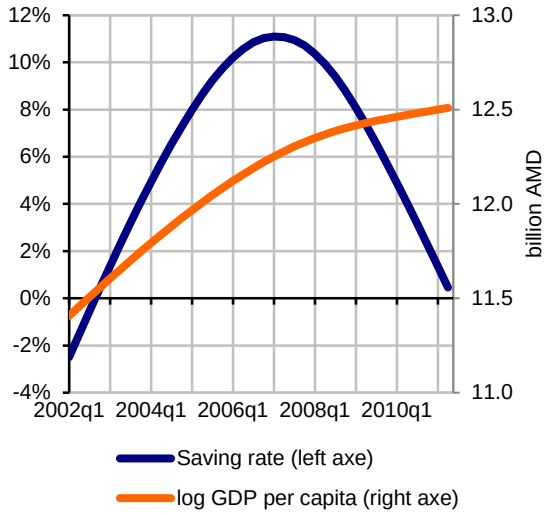
Figure 2 shows the evolution of the savings rate and five variables: the log of the GDP per capita, real exchange rate, time deposit rate, openness and public deficit. In this figure, all the variables are seasonally adjusted using a HP filter. [8] Savings rate and GDP per capita at market price appear to have been synchronized from 2002 to 2007, when the country was enjoying double digit growth rates. Since then, this synchronization has been broken (figure 2, panel a). The evolution of the quarterly change in savings rate and the GDP per capita from one quarter to the next appears synchronized during the entire period (figure 2, panel b).We notice a steady increase in the REER (appreciation) during the entire period (figure 2, panel c). Concerning the time deposit rate, a decreasing trend is observed from 2002 to 2006, followed by an increasing trend from 2006 onwards (figure 2, panel d), which can be explained by a high demand for funds from financial institutions in the wake of the construction boom. Openness has been steadily decreasing until the crisis hit Armenia, which makes it mirror an opposite trend to the savings rate (figure 2, panel e).. With regards to the public deficit, we notice that it was quite stable before the 2009 crisis. Since 2009 however, there has been a large increase in the public deficit as in many countries.

[7] If a government finances itself by raising debt, the private agents (household and corporate) will anticipate a future increase in taxes and will consume less and save more to face the future increase in taxation. This result is based on the hypothesis of perfect capital market, perfect substitution between government and private savings and absence of uncertainty and, especially, a representative infinitely-lived agent. That result does not hold in overlapping generation (OLG) models (like in the Blanchard-Yaari model, 1985-1965) and when Government and private sectors do not face the same credit constraint. Also, empirically some papers (e.g. Barro, 1989; Khalid, 1996) reject the full Ricardian equivalence mostly due to the fact that private and public savings are not perfect substitute and the presence credit-constrained individuals.

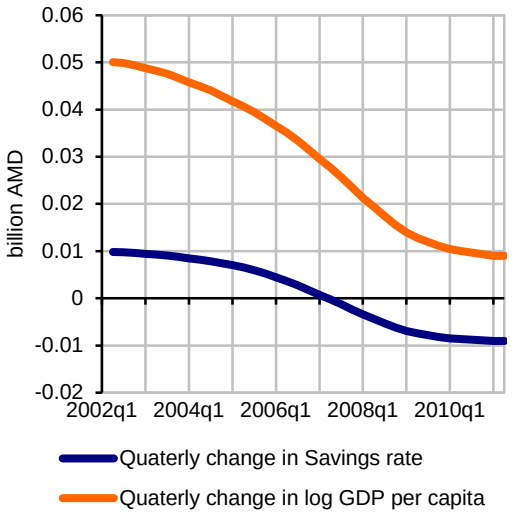
[8] The un-adjusted quarterly variables depict a similar pattern with the savings rate variable. In such case, using the adjusted variables in the regressions can lead biased estimators as demonstrated in Annex 1. For this reason, the regressions are run with the original variable with introduction of quarter dummies to control for seasonality.

Figure 2: Correlation between Saving Rate and the Six Macro Determinants

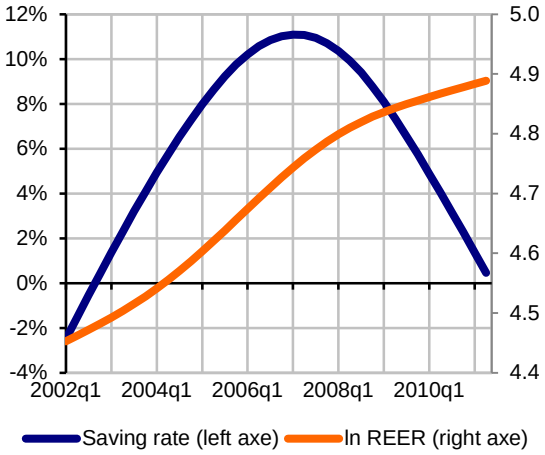
a: Saving rate and per capita GDP, percent



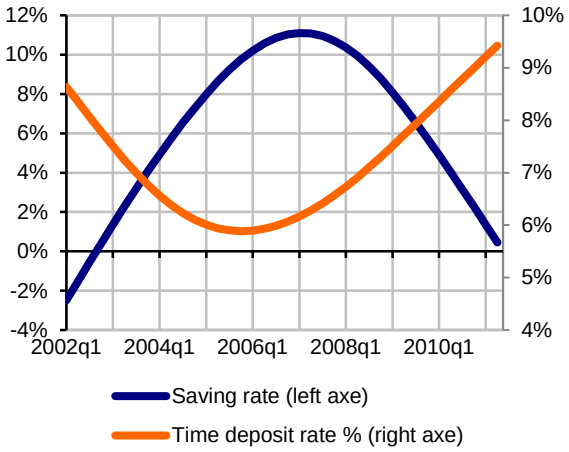
b: Saving rate and per capita GDP, quarterly change



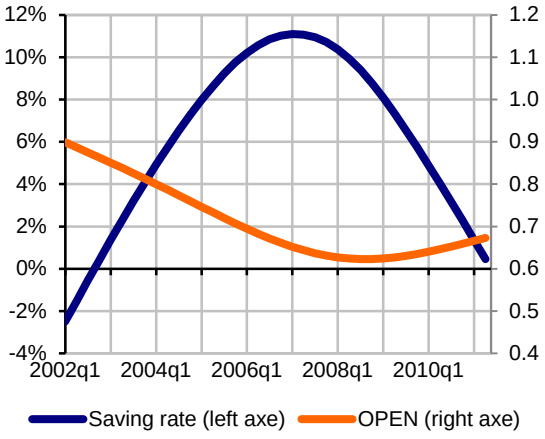
c: Saving rate and real exchange rate, percent



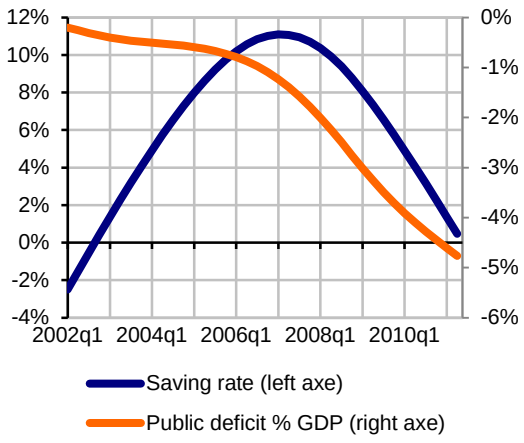
d: Saving rate and time deposit rate, percent



e: Saving rate and openness, percent



f: Saving rate and public deficit, percent



Source: Ministry of Finance and authors' calculations. All data are seasonnally adjusted using an HP filter.

Preliminary Tests on Variables

Before going further into our econometric inquiry, we need to run some preliminary tests on the time series variables in order to ensure their stationarity and avoid running spurious regressions. For this, we have to detect the degree of integration of the expected determinants. A variable is integrated of order one, noted I(1), if that variables is not stationary in level while its first difference is stationary. Here, the first difference of a given variable X means the variable $d.X_t = X_t - X_{t-1}$. Time periods are all quarterly.

We use the Dickey-Fuller and the Phillips-Perron tests for this purpose. The null hypothesis of those tests is the presence of unit roots in the variable considered, i.e. the variable is not stationary. We reject the test if the statistical value is greater than the critical value for a given significance level (1 percent generally) in absolute value. Thus, rejecting the null hypothesis means that the variable of interest is stationary, i.e. I(0). If we do not reject the null hypothesis on a variable in levels but reject that null hypothesis on the variable in difference, that means that our variable is I(1). The results of the different tests are presented in tables 2 and 3.

Table 2: Dickey-Fuller and Phillips-Perron Test on variables in levels

	Dickey-Fuller Test		**Philips-Perron Test**	
	Test statistics	Critical value at 1%	Z(t) statistics	Critical value at 1%
Variables				
Savings rate	-4.1	-4.3	-6.0*	-3.7
GDP per cap	-4.3	-4.3	-3.6	-3.7
lnREER	-1.9	-4.3	-0.8	-3.7
TD rate	-3.1	-4.3	-2.3	-3.7
Deficit	-2.9	-4.3	-3.6	-3.7
Openness	-2.4	-4.3	-4.4	-3.7

* Rejection at 1%

Table 3: Dickey-Fuller and Phillips-Perron Test on variables in difference

	Dickey-Fuller Test		**Philips-Perron Test**	
	Test statistics	Critical value at 1%	Z(t) statistics	Critical value at 1%
Variables				
d.Savings rate	-25.9*	-4.3	-19.8*	-3.7
d.GDP pc	-31.4*	-4.3	-16.9*	-3.7
d.lnREER	-6.7*	-4.3	-6.6*	-3.7
d.TD rate	-3.7*	-4.3	-3.9*	-3.7
d.Deficit	-7.2*	-4.3	-10.5*	-3.7
d.Openness	-12.2*	-4.3	-12.2*	-3.7

* Rejection at 1%

We notice that almost all the variables are integrated of order 1 with both tests. We then need to find a co-integration relationship between all the variables I(1). This relation will be interpreted as the long-run relationship between the variable and will be useful for a probable Error Correction Model (ECM).

The Co-integration or Long-run Relationship

We first run the regression of savings rate on all the independent variables. We also include the dummy variable INDCRIS. Its value is equal to 0 before the crisis and equal to one after the crisis hit Armenia in 2009. Only 4 variables are significant in our regression: GDP, Time deposit rate (TDR), Real exchange rate (REER) and the dummy variable INDCRIS. The co-integration relationship is tested by a stationarity test on the residuals of the regression: if the residuals are stationary, there is co-integration. Using the Dickey-Fuller test on the residuals, we reject the null hypothesis, which suggests that the residuals are stationary and there is co-integration. The Johansen test also confirms these results. The results of the regression and previous tests are presented below. The figures in bracket represent the standard errors in the co-integration relationship.

Table 4: Co-integration relationship and tests

Co-integration Relationship
sr= - 2.88 (0.27) + 0.37 (0.02)* gdpc + 0.02 (0.006)*TDR – 0.36 (0.066)*reer -0.2 (0.025)*INDCRIS Period: 2002q1-2011q2 ; N° obs=38; R^2 =0.90; F(4;33)= 77.85 ; Durbin Watson=2.2
Dickey Fuller on Residuals Test statistics= **-6.8** ; Critical value at 1% = -3.67
Johansen Test Trace statistics (for rank=0) = **193.6** ; Critical value at 1% = 68.5

As expected, an increase in GDP per capita has a positive impact on savings. In our specification, a 10 percent increase in the GDP per capita (i.e. gdpc increase in level by 0.1) leads to a 3.7 percent points increase in the savings rate in the long run (i.e. if the initial savings rate was 5 percent, after a 10 percent increase in the GDP per capita, the savings rate becomes 8.7 percent). Also the impact of the interest rate is positive on savings. Indeed a 1 percentage point increase in the TDR leads to a 0.02 percentage points increase in the total savings rate. This means that in our model, the substitution effect is higher than the income effect. That could be due to the fact that the initial assets are not very high and as a result the income effect is smaller. We notice the important negative impact of the crisis on the savings. However, intuitive determinants such as Openness and public deficit do not appear in the long run relationship. This might be due to the fact that those variables have experienced a dramatic change after the crisis, so that their effect is directly captured by the dummy variable INDCRIS. There is also a negative and significant impact of REER. Indeed, we find that a 10 percent increase in the REER (appreciation) leads a 3.7 percentage point decrease in the savings rate in the long run. Economically an appreciation of the REER is associated with a decrease in net exports, hence a decrease in aggregate output which may lead to a decrease in the savings rate.

Short-run relationship or Error Correction Model (ECM)

We are also interested in the short run relationship, which can be estimated by using the change in gross domestic savings as the dependent variable and the change in the other variables and their lags as the independent variables. We also add the lag of the residuals of the long run relationship to our independent variables. The coefficient of this latter variable will measure the speed of return to the long-run pattern after a unitary shock. This coefficient must be negative in order to ensure a return to the long run relationship.

Table 5: Error Correction Model Specification

$\Delta s = -0.012 + 0.49\ g + 0.15\ \Delta open - 0.94\ ECM_{-1}$	Dependant variable	
	Δ(sr)	
Independent variable	Coefficient	*t statistic*
constant	-0.012**	*-2.1*
Δ(gdpc) = growth rate *g* of GDP per capita	0.49***	*13.5*
Δ(OPEN)	0.15**	*2.0*
lag(ECM)	-0.94***	*-6.1*
Period : 2002q2-2011q2 ; N° observation=37 ; R = 0.96 ; Durbin Watson=1.96; ***significant 1%; ** significant 5%		

As depicted in table 5, the coefficient of *lag(ECM)* is negative and quite high in absolute terms (*0.94*). This means that there is a strong catch up process to the long-run equilibrium. The short run coefficients are also important. For instance, the coefficient of Δ*(gdpc)* is about 0.5 which suggests a strong short run reaction to a shock but that shock effect disappears quickly due to the strong catch up process to the long-run equilibrium. We also notice a positive important and significant impact of Δ*(OPEN)* on savings. This may be due to the fact that an increase in the ΔOpenness (i.e. acceleration in Openness) which may be due to an increase in the net exports (for instance, an increase in primary resources exports) leads to an increase in aggregate output and aggregate savings rate.

Figure 3 presents the dynamic simulation derived from our econometric specification. We can notice that our model fits quite well with reality. Using our short-run equilibrium, we managed to decompose the change in savings rate in term of the effect of each independent variable we retained in our specification. In Figure 4, the sum of the bars is almost equal (because of the residuals) to the actual change in savings rate for each quarter. As shown in our econometric models, we see that the change in GDP per capita is the main driver of the change in savings rate. The contribution of GDP per capita is presented by the dark blue bar. In terms of the effect on savings rate change, the GDP per capita is followed by the Openness of the country (orange bar). Although they have a significant effect on long run savings rate, the actual impact of REER and TDR are quite small compared to the previous variables. Those effects are presented by the yellow and light blue bars. Finally we can see the effect of the crisis thanks to the dark bar. That effect is very strong in the second quarter of 2009 but tends to disappear thereafter.

Figure 3: Observed and Simulated change in savings rate ΔS

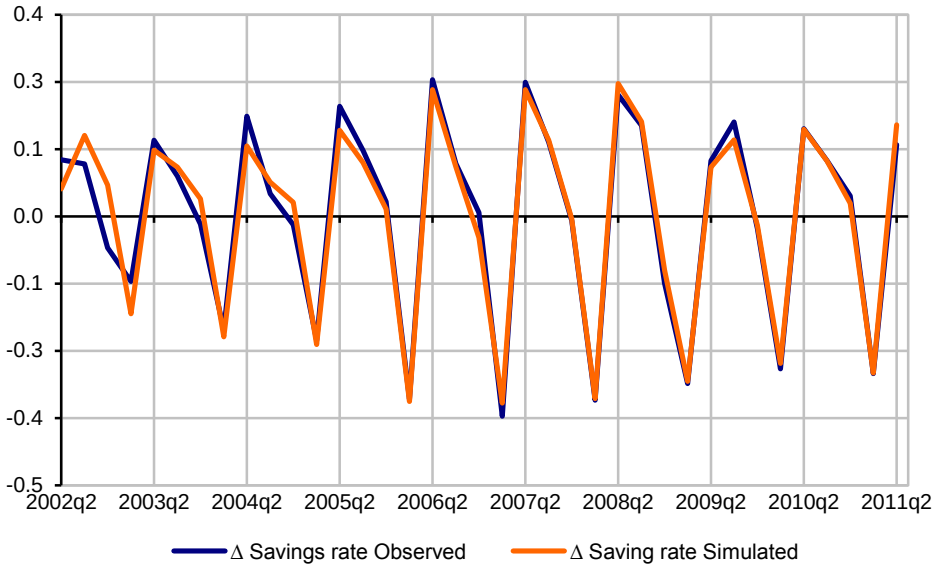
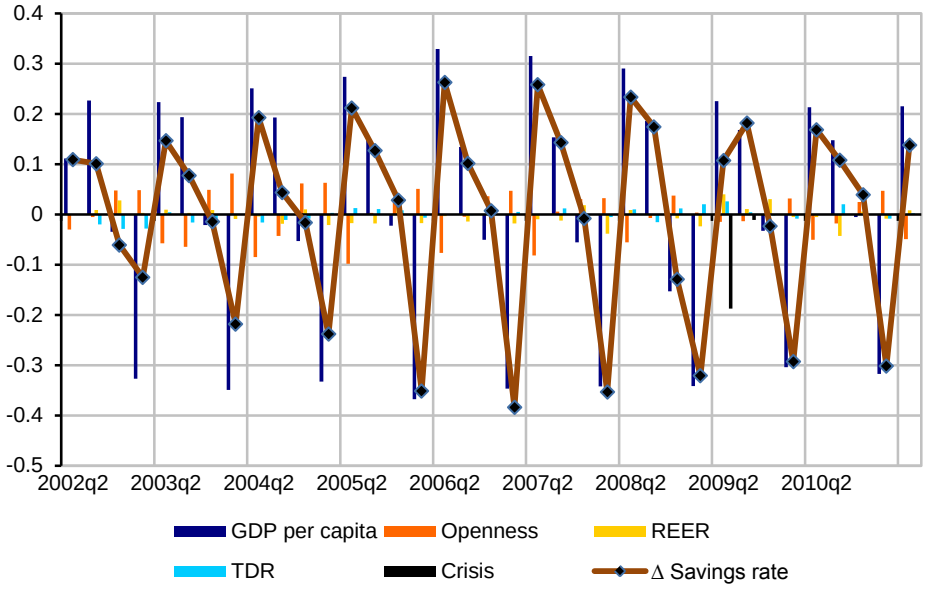


Figure 4: Dynamic contribution of independent variables to change in Savings rate ΔS



II.2 The Microeconomic Determinants of the Savings Rate

Prior literature on savings determinants typically employs empirical specifications of the following general form:

$$\frac{S}{Y} = f(Y, \sigma_Y, \sigma_f, \mathbf{x}, \mathbf{a}) \qquad (1).$$

Here, household saving is modeled as a linear function of five general classes of determinants: income, volatility of income, volatility of financial returns on potential investments, household characteristics, and regional and time dummies.

We use the Armenian Integrated Living Conditions Survey (ILCS) from 2004, 2006, 2008 and 2010 to test equation (1). These are a set of cross-sectional surveys examining household income and spending behavior, as well as collecting a comprehensive range of variables measuring household characteristics, **x**.[9] Savings rates are imputed from household diaries by taking the difference between reported household income and detailed consumption records observed over a one month period (focusing on disposable income, and purchases of food and consumer durables). It is important to note that both income and consumption exclude the purchase or sale of lumpy goods such as real-estate, land, vehicles or electro-domestic appliances. This is in accordance with prior studies on the microeconomic determinants of savings (see for example Kulikov et al., 2007, pp. 12-13 or Denizer et al., 2002). A small number of respondents are discarded either due to zero reported income or consumption values. The monthly savings rate is also capped at -150 percent and (by definition) 100 percent in order to limit the effects of large outliers, which likely represent families with incomplete income entries, incomes which vary widely between months, or who are spending down accumulated wealth. These observations represent 2 to 6 percent of the sample depending on the survey year.[10]

Table 6 presents descriptive statistics of nominal household income, consumption, savings and savings rate by survey year. Growth in reported household income and savings rates is seen in all periods except for a slight decline in income between 2008 and 2010. Gross savings peak in 2006 (in line with the macroeconomic evidence) before declining sharply in 2008. The inclusion of nominal household data rather than inflation-adjusted figures results in steadily rising income and consumption, at least in part due to the effect of inflation. The ratio of these variables however would be expected to remain constant despite inflation, suggesting a rising level of household thrift. Appendix 2 provides an inflation-adjusted version of these results, showing that savings rate do increase despite lower levels of (real) income. This is particularly noteworthy in 2010.

Table 6: Monthly Household Income, Consumption and Saving – Means and Standard Deviations

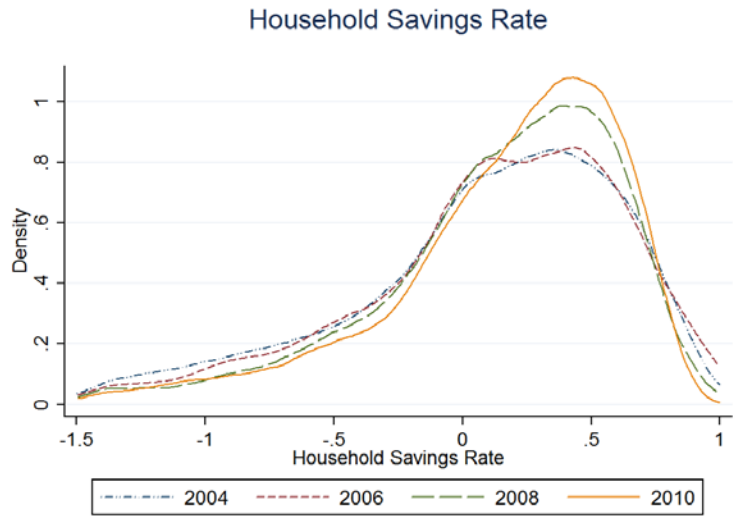
Value (drams)	2004	2006	2008	2010
Y	89887.63 (303483.9)	109722.1 (243930.9)	119479.1 (175245.5)	118811.7 (206286.5)
C	57329.02 (50038.23)	66440.94 (54592.61)	83332.32 (61448.48)	81107.57 (59158.89)
S	32558.62 (299965.9)	43281.21 (240259.7)	36158.46 (165750.8)	37698.4 (200274.1)
Savings Rate	0.0845 (0.526)	0.116 (0.508)	0.146 (0.463)	0.172 (0.452)
N (Households)	6122	4752	7545	7453

Source: Authors' calculation using ILCS data.

[9] In two of the survey years under study, the ILCS directly asks households to describe their saving behavior. However we do not use this variable in the analysis for two reasons. Firstly given that it has not been consistently collected in all the surveys, the results cannot be compared over time. Secondly, including this variable will make it difficult to compare the findings with other savings determinants studies. We however consult these results as a consistency check of imputed values.

[10] Later, least absolute deviations (LAD) results of the baseline model are examined which include these excluded outliers. LAD is much less sensitive to extreme values than OLS, allowing for the generation of estimates with less concern for households with high rates of dis-saving.

Figure 5: Household Savings Rate Distribution by Year



Source: Author's calculations from ILCS.

Kernel density plots of household savings rates (figure 5) suggest a similar evolution of savings over time. Mean household savings rates have followed an upwards trajectory. Given that the level of average household savings has not followed this trend, greater savings intensity is responsible for changing savings behavior. It is interesting to note that the rising average savings rates occur despite an apparent contraction in saving at the top end. These high savings rate households are generally high-income earners, who spend a small proportion of their total income on normal month-to-month consumption. Whilst this is an interesting trend, some caution is warranted when considering this data. Difficulty in measuring consumption and income due to underreporting is a frequent problem in household data, particularly at high income levels (Denizer et al., 2002). Although it is possible that households responded to the macroeconomic shock of 2006 by increasing frugality, it is also plausible to assume that the changing age profile of the population might be playing some (albeit likely minor) role, as is discussed later.

Basic OLS regression model

The initial empirical analysis of Armenian savings draws its motivation from earlier micro-econometric analyses of cross sectional household data. These typically use simple linear regressions to examine yearly savings determinants, as well as examining pooled results with the inclusion of appropriate dummies to account for macroeconomic variation (Segura and Tachibanaki, 1991; Kulivov et al., 2007, Denizer et al., 2002). A full list of the variables included is presented in Appendix 3.

OLS regression is used to model the determinants of conditional household savings in terms of the five classes of variables included in equation (1). These categories are income (*logY*); proxies for the variability of income such as *worktype*, *anytempwork*, *head_unemp* and educational indicators; indicators of financial access such as *sentmoney*, *receivedmoney* and *borrowedmoney*; a range of household characteristics (*numkids*, *numadults*, *hh_female*); and area dummies. All standard errors are robust to heteroscedasticity, and clustered at the level of the region (marz). Appendix 4 presents these results separately for each survey year. Results from 2006 are included for completeness but must be interpreted with caution, as the

ILCS 2006 did not include an employment module which implies that all measures of income variability σ_Y are not available. In what follows, this year is excluded from pooled estimations.

The estimations suggest that income is both statistically and economically an important determinant of households' savings behavior. Point estimates are reasonably consistent over time, ranging from 0.373 to 0.405 of an increase in savings rate corresponding to each point increase in log income. These estimates also agree with the empirical studies from other emerging or developing countries (for example, Kulikov *et al.* report ranges from 0.371 to 0.495).

Results examining σ_Y, the variability of income, are mixed. Indicators of the type of work undertaken by the head of the household show no consistent pattern as the income stream expected from a class of work becomes more variable. As the omitted case is salaried employment, it would be expected that, for consistency with permanent income hypotheses, more risky employment types should be associated with higher savings levels. No consistent pattern of this kind is seen.[11] Education, which has been suggested as a better proxy for the security of a future income stream, displays consistently negative and significant coefficients. This is both in agreement with empirical literature, and with the theoretical predictions of the PIH. Where working members of Armenian households are less educated, they increase savings, potentially in response to greater fluctuations in the income stream.

Access to financial products also results in coefficients of the expected sign. Where a household is able to acquire debt, the savings rate responds negatively. While this may be presented as evidence that households with access to formal or informal credit find it less necessary to save, it may also be explained by a number of other mechanisms. It seems likely that households taking on debt perceive some greater need for present liquidity. If these households are more likely to spend all available resources (either on consumption, investment projects or debt servicing payments), estimated coefficients should be negative. It is interesting to note that remittances, either sent or received, seem to be treated in a similar manner as income or expenses, and not as greater access to potential liquidity. Remittances received affect savings in a positive manner (although this effect is not significant in all time periods), and remittances sent reduce the savings rate of a household. There is some evidence that the ownership of non-durable assets also acts as an incentive to reduce savings. Households who own homes of higher quality (controlling for family income level) are less likely to save, possibly consistent with the fact that investment in assets is seen as a substitute for saving. This is true both for housing and particular goods in the home (such as centralized gas heating and a flush toilet). However, dummies for home ownership result in generally insignificant signs.

Examining other household characteristics, these generally predict savings in the manner expected. Larger households, both in terms of number of children and number of adults save less, in a statistically significant manner. A larger number of adult members is likely to increase the probability of having at least some future income streams, whereas the presence of children may be treated as motive to save less for old age, as offspring may act as a retirement income stream (Orbeta, 2006). There appears to be a generational (or life-cycle) gradient in savings, with younger generations saving significantly less than older generations, with a gradual increase over the age profile. The explanation of this effect may lie in two different mechanisms: a contemporaneous mechanism in which households borrow while

[11] However, this might be a reflection of small size samples since the number of individuals reporting to be in each income class is quite small

young and save later in the life cycle (consistent with the LCH), or a generational change, in which the savings behavior of younger and older cohorts is fundamentally different, with older cohorts acting more frugally than younger.[12]

Alternative specifications

The baseline model offers a number of results regarding Armenian household saving behavior which are examined further using alternative model specifications. Appendix 5 presents results of pooled OLS using data from all survey years (excluding 2006), a binary dependent variable model predicting saving behavior (column 5), along with quintile regressions at the first, second, and third quartile of the distribution (columns 2, 3 and 4). The binary dependent variable model (estimated using a probit regression) allows for the comparison of household level decisions regarding whether or not to save with decisions regarding the magnitude of saving presented in table 2 (along with column 1 of Appendix 5). The inclusion of quintile regression results seems appropriate for two reasons: as a manner to examine if the determinants of savings are constant along the savings distribution, and to estimate specifications using minimum absolute deviations in order to reduce the sensitivity to outliers in the savings model.[13]

Results from the probit model predicting whether a household makes any savings in the survey month are generally in agreement with results from the pooled OLS. As per the results discussed previously, savings behavior responds to income in a positive and significant manner. In the probit specification all results are reported as marginal effects at the mean, and at these values the importance of household income in determining whether to save exceeds the importance of income in determining the quantity to save.

Point estimates on household characteristics agree with those from Appendix 4 as well as with the pooled OLS results in column 1 of Appendix 5. This suggests that the mechanism underlying a household's decision of optimal savings rate responds to similar factors in a similar way as their decision of whether or not to save. The age gradient result is more pronounced in pooled OLS than in the probit specification, suggesting that the life-cycle or cohort specific savings preferences owe more to older age groups' preference to save a higher proportion of their income, rather than a greater preference to make any savings.

Robustness check

Finally, a series of quantile regressions are run in order to examine the robustness of the OLS regressions at various points of the savings distribution. Columns 2-4 of Appendix 5 present estimations at the 25^{th}, 50^{th} and 75^{th} percentile, and suggest that savings decisions are quite homogenous, particularly when considering certain determinants such as income. Whilst income is a significant predictor of savings at all savings rates, this seems to be particularly true at lower rates. Appendix 6 (figure 6.a.) presents the coefficient on income at each percentile of the savings distribution. Dotted lines represent the OLS estimations and confidence intervals (from column 1), whereas the solid line and shaded region presents the

[12] Such a hypothesis could be tested with savings data over a longer time period, but falls outside the scope of the present paper. It may also be that this age profile behavior responds to the extension of the national pension system from nonexistent, to a PAYG system, and, from 2014, to a fully funded system (Yeritsyan, 2011).

[13] Standard errors are calculated in the quartile regression framework using bootstrapping with 100 replications. All regression specifications in Appendix 5 include the full set of control variables listed in Appendix 2, although non-informative coefficients have been removed from the output for the sake of simplicity.

LAD (Least Absolute Deviations) estimates for each percentile and their confidence intervals respectively. At high savings rates, increases in income have a much lower effect on savings rates than at lower levels of income. This is the evidence of a diminishing marginal return (in terms of savings) of income increases in Armenian household data.

Similar results are found for ownership of land and real estate, condition of property, the sending of remittances, borrowing, number of household members, and education levels. The variation in these coefficients by savings rate demonstrates the homogeneity of a broad range of determinants, and suggests that naïve OLS fails to account for the distributional specific nature of these estimates. Ownership of land and real estate results in a higher savings rate, but this is particularly true at low savings levels. Given that households use this land for agriculture or other enterprise, it seems plausible that this might simply represent an income effect not entirely reflected in the *logY* term which measures income at a single point in time. The condition of property variables are also significant at low savings rates, suggesting that investments in housing quality might be substituting for savings, with the effect stronger for the savings-restricted parts of the distribution. The sending of remittances, education levels, and number of household members all result in greater negative impacts on savings at low savings rates.

These results, along with those from Appendix 4 suggest a number of stylized facts in Armenian household saving behavior: the importance of income as a saving determinant, at both high and particularly low savings rates; the characteristics reflecting the volatility of future income streams such as education and household size resulting in a reduction in savings rate; and an age-gradient in savings with older generations more likely to save at higher rates than the young.

As is the case in the empirical literature on savings determinants, a shortcoming of this analysis is the potential endogeneity of the regressors specified in equation 1. Measurement error in these variables or correlation with omitted terms will bias estimates presented in Appendixes 4 and 5. Whilst this paper does not examine the existence of this potential endogeneity, some support of the conclusions may be drawn from Kulikov et al. (2007), who use an IV strategy on Estonian data and find no evidence of potential endogeneity of the income term. Due to current data limitations such an analysis is not employed. However the existence of more comprehensive household surveys, and particularly panel studies allowing for the control of fixed household effects could be employed usefully as an extension to this paper.

III. How to Stimulate These Determinants to Support Growth?

The macroeconomic analysis of the determinants of Armenia aggregate savings rate allowed us to confirm that according to the literature the GDP per capita and its growth rate are the main determinants of the aggregate savings rate. We also pointed out the importance of the time deposit rate as one of the main determinants. Our analysis also figured out some non-intuitive determinants like the real exchange rate and the openness of the countries. We found that a depreciation of the REER (in our case a decrease in the level) leads to an increase in the savings rate. We also found that acceleration in the degree of openness has a positive impact on the savings rate.

Household savings behavior in Armenia has been examined using data from the ILCS 2004-2010. Results from standard linear regression models agree with the theory and past

empirical results from developing countries, and suggest that savings rates depend positively upon a household's income and characteristics representing volatility of expected income such as education and access to borrowing. Larger households tend to save less, potentially in response to a more diversified income stream. Remittances, either sent or received, appear to be treated in a similar manner as income or expenses, and remittances received tend to affect savings in a positive manner while remittances sent reduce the savings rate of a household. Results suggest that households determine whether to save and how much to save in the same manner, but that savings determinants vary significantly as a household's saving rate increases.

These macroeconomic and microeconomic analyses point to three policy areas: the macroeconomic environment, the financial sector and remittances. The significance of GDP per capita and income in determining savings rate implies that a macroeconomic environment enabling growth is a sine-qua-non to boost domestic savings rate. This is better illustrated by the negative impact of real appreciation and the 2009 crisis on the aggregate savings rate. The positive impact of time deposit rate on savings rate suggests that the financial sector can be designed to stimulate households and firms' propensity to save. The positive impact of remittances on savings rate suggests that with the right policies and institutions, part of the remittances received can be channeled into productive activities.

A macroeconomic environment that ensures low inflation, a sustainable fiscal deficit and a sustainable current account deficit is growth-enabling. This means that the monetary policy, the fiscal policy and the trade policy need to be closely coordinated to ensure that they are consistent. The inflation targeting rule of the Armenian Central Bank should be maintained to anchor inflation expectations. The exchange rate policy needs to support an export-led growth strategy, with the Central Bank open market operations maintaining the real exchange rate at a competitive level while containing imported inflation. The fiscal stance needs to be sustainable, with the debt ratio contained below 50 percent of the previous year GDP as per the government's fiscal rules, and the fiscal deficit maintained below 3 percent to create the necessary fiscal cushion. This tightened fiscal policy should allow the Central Bank to adopt a more expansionary monetary policy to support growth while keeping inflation on target.

A financial sector that accommodate firms' various cash flow management needs and households' saving constraints increase their propensity to save. A banking sector accessible to a large share of the population, with some attractive saving options is the formal way to tap domestic saving. Micro-credit institutions are also needed, particularly in small towns and rural areas, to supplement the formal saving channels. Revamping the stock exchange market as well as the government securities market is needed to make saving attractive to firms. This will also provide a channel to leverage pensions and life insurance proceeds into productive and profitable activities.

Finally, remittances can be channeled to productive activities if the proper institutions are put in place. More than 80 percent of Armenia's remittances come from Russia. Nearly 10 percent of these inflows are already being used for business investment. Another nearly 10 percent going to "other" use can be channeled to investment if the right institutions are in place. As of now, however, the institutional framework does not fully serve the initial idea of pulling remittances. For instance, Annelik Bank is an international transfer institution that could help. There is a need to streamline the mandate of those institutions to serve as remittances-channeling vehicles; and to introduce remittances-backed mechanisms to expand financial services provided to migrants or seasonal workers and their families. If better channeled, remittances can support SMEs through micro-credit institutions.

References

Abdelkhalek, T., F. Arestoff, et al. (2009). A Microeconometric Analysis of Households Saving Determinants in Morocco. Mimeo.

Barro R. (1989) “The Ricardian approach to budget deficits” The Journal of Economic Perspectives

Blanchard, O.-J. (1985) “Debts, deficits, and finite horizons” Journal of Political Economy

Browning, M. and A. Lusardi (1996). "Household Saving: Micro Theories and Micro Facts." Journal of Economic Literature **34**(4): 59.Denizer, C., H. Wolf, et al. (2002). “Household Savings in Transition Economies.” Journal of Comparative Economics **30**(3).

Edwards, S. (1996). “Why are Latin America’s savings rates so low? An international comparative analysis.” Journal of Development Economics **51**(1).

Edwards S. (1995) Why are savings rates so differents across countrries? An international comparative analysis. NBER (Working Paper n°5097)

Jongwanich Juthathip (2009). The determinants of household and private savings in Thailand. Applied Economics

Khalid A.M. (1996) “Ricardian Equivalence: Empirical evidence from developing economies” Journal of Development Economies

Kulikov, D., A. Paabut, et al. (2007). A Microeconometric Analysis of Household Saving in Estonia: Income, Wealth and Financial Exposure. Bank of Estonia Working Paper.

Horioka, C. and J. Wan (2007). “The Determinants of Household Saving in China: A Dynamic Panel Analysis of Provincial Data.” Journal of Money, Credit and Banking **39**(8).

Modigliani F. (1970) “The life cycle hypothesis of saving and inter-country difference in the saving ratio” Oxford Press

Montiel P. and Luiz Servén (2009) Real Exchange rate, Savings and Growth. Is there a link? Commission on Growth and Development (n° 46)

Obstfeld M. and Rogoff K. (1996) Fundations of International Macroeconomics. The MIT Press

Orbeta, A. (2006). Children and household savings in the Philippines. Discussion Paper, No. 14. Philippine Institute for Development Studies.

Romer D. (1996) Advanced Macroeconomics. The Mcgraw-Hill Series in Economics

Schmidt-Hebbel, K., S. Webb, et al. (1996). "Household saving in developing countries: first cross-country evidence." The World Bank Economic Review **6**(3).

Suruga, T. and T. Tachibanaki (1991). "The effect of household characteristics on saving behaviour and the theory of savings in Japan." Empirical Economics **16**(3).

Yaari, M. E. (1965) “Uncertain lifetime, life insurance, and the theory of the consumer” Review of Economic Studies

Yeritsyan, N. (2011). Old-age Multi-Pillar Pension Reform in Armenia. Technical Committee Meeting. Cape Town, Central Bank of Armenia.

Appendix 1: Seasonality

The presence on seasonality in the dependent variable (here the savings rate) might result in a bias of the estimates. We would have then needed to seasonally adjust the saving rate. In our case, the saving rate and the gdp per capita exhibits similar seasonality pattern (Figure 2, Panel a). But in the case when a seasonally varying dependent variable (saving rate) is regressed on a seasonally varying independent variable (gdp per capita) to find the effect of the latter on the former, the use of seasonally adjusted data can result in biased coefficients. This can be shown as following:

Let note Y the dependent variable with a seasonality part quoted S1 so that Y=Y1 + S1. Y1 is seasonally adjusted part of Y. We note X the independent variable. We want to estimates the relation

$Y=a + bX + u$ (E1)

When we seasonally adjust Y, we estimate the relation

$Y1 = a + bX + [u-S1]$ (E2)

Now let consider that the independent variable X also presents a seasonality pattern S2 and that S1 and S2 are correlated. In this case, the estimates equation becomes

$Y1 = a + b[X1 + S2] + [u-S1]$ (E2)

There is correlation between the independent variable X (=X1 + S2) and the residuals U (=u-S1), which leads to bias in the estimation. Thus, when both dependent and independent variable exhibits similar seasonality pattern, it is counter-productive to seasonally adjust the dependent variable.

The unbiased way is to use the non-adjusted data but introduce dummy variables for 3 quarter. We can't introduce the dummy variables for the 4 quarters otherwise there is perfect co-linearity between them. Those 3 dummies are not significant in the co-integration or long-run relationship equation. This seems to suggest that the seasonality linked to the dummy variables is already captured by the "seasonal" gdp per capita.

Appendix 2: Savings Trend Controlling for Inflation

Value (drams)	2004	2006	2008	2010
Y	89887.63 (303483.9)	105866.9 (235371.6)	101334.2 148615.7	90062.76 (156364.9)
C	57329.02 (50038.23)	64118.47 (52684.3)	70669.8 (52111.26)	61480.02 (44842.79)
S	32558.62 (299965.9)	41748.47 (231837.3)	30664.44 (140565.8)	28582.74 (151807.7)
Savings Rate	0.0845 (0.526)	0.111 (0.490)	0.124 (0.393)	0.130 (0.343)
N (Households)	6122	4752	7545	7453

Table 4: Monthly Household Income, Consumption and Saving – Means and Standard Deviations (defltated values, base year 2004)

Appendix 3 : List of Variables Used for the Microeconomic Determinants

Variable	Description
S_Y	Monthly savings rate expressed as savings (the difference between household income and consumption excluding the sale and purchase of large durable goods) over household monthly income
logY	Log household income (in drams), excluding the sale of real estate, vehicles, and household valuables
houseown	Variable taking value of 1 if the household owns the house it lives in
landown	Variable taking value of 1 if the household owns land on which it works
flushtoilet	Variable taking value of 1 if the household has a flush toilet
gasheat	Variable taking value of 1 if the household has centralized gas heating
housecond	A series of variables offering the household's subjective opinion of the state of their housing. 1= very good, 5=very poor
rural	Variable taking value of 1 if household is rural
sentmoney	Variable taking value of 1 if household sent money to relatives
Receivemoney	Variable taking value of 1 if household received money from relatives
borrowedmoney	Total value (in drams) of household borrowings in the past year
povertyben	Variable taking value of 1 if household qualifies for national poverty benefits
numkids	Number of individuals under the age of 18 in the household
numadults	Number of individuals 18 and over in the household
hieduc	Highest education level of the household head or spouse
headeduc	Education level of the head of the household
otherprop	Variable taking value of 1 if household owns other property which it rents out or uses to conduct business
worktype_head	Class of work of the household head. Ranges from 1=employee with contract to 7=informal
anytempwork	Variable taking value of 1 if any of household income in the month has come from temporary or seasonal work
head_unemp	Variable taking value of 1 if household head was unemployed during the survey period
hh_female	Variable taking value of 1 if household head is female
agehead_	Age of household head
Year	Dummies representing time period
Region	Dummies representing region (marz) of household

Appendix 4: Savings Determinants, by year

	(1)	(2)	(3)	(4)
VARIABLES	S_Y2004	S_Y2006	S_Y2008	S_Y2010
Logy	0.398***	0.353***	0.373***	0.405***
	(0.0117)	(0.0233)	(0.0182)	(0.0194)
Houseown	-0.00601	0.0539	0.0975**	0.0183
	(0.0192)	(0.0516)	(0.0343)	(0.0219)
Landown	0.0818	0.121*	0.0419	0.0760***
	(0.0458)	(0.0573)	(0.0280)	(0.0223)
Flushtoilet	-0.0312	-0.0447**	-0.0677*	0.00633
	(0.0240)	(0.0191)	(0.0330)	(0.0455)
Gasheat	-0.00174	-0.0471*	-0.0658	-0.125***
	(0.0180)	(0.0258)	(0.0368)	(0.0241)
housecond1	-0.131	-0.0941	-0.183***	-0.310***
	(0.0809)	(0.0637)	(0.0395)	(0.0714)
housecond2	-0.0957**	-0.0779	-0.0660	-0.0685
	(0.0384)	(0.0567)	(0.0457)	(0.0396)
housecond3	-0.0499**	-0.0201	-0.0284	-0.0314
	(0.0190)	(0.0583)	(0.0365)	(0.0362)
housecond4	0.0126	-0.0194	-0.0205	-0.0331
	(0.0257)	(0.0458)	(0.0329)	(0.0325)
Rural	0.0638	0.0640	0.0774	0.0162
	(0.0409)	(0.0641)	(0.0573)	(0.0461)
Sentmoney	-0.0864***	-0.0466	-0.0694**	-0.0377
	(0.0258)	(0.0368)	(0.0280)	(0.0241)
Receivemoney	0.0642***	0.0176	0.00627	0.00859
	(0.0184)	(0.0200)	(0.0213)	(0.0188)
Borrowedmoney	-8.49e-08	-6.76e-08	-6.60e-08***	-2.91e-08***
	(4.29e-07)	(2.57e-07)	(1.49e-08)	(8.46e-09)
Povertyben	0.0720**	0.111**	0.0997***	0.0278
	(0.0307)	(0.0429)	(0.0244)	(0.0195)

Numkids	-0.0500***	-0.0484***	-0.0553***	-0.0485***
	(0.00810)	(0.00954)	(0.00544)	(0.00249)
Numadults	-0.0425***	-0.0555***	-0.0480***	-0.0539***
	(0.00660)	(0.00598)	(0.00502)	(0.00483)
Hieduc	-0.0288***	-0.0321***	-0.0269***	-0.0257***
	(0.00272)	(0.00491)	(0.00358)	(0.00465)
Headeduc	-0.0123***	-0.0150***	-0.0108***	-0.0166***
	(0.00267)	(0.00286)	(0.00126)	(0.00321)
Otherprop	-0.0769**	0.00313	-0.0600	-0.115**
	(0.0294)	(0.0566)	(0.0728)	(0.0362)
worktype_head2	-0.218**		0.0192	-0.0282
	(0.0776)		(0.0192)	(0.0184)
worktype_head3	0.0200		-0.119**	0.0254
	(0.0245)		(0.0442)	(0.0239)
worktype_head4	0.219***		-0.0333	-0.242***
	(0.0509)		(0.0237)	(0.0568)
worktype_head5	0.183		0.0290	-0.0257
	(0.108)		(0.0642)	(0.0321)
worktype_head6	0.147		0.0250	-0.0625**
	(0.280)		(0.0696)	(0.0268)
worktype_head7	-0.00132		-0.124***	0.106***
	(0.101)		(0.0226)	(0.0295)
Anytempwork	0.0134		-0.00661	-0.0262
	(0.0191)		(0.0283)	(0.0199)
head_unemp	0.000343		0.00984	-0.00748
	(0.0135)		(0.0200)	(0.0216)
hh_female	0.0608***	0.0127	0.0148	0.0142
	(0.0140)	(0.0154)	(0.00962)	(0.0123)
agehead_2030	-0.0999	-0.0665	-0.0608**	-0.0603
	(0.0631)	(0.0524)	(0.0217)	(0.0431)
agehead_3140	0.0117	-0.0335	-0.0757***	-0.0859**
	(0.0360)	(0.0460)	(0.0155)	(0.0324)

agehead_4150	0.0163	0.00578	-0.0532**	-0.0449***
	(0.0358)	(0.0335)	(0.0172)	(0.0131)
agehead_5160	0.0446	0.0233	-0.00294	-0.0267**
	(0.0317)	(0.0305)	(0.0200)	(0.0115)
agehead_6170	0.00924	-0.00243	-0.0124	-0.0569***
	(0.0258)	(0.0190)	(0.0177)	(0.00798)
Constant	-3.862***	-3.355***	-3.697***	-3.913***
	(0.111)	(0.228)	(0.163)	(0.198)
Observations	6,117	4,749	7,540	7,449
R-squared	0.309	0.325	0.254	0.280

Appendix 5: Alternative Savings Specifications and Subpopulations

	(1)	(2)	(3)	(4)	(5)
VARIABLES	S_Ypool	q25	q50	q75	Any_Save
logY	0.393***	0.484***	0.384***	0.292***	0.508***
	(0.0123)	(0.00654)	(0.00594)	(0.00470)	(0.0275)
Houseown	0.0266	0.0621***	0.0327**	0.0142	0.0857*
	(0.0199)	(0.0178)	(0.0150)	(0.0107)	(0.0466)
Landown	0.0722***	0.0707***	0.0686***	0.0556***	0.127**
	(0.0222)	(0.0138)	(0.00943)	(0.00798)	(0.0547)
housecond1	-0.216***	-0.247***	-0.152***	-0.117***	-0.267*
	(0.0626)	(0.0523)	(0.0429)	(0.0319)	(0.148)
housecond2	-0.0840***	-0.0912***	-0.0517***	-0.0461***	0.00974
	(0.0226)	(0.0245)	(0.0154)	(0.0162)	(0.0579)
Rural	0.0533	0.0258	0.0323***	0.0335***	0.0788
	(0.0465)	(0.0171)	(0.0102)	(0.00831)	(0.100)
Sentmoney	-0.0679***	-0.102***	-0.0803***	-0.0724***	-0.152***
	(0.0131)	(0.0152)	(0.00978)	(0.00756)	(0.0454)
Receivemoney	0.0244	0.0306***	0.0308***	0.0237***	0.0296

	(0.0169)	(0.0106)	(0.00570)	(0.00486)	(0.0336)
Borrowedmoney	-4.68e-08***	-8.59e-08***	-6.81e-08***	-4.45e-08***	-9.90e-08***
	(1.02e-08)	(1.45e-08)	(1.29e-08)	(1.47e-08)	(1.84e-08)
Povertyben	0.0681***	0.0858***	0.0432***	0.0271***	0.0680***
	(0.0162)	(0.0127)	(0.0101)	(0.0104)	(0.0190)
Numkids	-0.0507***	-0.0657***	-0.0518***	-0.0353***	-0.0910***
	(0.00464)	(0.00561)	(0.00363)	(0.00238)	(0.0124)
Numadults	-0.0498***	-0.0523***	-0.0458***	-0.0349***	-0.0578***
	(0.00327)	(0.00567)	(0.00298)	(0.00263)	(0.0124)
Hieduc	-0.0274***	-0.0350***	-0.0274***	-0.0197***	-0.0334***
	(0.00143)	(0.00264)	(0.00212)	(0.00171)	(0.00575)
Headeduc	-0.0129***	-0.0153***	-0.0105***	-0.00836***	-0.0115
	(0.00188)	(0.00252)	(0.00149)	(0.00110)	(0.00861)
Otherprop	-0.0898***	-0.0934**	-0.0714***	-0.0459***	-0.164**
	(0.0184)	(0.0373)	(0.0153)	(0.0173)	(0.0700)
Anytempwork	-0.00473	-0.00323	-0.0144*	-0.0128*	-0.00709
	(0.0167)	(0.0113)	(0.00760)	(0.00730)	(0.0381)
head_unemp	0.000806	-0.0190	-0.00827	-0.00404	-0.0349
	(0.0122)	(0.0192)	(0.0106)	(0.0107)	(0.0270)
hh_female	0.0275***	0.0507***	0.0371***	0.0289***	0.0456**
	(0.00656)	(0.00961)	(0.00847)	(0.00605)	(0.0200)

agehead_2030	-0.0743*	-0.0696***	-0.0737***	-0.0240	-0.0185
	(0.0403)	(0.0268)	(0.0245)	(0.0179)	(0.110)
agehead_3140	-0.0563***	-0.0548**	-0.0653***	-0.0485***	-0.0314
	(0.0124)	(0.0225)	(0.0147)	(0.0137)	(0.0340)
agehead_4150	-0.0309*	-0.0316**	-0.0300***	-0.00555	-0.0363
	(0.0157)	(0.0150)	(0.00982)	(0.00779)	(0.0290)
agehead_5160	0.000964	0.0108	-0.0167**	-0.00458	0.0749**
	(0.0121)	(0.0127)	(0.00759)	(0.00715)	(0.0341)
Observations	21,106	21,106	21,106	21,106	22401
R-squared	0.276				

Appendix 6: Robustness check for coefficient of major variables.

The graphs below present OLS coefficients of major variables (income, rural, sentmoney, receivedmoney, hh_female, head_unemp) and confidence interval (dotted lines) and LAD estimated and confidence interval at each percentile of the savings rate distribution (solid line and shade area around solid line)

Fig 6.a. log Income (OLS and LAD estimates)

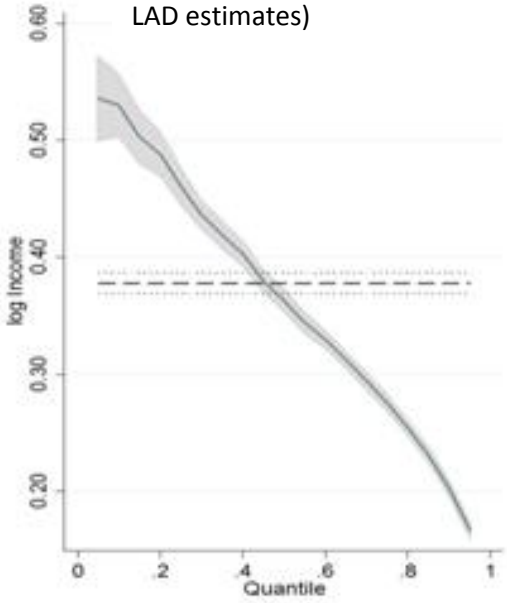


Fig 6.b. Rural area (OLS and LAD estimates)

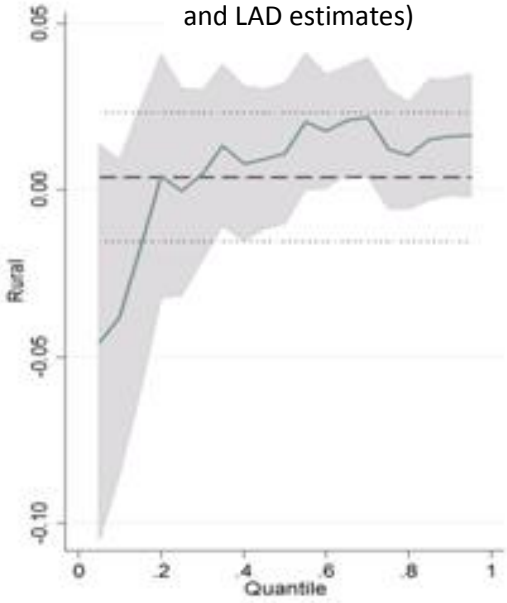


Fig 6.c. Sent money (OLS and LAD estimates)

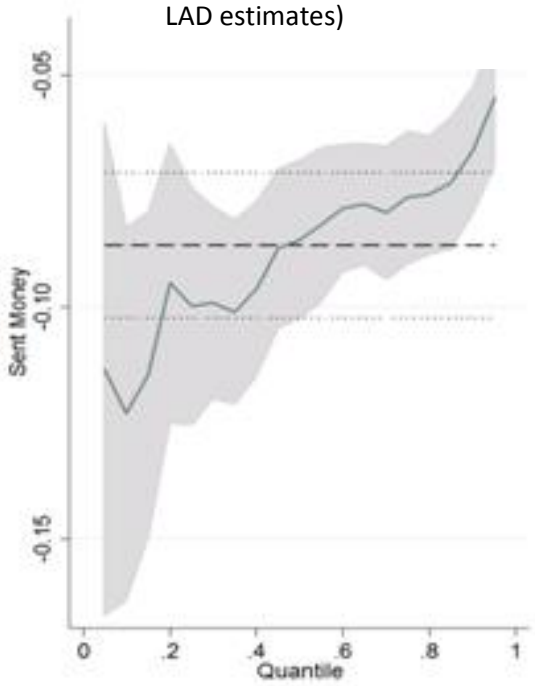


Fig 6.d. Received money (OLS and LAD estimates)

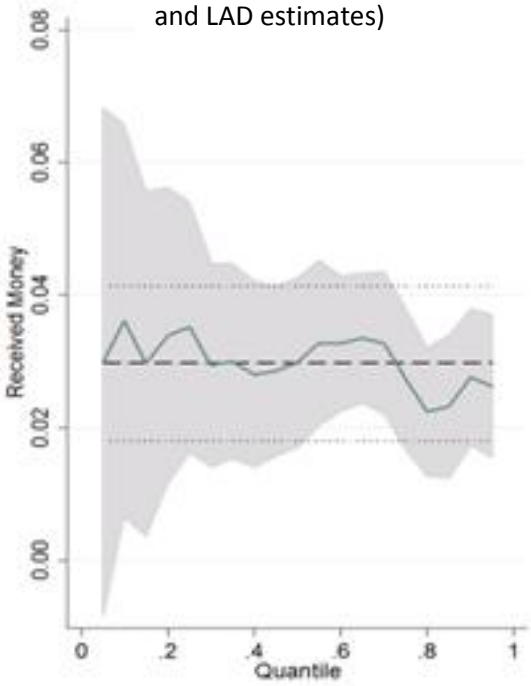


Fig 6.c. Sex of household head (OLS and LAD estimates)

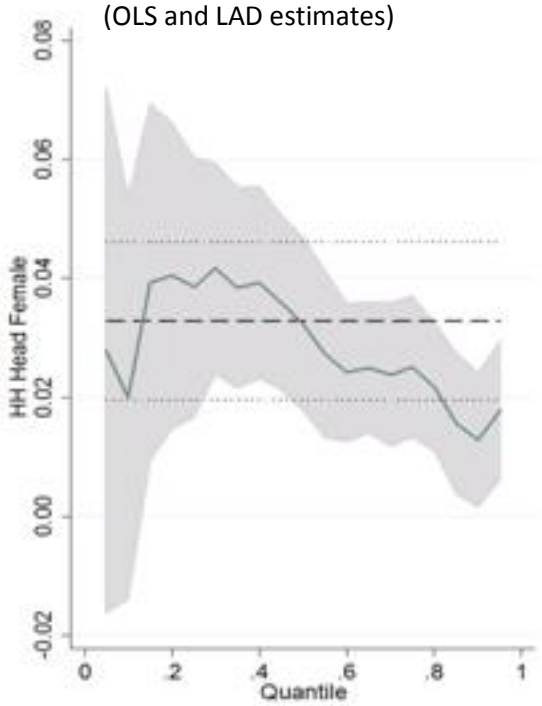


Fig 6.c. employment status of household head (OLS and LAD estimates)