Consumption in the Baltic States: Myopia or liquidity constraints?

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Abstract. This paper investigates the consumption pattern of the Baltic States for the period 1999-2010. The investigation is done using the aggregate annual data from the Baltic States: Estonia, Latvia and Lithuania. The panel data analysis of the data rejects the life-cycle - permanent-income hypothesis (LCH - PIH): the fraction of income, attributed to the "rule of thumb" consumption is generally substantial for these countries. The paper checks the possible reasons for this result with the well-known Shea's model with three hypotheses: myopia, liquidity constraints and "opposite asymmetry". Additionally the results based on the data of consumption of non-durables and services are compared with the results based on the data of total consumption.

Keywords: "rule-of-thumb" consumption, liquidity constraints, myopia, "opposite asymmetry".

JEL Classification: E21, C22
AMS Classification: 91B42, 91B84, 62M10, 62P20

1 Introduction

In recent years, there has been an increasing interest in consumer choice in economics. This problem has been analyzed mainly with two models: overlapping generation's model (Diamond [6]) and permanent-income model (Friedman [8], Hall [11]). During the last 25 years several papers have been published that do not support the results of these models. The most central among above-mentioned works are the papers of Campbell and Mankiw [2]-[4]. They considered that the world is populated with two types of consumers: a) individuals who consume their current income ("rule-of-thumb" consumers), the share of income, accrued to such consumers, is denoted by λ; b) individuals who consume their permanent income, i.e. they use their extra income for saving and follow life cycle-permanent income hypothesis (LCH-PIH); the share of income, accrued to such individuals, is $1-\lambda$. Using aggregate post-war US quarterly time-series data from 1948:1 through 1985:1 Campbell and Mankiw estimated that half of the consumers do not save the income gained from tax cuts, but spend it on consumption. Later on the LCH-PIH was rejected by several authors (for example, Chyi and Huang [5], Filer and Fisher [7], Fuhrer [9], Gomes and Paz [10], Sarantis and Stewart [19], Shea [20], Souleles [22]). The reasons vary. Households with less income are liquidity-constrained and just don't have the funds for saving (e.g., Souleles [22]). Some families may also be too optimistic about the future, hoping that their income and level of welfare increases. Several authors have found that the "rule-of-thumb" behavior is an essential cause for the rejection of LCH-PIH. Other reasons include habit persistence (e.g. Fuhrer [9]) and non-separable preferences between consumption and leisure/labor supply (e.g., Kiley [13]).

This article takes a country-specific approach in analyzing the relationship between consumption and disposable income in the Baltic States. The Baltic countries, Estonia, Latvia and Lithuania form the homogenous group for analyzing economical models and share many similarities like location, similar size and historic background. In this paper the investigations, started in [17], were continued. In [17] the LCH-PIH hypothesis was tested for the Baltic States for the period 1996-2010 using GMM estimation technique on cross country time series of aggregate quarterly data. Both in [17] and in the present paper the approach of Campbell and Mankiw with the two groups of consumers are used. During the period 1996-2010 the countries experienced rapid growth (1999 - 2007) and a recession (2007 – 2010). For both periods the LCH-PIH hypothesis is rejected: about 40-90% of income was consumed by current income consumers. In this paper the panel data techniques and aggregate annual data for the period of 1999 – 2010 were used for testing the LCH-PIH. It was established that the fraction of income, attributed to the "rule of thumb" consumers, is generally substantial for these countries: 81% of the total consumption and 74% of consumption of non-durables and services follow the "rule of thumb" consumption. These estimates are in good accordance with the results of Kukk et al. [14], who, using Estonian micro-data for

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the period 2002 – 2007, estimated that the fraction of "rule of thumb" consumption was approximately 75% in this period for Estonia. The possible reasons behind such estimates are checked using the Shea's [21] model with three hypothesis: myopia, liquidity constraints and "opposite asymmetry". Following Sarantis and Steward [19] (who suggested that the λ-model could allow "rule-of-thumb" consumers to have a durable consumption component), the estimates, based on the data of consumption of non-durables and services, are compared with the results, based on the data of total consumption.

The paper is organized as follows. Section 2 presents an overview of the related literature that gives different empirical estimates of the share of "rule-of-thumb" consumption from total income. The third section presents the data, methodology and empirical results. The fourth contains the conclusion.

2 Literature review

This section gives a little overview of different works, where LCH-PIH was rejected. Mainly we concentrate to the papers, where different estimates of the fraction of income, accrued to "rule-of-thumb" consumption, are presented.

One of the most important works dedicated to the problem of the estimation of λ is the paper of Weber [24], where the comparisons of the previous estimates of λ by different authors are provided. He argues that most authors have used log-linear Euler equation:

$$\Delta c_{t+1} = \mu + \Delta y_{t+1} + \sum_{i=1}^{k} \gamma_i X_i + \varepsilon_{t+1} , \tag{1}$$

where t is the time period, Δc_t is the change in log consumption spending, Δy_t is the change in log disposable income, the X_i's are other variables included in regression, such as real asset returns, and the γ_i's are slope coefficients, μ is the intercept and ε_t is the random error. Different researches estimated the value of λ for different countries and for different periods and found that the values of λ are between 0,114 and 0,843.

Several authors have rejected the LCH-PIH using data for the US. Fuhrer [9] estimated that the share of "rule-of-thumb" consumption is 29% by the Generalized Method of Moments (GMM), and 26% by the Full Information Maximum Likelihood (FIML). He also found that very important evidence against LCH-PIH is provided by the habit persistence. Additional evidence against LCH-PIH was also provided by Shea [20] ("opposite asymmetry"), Souleles [22] (liquidity-constrained consumers) and Kiley [13] (non-separable preferences between consumption and leisure/labor supply). Very recently Sahm et al. [18] analyzed fiscal stimulus packages of Michigan from 2008 and 2009 and found that 25% of households increased spending due to spring 2008 tax rebate and 13% due to spring 2009 tax rebate. One explanation of the variation of the "rule-of-thumb" consumption is recession. The share of "rule-of-thumb" consumption may be higher due to higher credit constraints or lower due to expectations of lower life-time income.

The estimates of λ indicate differences across countries in the effect of disposable income and consumption: for the United Kingdom with the sample period 1957-1988 (seasonally adjusted) λ = 0,203, for Canada with the period 1972 – 1988 (seasonally adjusted) λ = 0,225, for France with the sample period 1972 – 1988 (seasonally adjusted) λ = 0,401, for Japan with period 1972 – 1988 (not seasonally adjusted) λ = 0,035 and for Sweden with the period 1972 – 1988 (not seasonally adjusted) λ = 0,357 (Campbell and Mankiw [4]). For Japan, using a different sample period of 1957 – 1990 and different instrument set, Chyi and Huang [5] got another estimate: λ = 0,685. They also got the estimates of λ for some East Asian countries: λ = 0,333 for Korea with the annual sample period of 1966 – 1989, λ = 0,443 for the Philippines with the period of 1970 – 1990, λ = 0,412 for Thailand with the same period and λ = 0,275 for Taiwan with the sample period of 1961 – 1990.

Sarantis and Stewart [19] found that the presence of "rule-of-thumb" consumers is the major factor for the rejection of the basic LCH-PIH model in all OECD countries, which is firstly due to the liquidity constraints and a lesser extent due to the precautionary saving. The share of current income consumption varies across countries with the minimum of 44.2% for the UK and the maximum of 94.4% for Finland. The average proportion of income, accrued to the current income consumers, was calculated to be approximately 71% from time series estimates and 67% from panel estimates. Real per-capita total consumer expenditure was used in the estimates.

Gomes and Paz [10] checked the aggregate consumption behavior in four South American countries: Brazil, Colombia, Peru and Venezuela. They found that the estimation $\lambda \in [0.828, 0.906]$ for Columbia is statistically significant at 5% level for different instruments, for Brazil: $\lambda \in [0.734, 1.063]$ is statistically significant at 5% level, while the estimation $\lambda = 1.063$ had a big standard error 0,318, for Venezuela: $\lambda \in [0.703, 1.043]$ is statistically significant at 5% level. They noted that similar results for Brazil were also presented by other authors like Reis et al. [16]: $\lambda = 0.8$, Issler and Rocha [12]: $\lambda = 0.74$. Gomes and Paz displayed very surprising results for

Colombia: $\lambda \in [1.245, 1.502]$ for all instrument lists at 5 % level of statistical significance. All estimates of λ are larger than one that is not consistent with Campbell's and Mankiw's approach. They suggested that the total consumption has a specification problem, or alternatively, the predictive power of instruments is low.

3 Econometric analysis

3.1 Data

In this research aggregated annual data from the period 1999 – 2010 are used. Real adjusted gross disposable income of households per capita (*Y*) in PPPs was downloaded from Eurostat. The real total consumption (*TC*) is calculated as the adjusted final consumption expenditure of households divided by the purchasing power parities (PPPs) of the actual individual consumption of households and by the total resident population; all time-series obtained from the Eurostat. The consumption of non-durables and services were obtained from the OECD's database for Estonia. For Latvia and Lithuania the data was obtained from Latvian and Lithuanian national statistics authorities. The data was converted into the real terms using PPPs. The real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. This was downloaded from the World Bank database.

For Estonia, the nominal interest rates on one-year time deposits were obtained from the Bank of Estonia. For Latvia and Lithuania, one-year nominal interest rates were downloaded from DataStream.

3.2 The model

Following Campbell and Mankiw [2], the total change on consumption C_t (non-durables and services) with the assumption that real interest rate is not constant can be presented as follows:

$$\Delta \ln C_t = \mu + \lambda \Delta \ln Y_t + \phi r_t + \xi_t \,, \tag{2}$$

where $\Delta \ln C_t$ is the change of logarithm consumption spending and $\Delta \ln Y_t$ is the change of logarithm disposable income Y_t, r_t is the real interest rate, μ is the intercept, ξ_t is the random error, ϕ is the regression parameter for r_t. It is assumed that ξ_t is not correlated with the information from the period $t - 1$, but may be correlated with r_t and ΔY_t. Under LCH-PIH λ should be equal to zero.

Following Shea [21] the presence of myopia or liquidity constraints can be tested by the equation

$$\Delta \ln C_t = \mu + \lambda_1 (Pos_t) \Delta \ln Y_t + \lambda_2 (Neg_t) \Delta \ln Y_t + \phi r_t + \xi_t \,, \tag{3}$$

where Pos_t is a dummy variable equal to 1 for periods in which $\Delta \ln Y_t > 0$ and zero otherwise, and $Neg_t = 1 - Pos_t$, i.e. is equal to 1 when $\Delta \ln Y_t < 0$. The LCH-PIH implies that $\lambda_1 = \lambda_2 = 0$. Under myopia, λ_1 and λ_2 should be equal, and significantly larger than zero. Under liquidity constraints the condition $\lambda_1 > \lambda_2 > 0$ must be true at statistically significant level. The opposite case, when consumption is more sensitive to decrease rather to increase, i.e. $\lambda_1 < \lambda_2$, presents "opposite asymmetry".

Total consumption, TC_t, may be expressed as: $TC_t = C_t^{\eta_1} (CD_t)^{\eta_2}$, where C_t and CD_t denote correspondingly non-durable and durable expenditures and η_1, η_2 are positive constants. We suppose that the innovations to durable (v_t) and non-durable (ε_t) are proportional, i.e. $v_t / \eta_1 \varepsilon_t \equiv \rho$. Then, following Sarantis and Stewart [19], Gomes and Paz [10], and equations (2), (3), the total consumption can be estimated with the help of the following equations:

$$\Delta \ln TC_t = \mu + \lambda \Delta \ln Y_t + \phi r_t + \tau_t + \xi_1 \tau_{t-1} + \xi_2 \tau_{t-2} \tag{4}$$

$$\Delta \ln TC_t = \mu + \lambda_1 (Pos_t) \Delta \ln Y_t + \lambda_2 (Neg_t) \Delta \ln Y_t + \phi r_t + \tau_t + \xi_1 \tau_{t-1} + \xi_2 \tau_{t-2} \,, \tag{5}$$

where $\tau_t = (1 - \lambda)\eta_1 \varepsilon_t$, $\xi_1 = \rho \eta_2$ and $\xi_2 = A \rho \eta_2$ (A is a constant).

3.3 Results

For the estimation of λ we use the panel data approach [1] since it is not possible to realize the usual time series analysis due to very short time period: 12 years. We have annual data only for the period 1999 – 2010; earlier data for those countries are not available. As we have data for three countries for the period 1999 – 2010, we can use 36 observations in total. To determine the stationarity of variables, the empirical analysis starts from the panel unit root test. Namely, we apply the Levin-Lin-Chu test (Table 1), because this test imposes homogeneity on the unit root coefficient, while, for example, Im-Pesaran-Shin test does not. If panels are non-stationary, then any conclusion of the panel estimates will be invalid due to inconsistency and falseness. The test shows that the data are stationary in level I(0) for all variables.

Variable	Level		1st Difference		Process
	t-value	*P* > *t*	*t*-value	*P* > *t*	
Y	-1.600	0.0548	-1.669	0.0476	I(0)
	(-2.301)		(-3.882)		
TC	-1.689	0.0456	-6.288	0.0000	I(0)
	(-2.887)		(-8.077)		
C	-1.772	0.0382	-3.778	0.0001	I(0)
	(-2.810)		(-5.109)		
i	-2.076	0.0190	-2.881	0.0020	I(0)
	(-2.169)		(-2.985)		
r	-2.703	0.0034	-4.502	0.0000	I(0)
	(-2.818)		(-4.704)		

Table 1 Levin-Lin-Chu stationarity test

Note: In the analysis, Akaike criteria's automatic selection of lags was used; automatic Newey-West bandwidth selection method (with Bartlett kernel type) was used, p – statistic was calculated using normal distribution.

The results of the estimates of equations (2) and (4) are presented in Table 2. The first and the third column show the estimates for the total consumption, and the second and the forth show the estimations for consumption of non-durables and services. The OLS (ordinary least squares) and Arellano and Bond GMM (general method of moments) estimation techniques are used. Equations (4) and (5) have a MA(2) error process which requires a special care in choosing the instruments, namely the first two lags should be excluded from the estimations. The expanding GMM instruments – the real and nominal interest rates, change of consumption and disposable income - are lagged 2-3 years similarly to Sarantis and Stewart [19]. In order to choose between fixed effects (FE) and random effects (RE) model (in accordance with [23]) we applied the Hausman test (the results not presented). The test suggested that the RE approach is more appropriate. Although the OLS estimation is biased (see, for example [3]), we presented the OLS estimates for comparison with GMM estimates.

	TC OLS	*C* OLS	*TC* GMM	*C* GMM
λ	0.6719***	0.6219***	0.8115***	0.7365***
	(0.1586)	(0.1538)	(0.2843)	(0.2724)
J	-	-	6.3717	7.3904
Jp	-	-	[0.497]	[0.389]
R-squared	0.3911	0.3772	0.369	0.343

Table 2 Estimates of equations (2) and (4) in period 1999 – 2010

*Note: μ and ϕ included, not shown. The expanding GMM instruments are lagged 2-3 years. The test of restrictions is Sargan's test of overidentifying restrictions (H_0: instruments are valid) with J-statistic and p-value in square brackets with the chi-square distribution. Robust standard errors are in parenthesis. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.*

From Table 2 we see that OLS and GMM estimates are different, but this difference is not very great. More trustworthy estimates we got with the GMM method. So it can be asserted that the bulk of the Baltic consumers follow the "rule-of-thumb" behavior, they make 81% of the total consumption and 74% of the consumption of non-durables and services (Table 2). Only a small part of the consumption follows the PIH-LCD approach: 19% and 26% respectively. As it can be seen from the estimates, the difference between consumption of non-durables and services and total consumption is present, but it is not so big as to make the total consumption model inconsistent. The model of Sarantis and Stewart [19] with the allowance of durable component can be used in the first

instance for the countries, where the data for durability are not available. However, we must admit that the estimates of λ contain certain ambiguity, because we have very short time-series for trustworthy estimation.

Due to the above-mentioned estimates of λ the LCD-PIH is inconsistent for the Baltic countries. To find the possible reason for this the Shea's model (3) for consumption of non-durables and services and modified. Shea's model (5) for consumption with the durable component was used. OLS and GMM with the same instruments like in previous estimations were used and are presented in Table 3. The coefficient of positive change of disposable income λ_1 is positive and smaller than the coefficient of negative change for disposable income λ_2. It indicates the "opposite asymmetry": the aggregate consumption is more strongly correlated with the decrease of predictable income than increase. However, the estimates of λ_1 for consumption of non-durables and services become insignificant, weakening so the conclusion about the "opposite asymmetry". As the F-test resulted with $\lambda_1 \neq \lambda_2$, then the myopic behavior is rejected. The value of λ_2 is bigger than one: $\lambda_2 = 1.4684$ with the standard error 0.4158 for *TC* GMM and $\lambda_2 = 1.3975$ with the standard error 0.3931 for *C* GMM. These results are in contradiction with the rule that the elasticity of consumption with respect to disposable income should be less or equal to one. It should be mentioned that similar estimates for λ_2 are also presented by Shea [21] and for λ_1 (for Colombia) by Gomes and Paz [10] (moreover, for λ_2 their estimates are insignificant for all examined cases). However, the estimates, presented here, are just a little better: taking into account the standard error, it can be asserted that with a little probability the real value of λ_2 could be approximately equal 1, but Gomes and Paz and Shea estimated that the real values of λ_1 and λ_2 are firmly greater than 1. Similarly to [10] and [21] our estimates for λ_2 may be caused by poor instruments or too small data sample.

	***TC* OLS**	***C* OLS**	***TC* GMM**	***C* GMM**
λ_1	0.9540***	0.8363***	0.8319*	0.5121
	(0.2554)	(0.2320)	(0.4398)	(0.4293)
λ_2	1.1323***	0.9776***	1.4684***	1.3975***
	(0.2865)	(0.2602)	(0.4158)	(0.3931)
F-test	27.4128	25.1290	17.4526	13.4610
Fp	[0.000]	[0.000]	[0.000]	[0.000]
J	-	-	9.3252	7.7907
Jp	-	-	[0.230]	[0.351]
R-squared	0.6463	0.6262	0.608	0.5635

Table 3 Estimates of equations (3) and (5) in period 1999 – 2010

*Note: μ and ϕ included, not shown. The expanding GMM instruments are lagged 2-3 years. F-test: (H_0: $\lambda_1 = \lambda_2$). The test of restrictions is Sargan's test of overidentifying restrictions (H_0: instruments are valid) with J-statistic and p-value in square brackets with the chi-square distribution. Robust standard errors are in parenthesis, ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.*

4 Conclusion

Using the panel data analysis it can be concluded that PIH-LCD is inconsistent with aggregated annual data from the period 1999 – 2010 for the Baltic States: Estonia, Latvia and Lithuania. We compared the estimates of the share of "rule-of-thumb" consumption λ for the consumption of non-durables and services with the estimates of λ for total consumption. We established that the share of "rule-of-thumb" consumption is very essential in the Baltic States and it is 81% for total consumption and 74% for consumption without the durable component. As the difference between above-mentioned estimates is not very great, then it is possible to use the data of total consumption in the empirical research in the case where the durability data are not available. Additionally it must be admitted that the estimates of λ contain certain ambiguity, because of the very short time period for trustworthy estimation. However, the truthfulness of our estimates is supported by the above-mentioned results of Kukk et al. [14], who also established that the fraction of "rule of thumb" consumption was approximately 75% in the period 2002 – 2007 for Estonia.

Analysis of the asymmetric effects shows that the most probable reason of the rejection of PIH-LCD in the Baltic countries is the "opposite" asymmetry. Both myopia and liquidity constraint are inconsistent with our results. Under myopia, consumption should respond symmetrically to the changes in disposable income, but under liquidity constraints the consumption should be more sensitive to the income increase rather than to decrease. There was a loan boom in these countries in the period 1999 – 2007 before recession. It was very popular among the households to borrow for home mortgages and car leasing. This indicates that the liquidity constraint is not a very probable reason for the rejection of PIH-LCD. The last assertion is also confirmed by the data of

total consumption were the durable component is presented. The consumption for non-durables and services shows that the sign of positive change of disposable income are insignificant and only for the OLS estimation, what is biased, shows the presence of "opposite asymmetry". Shea [21] argues that under myopia non-durables consumption may be also more sensitive to income declines rather to increases. However, the data of total consumption has not confirmed this assertion for the Baltic States

Acknowledgements

This research was supported by the Estonian Science Foundation grant 8627.

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