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Article

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Dynamics of Household Savings and Consumption in the Euro Area

*Mária BOHDALOVÁ – Martin PAŽICKÝ**

Abstract

In this paper, we are looking for an answer to the long-standing question how the households tend to distribute their income between consumption and savings. We have decided to analyse householder behaviour in the euro area using quarterly data for euro area countries over the time horizon 2000 – 2018 to estimate marginal propensity to consume, marginal propensity to save, and to compare the saving dynamics with monetary policy and country wealth. We first considered panel regression model estimated using Arellano-Bond estimator for aggregate euro area level. This model was altered by an autoregressive time series model applying the Newey-West standard errors for individual countries. The results show that the Global Financial Crisis was an important break-even in saving habits of European households. Finally, we have identified four country groups based on the relationship between the economic performance of euro area countries and saving habits of households.

Keywords: *marginal propensity to consume and to save, monetary policy, country's wealth*

JEL Classification: E52, E58, C22, C58

Introduction

The economic outlook for a country is expected to significantly affect households' consumption or savings. It has long been assumed that "the poor and middle class spend a higher percentage of their income on goods than do the rich, …" (Greenhouse, 1992). This intuitive observation has recently been subject to changes under the influence of the dynamics brought about by the Global Financial Crisis in 2007. The topic is particularly interesting for the euro area,

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because it is a relatively young union of countries with diverse cultures, history, but also with different social characteristics and a different degree of economic development. The euro area as very heterogeneous alignment is relatively dynamic (i.e., new countries are gradually joining the euro area). Member States' monetary policy has been entrusted to the ECB and the countries have adopted the euro common currency. Fiscal policy was left in the hands of individual Member States, which might contribute to the inequalities between countries. Moreover, the Global Financial Crisis has triggered deep structural changes, which has led to a new setup in traditional chains in the economy. Such changes are assumed to have lasting consequences affecting many areas of the economy.

Another phenomenon as the introduction of unconventional monetary instruments (i.e., the extremely low interest rates influenced by the forward guidance and Asset Purchase Programme – APP) has led to fundamental changes in the economy. The results include inflated balance sheet of the ECB, extremely low net interest margins in the banking sector, flat Phillips curve and still unstable rate of inflation.[1] Dovish monetary policy, on the other hand, has contributed to the long-lasting and robust economic growth in the euro area over the recent years. For these reasons, it is extremely important to monitor the behaviour of households in the event of an increase in their marginal income.

We are convinced that the low referential interest rates affect interest rates on borrowing and consequently household consumption and savings. It is rational to assume that the habits of the population related to consumption and savings have changed fundamentally from the Global Financial Crisis. The aim of this paper is therefore to analyse the impact of current economic conditions on consumers behaviour from aggregated point of view for all European countries and for each country separately. Analyses given in this paper are important for setting the monetary policy of the ECB and the central banks of euro area countries that do not use euro as their own currency.

Evidence of the legitimacy of this polemic is the increasing interest of authors who have dealt with this issue. One of the studies with a big impact in this area was carried out by Jensen and Johannesen (2017). They document that banks exposed to the financial crisis reduced their lending relative to nonexposed banks, which in turn caused a significant decrease in the borrowing and spending of their customers. Borrowing remained reduced in the post-crisis period and spending foregone during the crisis was not recovered. Their study was carried

[1] For the assessment of the current situation in the banking sector in the euro area, refer to the speech of Mario Draghi (2019b) at the conference 'The ECB and Its Watchers XX', Frankfurt am Main, 27 March 2019. For assessing the Phillips curve in the euro area, refer to Remarks by Peter Praet, at the conference in Cerlce de Lorraine, Brussels, 1 February 2018 (available at the Bank for International Settlement).

out on dataset that contains observations for all accounts in Danish banks as well as comprehensive information about individual account holders and banks. Jaramillo and Chailloux (2015) investigated the consumption drivers by estimating a consumption function for a panel of quarterly data for 14 advanced economies spanning from 1998 to 2012, using an error correction specification. They found a significant long-run relation between consumption and the different components of income and wealth.

Looking at research studies conducted solely in the euro area economy, the study of Jappelli and Pistaferri (2014) is of particular interest to our analysis. They analysed the responses to survey questions in the 2010 Italian Survey of Household Income and Wealth that asked consumers how much of an unexpected transitory income change they would consume. Their estimate of marginal propensity to consume is 48 percent on average. They also document substantial heterogeneity in the distribution, as households with low cash-on-hand exhibit a much higher marginal propensity to consume than affluent households. Relatively new evidence is provided by the study of Dossche et al. (2018), who attempt to identify the relative importance of different factors driving consumption, such as the recovery in the labour market, accommodative monetary policy, the drop in oil prices during years 2014 – 2015, increase in asset prices, the easing of credit conditions and deleveraging. As the fall in consumption from 2008 to 2013 was very heterogeneous across countries, their study also sheds light on the extent to which the current expansion has actually led to a net increase in consumption over the past decade. This is relevant because private consumption is also a prime indicator of the economic well-being of households. Authors find that consumption in the last decades has been driven mainly by the recovery in the labour market, even though unemployment in some countries and for some groups of workers remains higher than before 2008.

Based on the studied literature, we believe that the crucial factors influencing consumption and savings of households are their disposable income together with borrowing rates. At the same time, we are convinced that the dynamics of consumption and savings have changed after the Global Financial Crisis in the euro area. In this context, we are addressing our first research question as follows:

"*How has the consumption/savings of euro area households changed after the Global Financial Crisis?*

As we have already indicated, we expect borrowing rates to have a significant impact on the consumption and savings of euro area households. However, at times of quantitative easing by the ECB supported by the Asset Purchase Programme (APP), interest rates can play an even more important role. The undisputed fact is that the ECB's monetary policy after the Global Financial Crisis has

remained extremely accommodative, which could have stimulated households in some countries to borrow more and thus increase their consumption. At the same time, asset purchases could increase inequalities within the euro area. Number of studies evaluating the impacts of the quantitative easing of the ECB have been conducted. We focus on the more up-to-date studies assessing the impacts on consumption and savings. One of the latest analyses is given by Tzamourani (2019) from Deutsche Bundesbank, who estimated the "unhedged interest rate exposure" of euro area households. Tzamourani (2019) found that the median household in the euro area has a positive interest rate exposure, indicating that it would gain, in the first instance, from an increase in the interest rate, all other things remaining constant. Households in the lower end of the net wealth and income distribution, younger households and mortgagors have negative interest rate exposure and would lose from an increase in interest rates. Ampudia et al. (2018) investigated the effects of monetary policy on euro area households. They found that the indirect income channel has an overwhelming importance, especially for households holding few or no liquid assets. They also found evidence that the indirect income channel is therefore also a substantial driver of changes in consumption at the aggregate level. Domanski, Scatigna and Zabai (2016) used household survey data to analyse the possible drivers of wealth inequality and the potential effect of monetary policy through its impact on interest rates and asset prices. They claimed that while low interest rates and rising bond prices had a negligible impact on wealth inequality, rising equity prices were a key driver of inequality.

Summarized literature leads us to pose a second research question:

"How does the real interest rate affect the consumption in the euro area?"

Finally, our intention in this study is to address the wealth of euro area households and its links to consumption and savings. A great portion of economic literature deals with wealth of countries and wealth inequalities. Navarro and Flores de Frutos (2015) claim in their paper that the ultimate effect of wealth on consumption is a combination of two effects: the impact of interest shock on wealth and the impact of wealth on consumption. Their results for the Spanish economy indicate the relative importance of each component of wealth. When comparing effects on the consumption of housing wealth versus financial wealth, it is important to distinguish whether there exist two specific shocks (one for each type of wealth) or if there is only one external shock affecting both variables (Navarro and Flores de Frutos, 2015). Decreasing marginal propensity to consume out of wealth across the wealth distribution for all net wealth components was found by Arrondel, Lamarche and Savignac (2015). They assert that marginal propensity to consume out of financial assets tends to be higher

compared to the effect of housing assets, except in the top of the wealth distribution. As a consequence, the consumption is less sensitive to the value of the main residence than to other housing assets. Sousa (2009) contributed to the discussion on wealth dynamics of euro area in several aspects. His paper deals not only with financial wealth and housing wealth but also with consumption growth, which exhibits strong persistence and responds sluggishly to shocks.

After screening the literature, we believe that household´s savings in the euro area are closely linked to their wealth. We assume that cultural and geographic predispositions of the individual Member States define the relations between country's wealth and saving habits of households. Based on these assumptions, we put the last research question as follows:

"How does the country's wealth influence the saving habits of euro area households?"

Our analysis contributes to existing literature with several aspects. First and foremost, we estimate the effects at both aggregated and individual country level. Second, we identify not only the effects caused by the change in the euro area, but also the structural changes caused by the Global Financial Crisis. Third, we look at the effects on the marginal propensity to consume and the marginal propensity to save, taking into account accommodative monetary policy through controlling the low interest rate after the crisis. Fourth, we address the role of country wealth in consuming and saving. Fifth, we define the relation between the economic performance of euro area countries and saving habits of households.

The rest of this paper is organized as follows. Section 1 describes data selection and preparation process. Section 2 specifies the model used in the empirical analysis. We present our main results in Section 3. Finally, last section concludes our results.

1. Data

Given the fact that the process of euro area formation is a dynamic process, proper selection of our dataset became the most crucial phase of our study.[2] We needed to take into account several facts. First, the euro area is a heterogeneous group in the sense that individual European countries have been joining the group over time. Second, the initial period of euro area formation is characterized by high degree of data variability. Last, the whole economy was severely hit by the Global Financial Crisis in 2007, which led to structural changes across

[2] Issues with data construction in the euro area are extensively discussed in paper of Beyer, Doornik and Hendry (2002).

the economy. We should take into account all these drawbacks for a correct estimate of the marginal propensity to consumption in the euro area.

We constructed a panel of data consisting of household's consumption expenditure per capita (variable *C*),[3] gross disposable income per capita (variable *GDI*),[4] savings (variable *S*), interest rate (variable *IR*) and a wealth indicator (variable *W*) for each current euro area country (i.e., 19 countries in total). Savings are approximated by the index of households and NPISH gross savings in individual countries. We used a long-term interest rate referred to government bonds of each country maturing in ten years (variable *IR*) denominated in euro currency. Data was downloaded from the ECB Statistical Data Warehouse (SDW). As interest rates are expressed in their nominal values, the time series in each country were deflated by the HICP, thus obtaining quarterly real interest rates in each country. Wealth indicator captures the number of people (divided by population), who are above the risk of poverty threshold based on purchasing power standards. The threshold represents 60 percent of median equivalised income. A higher value of our indicator means better living conditions in the country. All used variables are seasonally adjusted. The source of the data is Eurostat, with the exception of interest rates obtained from the ECB SDW.

We have collected quarterly data spanning from the first quarter of 2000 until the third quarter of 2018, which yields 75 observations for each variable of each country.[5] Due to unavailability of older data in some countries and to keep data consistency for all countries, we excluded the first 10 years of euro area existence from the analysis. For a deeper understanding of the data and an overview of their basic statistical characteristics, we refer to Table 1.

In addition to the mentioned economic variables, we have created two dummy variables, which partly help us cope with the heterogeneous nature of the group and the structural break caused by the Global Financial Crisis. Dummy variable EA_i is equal to one if a *i*-th country was in a given quarter a member of euro area countries and zero otherwise. The variable helps us clarify the change in consumption dynamics of countries before and after joining the euro area.

[3] Households consumption expenditure per capital consists of total consumption expenditure of households (S.14) and non-profit institution serving households (NPISH – S.15), which is a standardly used aggregate. Time series are expressed as chain linked volumes (2005) in million euro divided by the population of the country in a given year.

[4] Gross disposable income per capita is calculated as gross disposable income of households (S.14) and NPISH (S.15) divided by the population of the country in a given year.

[5] Usually we managed to collect data for all time periods in all countries. The break in the data occurs rarely. It usually happens in the third quarter of 2018, when the data might not have yet been released at the time of conducting the analysis. Exceptions are data on savings in Malta. As data are not available in Eurostat, we could not include them in our study. Such an issue with data homogeneity must be treated by carefully selected estimation methods.

Obviously, the countries that were members of the group before year 2000 have the value of the EA_i variable equal to one in each quarter (as none of the countries left the euro area yet). We also created a dummy variable *GFC* representing the structural changes triggered by the Global Financial Crisis. As a break-even date, we use 4th quarter 2008, when the Lehman Brothers collapsed (15 September 2008). We are aware that roots of Lehman Brother collapse stem from many months before, but we aim to address the structural changes in the economy. Since September 15, 2008 the contagion spilled effect over other countries, which led to the structural changes in the economies around the globe. From this reason, we are convinced that the 4-th quarter of 2008 is an appropriate break--even point. The *GFC* variable is therefore equal to one from that quarter going further. As a matter of fact, the profile of *GFC* variable is identical in each country, which allows us to assess three separate cases (i.e., three separate regressions) – one if *GFC* is equal to 0, one if *GFC* is equal to 1 and one for all period without differentiating.

T a b l e 1

Data Description

	C	***GDI***	***IR***	***W***	***S***
Number of observations	1,444	1,425	1,444	1,204	1,350
Unit	(EUR/capita)	(EUR/capita)	(%)	(num of people/capita)	(index)
Average	3,077.41	3,800.44	4.78	0.44	440.53
Standard Deviation	1,356.24	1,716.01	3.12	0.82	388.02
Max	6,253.54	9,169.29	26.88	3.59	2,023.14
Min	591.01	568.08	–0.09	0.01	–242.22
Skewness	0.0129	0.3264	1.3462	2.5116	1.1435
Kurtosis	2.2769	3.2196	7.1481	8.2124	4.9256

Source: Own calculations based on data retrieved from Eurostat and Statistical Data Warehouse of the ECB.

2. Model Specification

The Keynesian theory (Keynes, 1936) assumes that an increase in production leads to a higher income of consumers, who are then stimulated to consume more. The proportion of marginal disposable income (i.e. income after taxes and transfers), which individuals spend on consuming goods and services, is known as a marginal propensity to consume (*mpc*). It can be written as follows:

$$mpc = \frac{\Delta C}{\Delta GDI} \tag{1}$$

where

ΔC – change in consumption,

ΔGDI – denotes gross disposable income.

In a similar way, we can easily express the marginal propensity to save (*mps*) by replacing consumption *C* for savings *S*.

Consumers can decide how they distribute the marginal increase in their disposable income. In principle, they can spend additional income on consuming goods and services or on savings. In theory, the sum of *mpc* and *mps* should therefore be equal to 1, which is practically almost impossible. This is caused due to several factors, but for all, we can mention borrowings (as an alternative source of income) and investments (as an alternative use of additional income). Both factors affect the dynamics of consumer revenue and expenditure.

As we have already discussed, our dataset is heterogeneous and unbalanced. A dynamic panel of data with such characteristics entails several difficulties. Economic relationships usually involve a dynamic adjustment process, which is in time series regression models solved by including the lagged values of the covariates, the dependent variable, or both in the model specification.[6] However, in the panel data analysis with a relatively small number of time periods and a large number of groups, there are often inference problems (e.g., small sample bias in coefficient estimation or hypothesis testing). Due to the various issues with endogeneity, frequently used least square based inference methods are inconsistent and biased. Hence, it has become a standard practice to use either Instrumental Variables (IV) or Generalized Method of Moments (GMM), which produce consistent parameter estimates. In particular GMM estimation has become extensively popular in empirical research due to its potential to provide asymptotically efficient inference, employing a minimal set of statistical assumptions. Taking into account this plausible inference, we apply the estimator proposed by Arellano and Bond (1991).[7]

Arellano and Bond (1991) derived a consistent GMM estimator for the parameters of linear dynamic panel data models. Such models include *p* lags of the dependent variable as covariates and contain unobserved panel effects (both fixed and random). The estimator of Arellano and Bond (1991) is suitable for datasets with many groups and few periods. The estimation method requires no autocorrelation in the idiosyncratic error term. We have applied Arellano and Bond (1991) method to estimate the following relationship:

$$logC_{it} = \alpha_i + \beta_1 logC_{i(t-1)} + \beta_2 logGDI_{it} + \beta_3 IR_{it} + \beta_4 W_{it} + \beta_5 EA_{it} + \varepsilon_{it} \qquad (2)$$

[6] Besley and Case (2000) carried out the empirical analysis showing that the policy variables are most likely to be not strictly exogenous but simultaneously related with the outcome variable of interest.

[7] For a detailed overview of the method refer to the original study of Arellano and Bond (1991) or Baltagi (2013) or Baltagi, Feng and Kao (2016).

where consumption C_{it} is a dependent variable for individual country *i* at time *t* and $C_{i(t-1)}$ is its value in the previous period. Term GDI_{it} denotes gross disposable income; IR_{it} represents interest rate and W_{it} is a value of wealth indicator for individual country *i* at time *t*. Dummy variable EA_{it} indicates whether a specific country *i* was a member of the euro area at time *t*. Time-invariant unobservable (i.e. constant) is denoted by α_i and ε_{it} stands for a time-varying unobservable. Estimation coefficients are denoted as β_1, β_2, β_3, β_4 and β_5. We estimated the relationship denoted by equation 2 for three separate cases (i.e., we processed three separated estimation procedures):

- for the period before the Global Financial Crisis (*GFF* = 0),
- for the period after the Global Financial Crisis (*GFC* = 1).
- for the whole analysed period.

The parameter of interest, which should reflect the marginal propensity to consume is β_2. It is fair to admit that the coefficient estimate does not in itself tell us anything about the reliability of the estimate. In order to verify our results, we estimate an alternative model using savings *S* instead of consumption *C*. The estimated equation has the following form:

$$S_{it} = \alpha_i + \beta_1 S_{i(t-1)} + \beta_2 GDI_{it} + \beta_3 IR_{it} + \beta_4 W_{it} + \beta_5 EA_{it} + \varepsilon_{it} \qquad (3)$$

Since variable *S* is an index, we do not transform the values into natural logarithm. Coefficient β_2 in equation (3) represents marginal propensity to save. The marginal income is in theory distributed between consumption and savings. Accepting this assumption, the sum of marginal propensity to consume and marginal propensity to save should be approximately equal to one. In our case, it means that the sum of coefficients β_2 from equations (2) and (3) should be approximately one. In such a way, we can easily verify our results. After estimating the models, it is necessary to proceed by testing for over-identifying restrictions. For this purpose, we used Sargan test proposed by Arellano and Bond (1991).

To compare and to verify the results coming from the dynamic panel data models, we designed the autoregressive time series model separately for each country of the euro area. Augmented Dickey-Fuller (ADF) test for unit root was used to verify the stationarity. The dynamic testing procedure using univariate and multivariate hypothesis tests of Enders (2010) was applied. A commonly used remedy to tackle the non-stationarity issue is to transform the level of variables into their first difference. Since all explanatory variables are integrated *I*(1), we can use the variables in levels. We have overcome the issue of possible autocorrelation by applying the Newey-West standard errors for coefficients

estimated by OLS regression. In addition, the Newey-West standard errors allow for heteroscedasticity in error structure.[8] The estimated regression for each country has the following form:

$$S_t = \alpha_0 + \beta_1 S_{(t-1)} + \beta_2 GDI_t + \beta_3 IR_t + \varepsilon_t \quad (4)$$

where α_0 is a constant and ε_t represents an error term. The autoregressive term is $S_{(t-1)}$. Coefficient β_2 represents a marginal propensity to save for individual countries. We can compare the savings habits of households in each euro area country when we obtain the coefficient for each individual country. Our results are then easily comparable with official saving statistics in European countries. We also obtain higher information granularity in terms of interest rates consequences for savings.

3. Results

This section presents the results of our models. First, we show the results of Arellano-Bond estimation given by equation (2). The results are available in Table 2, where we present the estimation coefficients of three separate regressions. The dependent variable is always *log C* variable. The results show that the lag value of the dependent variable is always highly significant and explains the vast majority of the current value dynamics. Such an empirical evidence is fully in line with our expectations and Arellano-Bond estimator is developed to take this endogeneity into account.

We focused on estimating *log GDI* coefficient, which represents the marginal propensity to consume. Since gross disposable income data (and also consumption data) has been transformed into the natural logarithm, it is necessary to convert the coefficient back to a standard scale in order to determine the marginal propensity to consume (the converted value representing the *mpc* is shown at the bottom of the table where we also report the *mps* calculated manually as 1 – *mpc*). The results show that the euro area countries have spent much more on consumption in the period preceding the Global Financial Crisis than in the period afterward. The negative value of *mpc* coefficient suggests that an average household in the euro area used to finance excess consumption by alternative sources of income (such as loans) before the crisis. Household habits to over-spend (and simultaneously to over-borrow) have reversed after the crisis. The structural changes after the Global Financial Crisis have apparently slowed the excessive households demand. The value of the estimated *mpc* coefficient (as well as of the

[8] For a detailed overview of the method and its advantages refer to Newey and West (1987).

mps coefficient) over the entire horizon is somewhere in the middle of the values measured in both periods individually, which to some extent confirms the accuracy of our estimates.

T a b l e 2

Consumption Estimation Using Arellano-Bond Estimator

Dependent variable:	*log C*		
	total period	pre-crisis (*GFC* = 0)	post-crisis (*GFC* = 1)
Independent variables:			
L.log C	0.9519*** *(0.0000)*	0.9055*** *(0.0000)*	0.8502*** *(0.0000)*
log GDI	–0.0324*** *(0.0000)*	0.0048 *(0.7830)*	–0.0612*** *(0.0000)*
IR	–0.0027*** *(0.0000)*	–0.0032*** *(0.0080)*	–0.0020*** *(0.0000)*
W	–0.0007 *(0.9120)*	–0.0359 *(0.1770)*	–0.0420*** *(0.0040)*
EA	0.0033 *(0.1040)*	0.0144*** *(0.0050)*	0.0112*** *(0.0020)*
Constant	0.6597*** *(0.0000)*	0.7407*** *(0.0000)*	0.7026*** *(0.0000)*
num of obs	1,151	448	665
num of groups	19	19	19
num of instruments	1,100	377	498
Wald chi2	19,969.1	4,963.5	10,265.9
Prob > chi2	*(0.0000)*	*(0.0000)*	*(0.0000)*
group variable	country	country	country
time variable	date	date	date
mpc	**0.9681**	**1.0048**	**0.9406**
Mps	**0.0319**	**–0.0048**	**0.0594**

Note: Standard errors are derived from asymptotic theory using the conventionally derived variance estimator for GMM estimation. The p-values are displayed in parentheses. Significance: * < 0.1; ** < 0.05; *** < 0.01

Source: Own calculations based on data retrieved from Eurostat and Statistical Data Warehouse of the ECB.

In terms of the interest rate estimate (i.e., *IR* variable), we can conclude that an increase in the interest rate reduces the consumption of households. Such an intuitive result is consistent across all observed periods. However, we see a somewhat greater economic impact of interest rates before the Global Financial Crisis, which might be caused by the application of unconventional monetary instruments in the post-crisis period. Our results confirm the empirical findings of several studies comparing the impacts of monetary policy before the Global Financial Crisis and afterwards.[9]

[9] For a detailed comparison of the efficiency of unconventional monetary instruments and the traditionally used interest rate in the euro area, refer to Peersman (2011), who used the SVAR model. For a more recent evidence from the euro area, refer to Pažický (2018) or Pažický (2019).

The estimate of the coefficient *W* is very important for assessing the implications of country's wealth for household's consumption spending. The negative coefficient across periods indicates that the richer the euro area country, the less of the marginal income of households is consumed. In other words, the richer the country, the less need for households to use marginal income to cover their consumption. Rich country households may prefer to use marginal disposable income to save and invest. Finally, using a dummy variable EA, we can observe that euro area membership and a single European market improve countries' competitiveness, leading to an increase in household's consumption.

Our results presented in Table 2 have been verified by an alternative specification using the same method and the same explanatory variables. However, we inspected the impact of individual variables on the savings of households in the euro area instead of their consumption. The dependent variable is the variable *S*, which represents the savings index. Again, we compare the interactions for the three cases.

The results are summarized in Table 3.

T a b l e 3

Savings Estimation Using Arellano-Bond Estimator

Dependent variable:	*S*		
	total period	pre-crisis (*GFC* = 0)	post-crisis (*GFC* = 1)
Independent variables:			
L.S	0.7821*** *(0.0000)*	0.3914*** *(0.0000)*	0.6322*** *(0.0000)*
GDI	0.0576*** *(0.0000)*	0.1189*** *(0.0000)*	0.1120*** *(0.0000)*
IR	1.5683 *(0.1130)*	–2.6268 *(0.5950)*	4.7869*** *(0.0000)*
W	–24.5876 *(0.4820)*	–322.7110*** *(0.0010)*	248.9254*** *(0.0020)*
EA	–24.7906*** *(0.0070)*	–54.6477** *(0.0140)*	–24.3731* *(0.0990)*
Constant	–101.5120*** *(0.0010)*	6.3066 *(0.9080)*	–375.013*** *(0.0000)*
num of obs num of groups num of instruments	1,098 18 1,003	432 18 360	630 18 477
Wald chi2 Prob > chi2	3,009.79 *(0.0000)*	279.13 *(0.0000)*	1,015.34 *(0.0000)*
group variable	country	country	country

Note: Standard errors are derived from asymptotic theory using the conventionally derived variance estimator for GMM estimation. The estimations have 18 groups because savings data for Malta did not manage to be collected. The p-values are displayed in parentheses. Significance: * < 0.1; ** < 0.05; *** < 0.01

Source: Own calculations based on data retrieved from Eurostat and Statistical Data Warehouse of the ECB.

Since the savings are expressed through the index, it was not necessary to convert the data to a logarithmic scale. Therefore, the *mps* value is directly observable from the estimated *GDI* coefficient without conversion. As can be seen, the value of the estimated *GDI* coefficient is reasonable in all three regressions, since their sums with *mpc* estimates from Table 2 are always close to the value of one. In particular, the sum is very close to one for the whole period. In individual sub-periods, a slightly greater deviation from the value of one is observed, due to the fact that other factors such as borrowing and investment interfere with the consumer dynamics. Despite the small deviations, alternative estimates confirmed that our results are acceptable.

In relation to the interest rate *IR*, we can see that the coefficient is only significant after the Global Financial Crisis. The positive value of the coefficient suggests that higher interest rates encourage households to save more. Although the explanatory variable *IR* is the interest rate on borrowing (not the interest rate on saving), we assume that both interest rates are somewhat correlated. We know that the dovish monetary policy of the ECB after the Global Financial Crisis, supported by its Asset Purchase Program (APP), has led to an unprecedented decline in all interest rates. In this context, the positive value of the coefficient can be interpreted as a decrease in the saving index *S* of the average euro area household in the post-crisis period, as interest rates gradually declined. The households were not incentivised to save.

The results of the coefficient *W* show that as country's wealth increases, the euro area households tend to save more after the Global Financial Crisis than they used to in the previous period. Such results indicate that the household's awareness of saving importance has substantially improved. Households seem to have learned to put aside for worse times. It is important that integration into the euro area has not contributed to improving the awareness of the importance of savings. The break-even point in awareness was the Global Financial Crisis. This statement is confirmed by the *EA* coefficient, which is negative in each subperiod, although its economic importance has decreased in the post-crisis period. This is because the second period coincides with the period when most countries were already in the euro area.

We verified the over-identifying restrictions by applying the Sargan test, which tests the null hypothesis that over-identifying restrictions are valid against the alternative. The null hypothesis was accepted at least at 1 percent confidence level after each regression, which allows us to conclude that our regressions are not over-identified and the results presented in Table 2 and Table 3 are valid.

In what follows, we present the results of autoregression time series models using Newey-West standard errors for each euro area country separately, as

defined by equation (4). We first applied the ADF test for unit root to decide on stationarity and order of integration. Since we found that all the explanatory variables are integrated *I* (1), we use the data in levels. Dependent variable is always the saving index *S*. Since we used an index, there was no need to logarithmically transform the data, which allowed us to define *mps* immediately from the estimate of *GDI*. For convenience, we show *mps* coefficients in the last column of Table 4.

T a b l e 4

Savings Estimations Using Autoregressive Models for Euro are Countries

	L.S	***GDI***	***IR***	***constant***	***obs***	***F stat***	***mps***
AT	0.5495*** *(0.0000)*	0.1304*** *(0.0000)*	31.5705*** *(0.0000)*	–468.2842*** *(0.0030)*	74	69.02 *(0.0000)*	0.1304
BE	0.6575*** *(0.0000)*	0.0716* *(0.0010)*	19.8914*** *(0.0000)*	–185.1791* *(0.0860)*	74	54.94 *(0.0000)*	0.0716
CY	0.9856*** *(0.0000)*	–0.0134 *(0.3550)*	–3.2368 *(0.3590)*	64.2767 *(0.3170)*	74	533.61 *(0.0000)*	–0.0134
DE	0.5730*** *(0.0000)*	0.1253*** *(0.0000)*	8.9827** *(0.0240)*	–300.5663*** *(0.0010)*	74	2 135.24 *(0.0000)*	0.1253
EE	0.8602*** *(0.0000)*	0.0522* *(0.0610)*	5.1280 *(0.1730)*	–88.1155** *(0.0900)*	74	1 978.23 *(0.0000)*	0.0522
EL	0.7346*** *(0.0000)*	–0.0593* *(0.0510)*	–3.7932** *(0.0320)*	–137.6138 *(0.1120)*	74	53.83 *(0.0000)*	–0.0593
ES	0.7300*** *(0.0000)*	0.0404 *(0.1560)*	8.6875 *(0.1380)*	–94.2162 *(0.3930)*	74	45.21 *(0.0000)*	0.0404
FI	0.1426 *(0.3600)*	0.1216*** *(0.0020)*	34.6266** *(0.0110)*	–385.8021* *(0.0560)*	74	11.83 *(0.0000)*	0.1216
FR	0.4697*** *(0.0000)*	0.1304*** *(0.0000)*	14.5988*** *(0.0010)*	–310.0128*** *(0.0020)*	74	163.37 *(0.0000)*	0.1304
IE	0.6147*** *(0.0000)*	0.0935*** *(0.0010)*	4.0478 *(0.4060)*	–290.3940** *(0.0160)*	74	124.42 *(0.0000)*	0.0935
IT	0.8168*** *(0.0000)*	0.0009 *(0.9620)*	6.7471** *(0.0200)*	69.8303 *(0.4940)*	74	104.55 *(0.0000)*	0.0009
LT	0.8207*** *(0.0000)*	0.0058 *(0.4590)*	1.9007 *(0.1360)*	–15.6049 *(0.3870)*	74	100.71 *(0.0000)*	0.0058
LU	0.5353*** *(0.0000)*	0.1706*** *(0.0000)*	8.1616 *(0.1050)*	–670.9042*** *(0.0000)*	74	930.72 *(0.0000)*	0.1706
LV	0.8241*** *(0.0000)*	0.0250 *(0.2000)*	1.8613 *(0.3220)*	–40.9572 *(0.2400)*	74	136.17 *(0.0000)*	0.0250
NL	0.5840*** *(0.0000)*	0.1516** *(0.0110)*	–2.3881 *(0.8630)*	–430.0022 *(0.1700)*	74	342.73 *(0.0000)*	0.1516
PT	0.2355** *(0.0400)*	–0.0230 *(0.3650)*	4.2180 *(0.1240)*	210.3784** *(0.0130)*	74	5.89 *(0.0012)*	–0.0230
SI	0.8620*** *(0.0000)*	0.0788 *(0.9510)*	–1.5687 *(0.1510)*	61.8374* *(0.0990)*	74	314.19 *(0.0000)*	0.0788
SK	0.8463 *(0.0000)****	0.0111* *(0.0860)*	–0.3714 *(0.4300)*	3.8991 *(0.5570)*	74	1 554.47 *(0.0000)*	0.0111

Note: The estimate is missing for Malta, for which we have not been able to collect savings data. The p-values are displayed in parentheses. Significance: * < 0.1; ** < 0.05; *** < 0.01; AT – Austria, BE – Belgium, CY – Cyprus, DE – Germany, EE – Estonia, EL – Greece, ES – Spain, FI – Finland, FR – France, IE – Ireland, IT – Italy, LT – Lithuania, LU – Luxembourg, LV – Latvia NL – Netherlands, PT – Portugal, SI – Slovenia, SK – Slovakia.

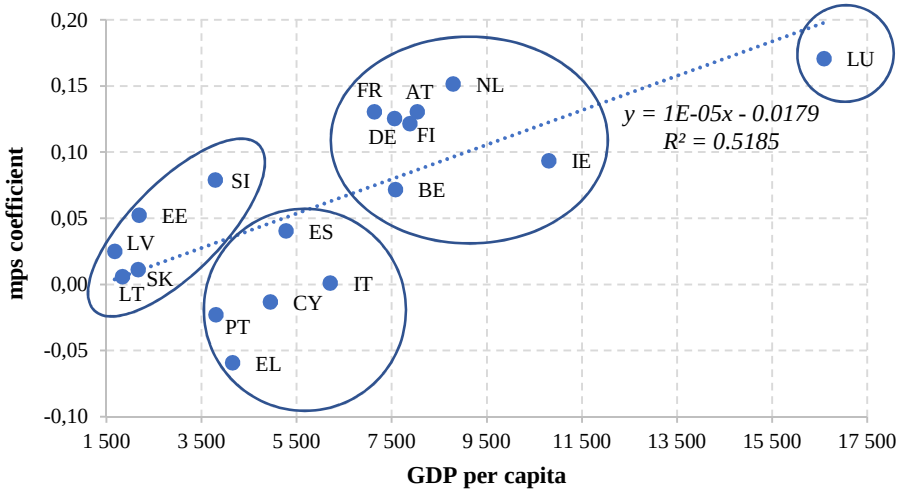
Source: Own calculations based on data retrieved from Eurostat and SDW of the ECB.

The results in Table 4 allow us to compare the estimates of *mps* coefficients across countries. For example, we see that the country with the highest propensity to save is Luxembourg, which at first glance appears to be a rational conclusion because the country is the richest.

Similarly, countries like Belgium, Germany and France seem to achieve relatively high *mps* coefficients. On the contrary, the country with the lowest tendency to save is Greece, which is again a rational conclusion. At the same time, we observe relatively low levels of the coefficient for southern European countries such as Portugal, Cyprus and Italy. Detecting these characteristics requires a deeper analysis of our *mps* estimates. We consider it beneficial to look at the development of *mps* in relation to the performance of the country's economy defined by GDP per capita. We analyse this relationship by means of Figure 1.

F i g u r e 1

Relation between *mps* Estimates and GDP per capita in the Euro Area



Note: mps coefficients are taken from our estimates presented in Table 4.

Source: Own calculations based on data retrieved from Eurostat and Statistical Data Warehouse of the ECB.

Figure 1 reveals two interesting facts. First, we can observe a clearly positive relationship between the economic performance and the marginal propensity to save (R^2 is 0.52). Such a statement is in line with our previous claim that as the country's wealth is growing, the consciousness of saving is also increasing, but only in the period after the Global Financial Crisis (see Table 3).

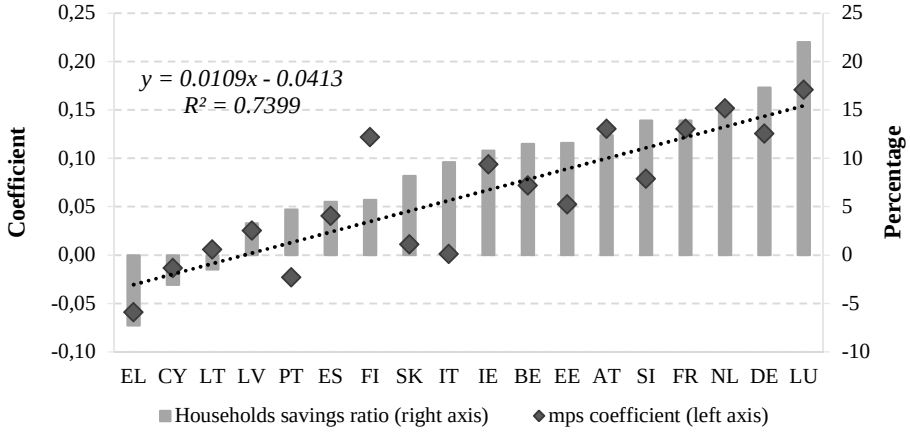
It follows from Figure 1 that the analysed countries can be divided into four groups. We can identify countries in group one as ones characterized by very low propensity to save and at the same time low GDP per capita. This group includes Portugal, Italy, Greece, Cyprus, and Spain, the countries of southern

Europe. They do not save due to their weak economies. The second group consists of countries that have approximately the same propensity to save as those in the previous group, but their GDP per capita is much lower. These are the countries with the weakest economic performance, and they are in the converging process to the economically developed members. Most of these countries are relatively new members of the euro area. Latvia, Lithuania, Slovakia, Estonia and Slovenia. The advanced countries of Europe create the third group. They are economically advanced countries with much higher values of GDP per capita, while the propensity to save in these countries is high as well. This result may be caused by households being aware of the importance of thinking about the future. This group includes Netherlands, Austria, France, Germany, Finland, Belgium and Ireland. Note that most countries in the group are very concentrated in Figure 1. Finally, we can identify the last group in which we can include only one country, Luxembourg, which cannot be included in any of the previous categories. The economic performance measured by GDP per capita is very high in Luxembourg. At the same time, the propensity to save is outstanding. Luxembourg can be taken as an example for many euro area countries. The above-mentioned splitting of the euro area confirms cultural characteristics (e.g., language, territorial and social aspects) in analysed euro area countries.

Finally, we compare our *mps* coefficients with the household's savings ratios (i.e., the amount of savings as a proportion to the GDP of the country) published in the ECB's Annual Report 2018 for all European countries (except for Malta). The comparison is available in graphical form in Figure 2.

F i g u r e 2

Comparison of *mps* Estimates with Saving Ratios



Note: mps coefficients are taken from our estimates presented in Table 4.

Source: Own calculations based on data retrieved from Eurostat, Statistical Data Warehouse of the ECB and the Annual Report 2018 of the ECB.

Figure 2 compares our *mps* estimates with the savings ratios of ECB. If the countries are ranked in ascending order according to the ECB's savings ratio, and then we include estimates of our *mps* coefficients to the countries, we can observe strong similarity between data. First, we agreed on a country whose households have the highest propensity to save (i.e., Luxembourg) and also a country whose households are the least prone to save (i.e., Greece). At the same time, we can observe a very similar trend for both categories (R^2 equal to 0.74 indicates a relatively good match). On the other hand, there are some deviations between our estimates and the ECB statistics. The most pronounced difference is in the case of Finland. This fact, however, does not compromise our estimates of *mps* coefficients, as the ECB statistics show the situation in 2018, while our estimates capture the value of the propensity to consume based on data over the past 18 years.

Conclusion

The attention in our analysis is paid to the dynamics of relationships between consumption, savings and wealth in euro area households. We are dealing with a few key factors such as the loan interest rates, which is now very low due to the accommodative policy of the ECB. At the same time, we control for the impacts of countries' membership in euro area on consumption and savings. The contribution of our study is the comparison of the dynamics before and after the Global Financial Crisis. We have estimated these relationships at the aggregate level for the entire euro area as well as for individual Member States separately.

To verify the dynamics at the aggregate level for the whole euro area, we applied the panel analysis using Arellano-Bond estimator. Our results suggest that the household's marginal propensity to consume in euro area is close to the value of one, which indicates that average European household lean towards consumption in the event of disposable income increase. Such a result is in a slight contradiction with the finding of Jappelli and Pistaferri (2014), who report *mpc* coefficient in Italy equal to 48 percent. However, they used survey analysis instead of econometric approached preferred in this paper. Similar to Jensen and Johannesen (2017), we have also identified a structural change in the behaviour of households after the Global Financial Crisis. Households have learned to save more and think more about the future compared to the pre-crisis period. The results of the analyses confirmed the assumption that an increase in the interest rate reduces household consumption. At the same time, we document a somewhat greater economic impact of interest rates before the Global Financial Crisis, which could be due to limited efficiency in conventional monetary

instruments such as interest rates. With regard to the country wealth, we have found that the richer the euro area country, the less households tend to use marginal income for consumption.

An alternative model specification, taking into account savings instead of consumption, confirmed our previous conclusions. In addition, the results suggest that interest rate cuts discourage households from saving. These results confirm the conclusions of Tzamourani (2019) or Ampudia et al. (2018). The accommodative monetary policy the ECB after the Global Financial Crisis has led to an unprecedented decline in all interest rates. Our results show that households in the post-crisis period did not have the incentive to save. Such a conclusion is in line with the finding of Jensen and Johannesen (2017).

Subsequently, we estimated the savings factors for each euro area Member State based on autoregression time series models using Newey-West standard errors. The results confirmed the different effects of changes in interest rates for household savings in individual countries. Similar inequalities were identified by Arrondel, Lamarche and Savignac (2015). At the same time, we have detected the existence of a certain pattern between the estimated *mps* coefficients and the economic performance of countries expressed by GDP per capita. We have recognized four fundamentally different groups of countries based on the relationship between economic performance and saving habits. Our identified groups reflect certain language, territorial and social characteristics of the countries. First group is characterised by poor economic performance and low savings. Second group achieves somewhat better economic results. Countries with stable economic performance and high savings are in the third group. Finally, Luxembourg, in its own group, achieves extraordinarily good economic results and at the same time Luxembourg households tend to save much more than all the remaining groups. The estimates of our *mps* coefficients are consistent with the saving rates published in Annual Report 2018 of the ECB (Draghi, 2019a).

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