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Interest rate and the financial and housing wealth effects in ten CEEC

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Abstract

This article provides new evidence on the long- and short-run relationship between private consumption, housing wealth, stock market wealth, income and interest rate in ten CEEC. In order to assess this relationship empirically, we use pooled mean group estimator of dynamic heterogeneous panel data. Several conclusions can be drawn from the analysis presented in this paper. Firstly, personal consumption, stock market wealth, housing wealth, income and interest rate form a long-run equilibrium relationship in the countries under analysis. Secondly, according to the estimates from the baseline model, the long-run housing wealth effect is positive and is higher than the financial wealth effect. We also find negative and significant interest rate effect on consumption. Our findings corroborate the results of earlier studies. In the short-run, only income is significant.

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1. Introduction

The wealth effect is a classic subject of theoretical and empirical macroeconomics. Due to the behaviour of net financial wealth and house prices in the last few years, there is renewed interest in the wealth effect, especially in the context of the recent 2007/2008 financial crisis.

The present article provides new evidence on the nexus between financial and real wealth and household consumption by also considering the role of the interest rate. Thus, the four main contributions to the existing literature are the following: (i) we focus on emerging countries in EU: 10 CEEC; (ii) we use a mix of macroeconomic cross-country comparisons and within-country regional comparisons; (iii) we dissociate housing from financial wealth; (iv) we assess the role of interest rate on per capita consumption.

Most of the empirical studies focus on the advanced economies. Extending the literature to the emerging markets, the main contribution of our paper, may be important as these economies are becoming a key engine of growth in the world economy. Given that emerging markets are becoming financially developed, their access to financial assets and the possibility of extracting equity from these assets has also risen, amplifying the potential macroeconomic impact of domestic asset price movements[1]. Studies of emerging markets are, unfortunately, surprisingly rare given that the level of consumption in these countries is absolutely comparable to that of developed countries (the focus of many studies). In addition, asset markets in emerging countries are much less liquid and have higher transaction costs, which could result in a smaller propensity to consume wealth than developed countries, even if the wealth increases in the examined period have been extremely large. This paper is also important for policy makers, since,

[1] Held *et al*. (1999) argue that financial integration is the "extent to which the prices of, and returns to, assets are equalized between different national financial markets". Adam *et al*. (2002) complete the affirmation by saying that "financial markets are integrated when the law of one price holds". Assets that produce the same cash flows should have identical returns, despite of the country of the issuer and of the asset owner. Financial openness also leads to international capital mobility (Edison *et al*. 2002). Also, a decrease in international transaction costs may increase the demand for (and supply of) assets and an increase in asset prices, leading to higher cross-border diversification.

in the last two decades, asset price booms and busts had more impact on the CEEC than on developed countries (Posedel and Vizek, 2009), this influencing consumption spending.

The remainder of the paper proceeds as follows: section 2 provides an overview of the prior literature in this field of study; section 3 describes the research data and the research methodology and presents the estimated results; section 4 concludes.

2. Overview of the related studies

Shocks to different forms of wealth could make consumption respond differently, for the following reasons. One reason is that housing has a "dual function" (Cheng and Fung, 2008) because it is both a consumption item and an asset. Hence, when house prices increase, the individual's wealth increases, this could also lead to increases in the cost of housing services (Cheng and Fung, 2008). Another reason, according to Pichette and Tremblay (2003), is that households may consider changes in housing wealth more permanent than those in financial wealth. Another motive - the "bequest reason" could be more important for the housing wealth, households being more hesitant to trade their house[2]. A positive relationship between consumption and housing wealth is supported by the fact that housing wealth can play a collateral role. When home prices increase, homeowners have more collateral[3] against which they can borrow. Cooper and Dynan (2016) present support upon the fact that countries with greater financial liberalization may justify the more significant housing wealth effects that describe the USA, the UK and Australia (Ahec Šonje *et al*. (2014), Barrell *et al*. (2015), Dreger and Reimers (2009), Ludwig and Sløk (2004)).

As we have already mentioned in the Introduction, empirical studies of the wealth effect on consumption were mostly made on advanced economies, revealing a positive and important long-run connection between wealth and consumption. Still, the literature on this topic lacks in studies made on emerging countries in general, and in the

[2] Households could not react to short-term evolutions in real estate prices because they would be in favour of having in possession appreciated assets up to their death.
[3] Cooper and Dynan (2016) argue that the strength of the financial sector and the financial openness are very important characteristics as the collateral channel to loan households' wealth effects will be sensitive to them.

post-transition European countries in particular. The first author to study only the financial effect in 16 emerging economies was Funke (2004); he found a small and statistically significant effect of financial wealth on consumption. Ahec Sonje *et al*. (2012) showed that private consumption reacts to movements in housing wealth in the long- and short-run in Bulgaria, Croatia, the Czech Republic and Estonia. Peltonen *et al*. (2012) analyses the wealth effects in Asian and Latin American emerging countries and shows statistically significant housing and stock market wealth impact in both areas. The two effects are more significant for Asian countries (where the stock market capitalizations are greater per unit of GDP) than in Latin America. Ciarlone's (2011) work shows a positive long-run effect of housing and financial wealth on consumption for 17 emerging Asian countries and post-transitional CEEC. Ciarlone (2011) finds a greatly smaller elasticity of financial prices than that of housing prices. Vizek's (2011) study shows a long-run wealth effect in Bulgaria, Croatia and Czech Republic, with only a financial wealth effect in Bulgaria. Both types of wealth effects are shown in the other two countries studied. Using the PMG estimator, Ceh Casni (2016), showed a statistically significant and positive long-run link between consumption, income and housing wealth for the selected group of countries, which is in line with LCH.

3. Methodology and results

3.1 Research data

The dataset used in this paper contains real estate prices and real equity price indices, real personal consumption, real disposable income, interest rate for 10 CEEC[4] for the 1996Q1-2018Q3 period. Data for housing price index, personal consumption, interest rate and compensation of employees were taken from Eurostat. The indices for equity prices were taken from the websites: investing.com and stooq.com. Data on the four variables (housing price index, personal consumption, equity prices and compensation of employees) are deflated using the Consumer Price Index. We used quarterly total country population from Eurostat to express variables (income, consumption, housing and equity price indices) in per capita terms.

[4] The countries included in the sample are the following: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

Real per capita personal consumption and real per capita income were expressed in indices (2010=100). We then expressed the variables in logarithms (the parameter estimates are explained as the elasticity of consumption to changes in income, financial and housing wealth, and interest rate). Additionally, we seasonally adjusted the variables with the X-12-ARIMA method.

Several data limitations were dealt with, considering the broad coverage of this paper. Firstly, data on housing and financial wealth are available for only some countries in the panel, so we used real estate and equity price indices as proxy variables for housing and financial wealth, respectively. In some wealth effect studies (Ludwig and Sløk (2004), Labhard *et al*. (2005), Carroll *et al*. (2011) and Ciarlone (2011)), price indices were also used as proxy variables. Nevertheless, the use of real estate price index could be interesting in itself when analysing the wealth channel, the channel responsible for transmitting the changes in the monetary policy to asset values, thus affecting the consumer expenditure on nondurable goods and services, something to which this study contributes empirically. Secondly, the data is on total aggregate consumption, we are not able to distinguish between the consumption of durable and non-durable goods[5].

3.2 Research methodology and estimation results

Recent dynamic panel data studies use panels in which both the number of time series observations (T) and the number of groups (N) are somewhat large and/or in the same order of magnitude (Ahec Sonje *et al.*, 2014). Therefore, the usual practice would be to either use the MG, the DFE[6] or the PMG (Pooled Mean Group) estimator. We chose to use the PMG method, which relies on both pooling and averaging the coefficients. We also consider the case where regressors follow unit root process (Pesaran *et al*., 1999). Our estimator allows intercepts, short-run coefficients and error variances to differ across countries and

[5] Even though conventional consumption theories apply to the flow of consumption, durable consumption can be considered a substitute and addition to capital stock, some studies use only non-durable consumption (Lettau and Ludvigson, 2004).

[6] The Mean Group (MG) estimator allows the intercepts, slope coefficients and error variances to differ across groups. The Dynamic Fixed Effects (DFE) estimator restricts the coefficients of the cointegrating vector to be equal across all panels and sets the speed of adjustment coefficient and the short-run coefficients to be equal, leaving the intercepts to vary across countries.

imposes identical long-run coefficients across countries. Our study is strongly founded in theory, since the long-run income elasticity of consumption should be equal to one in all countries, despite their institutional or cultural differences, or saving rates would be falling or rising indefinitely (Friedman, 1957). There are good reasons to expect that the long-run relationship between variables is similar across countries due to budget constraints, arbitrage conditions or common technologies. In addition, not imposing equality of short-run coefficients allows for a dynamic specification, the number of lags included may differ across countries.

We examine the statistical properties of our data and test if the series of interest are *I(1)* and indeed cointegrated in the long-run. The results can be found in Tables A1 and interpreted in Appendix A. As we focus on the long-run relationship between personal consumption, we realise that these variables cannot be consistently estimated if all single variables have a unit root, unless they are cointegrated in the long-run. We perform panel cointegration tests, both residual-based ones (Kao, 1999; Pedroni, 1999, 2004) and likelihood-based ones (Maddala and Wu, 1999). Given the results[7], we can conclude that the five variables under analysis are indeed cointegrated in the long run.

We now estimate the simplified personal consumption equation:

$$cons_{it} = \gamma_{0i} + \gamma_{1i} income_{it} + \gamma_{2i} hpi_{it} + \gamma_{3i} smi_{it} + \gamma_{4i} ir_{it} + \varepsilon_{it} \qquad (1)$$

with $i = 1,\ldots,N$; $t = 1,\ldots,T$; $cons$ is the real per capita personal consumption, smi is the stock prices index, hmi is the real estate prices index and $income$ is the real per capita compensation of employees, ir is the interest rate. The error term (ε_{it}[8]) shows the effects of unexpected shocks to personal consumption, i and t are country and time, respectively. γ_{1i}, γ_{2i}, γ_{3i} and γ_{4i} are income, housing and financial wealth coefficients, interest rate coefficients, respectively, we would expect them to be different from zero (Pesaran *et al*., 1999).

The model given in eq. (1) can be written as an autoregressive distributed lag — ARDL $(p, q_1, \ldots, q_k)$ model:

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[7] The results of panel cointegration tests are available upon request.

[8] Because all the variables are *I(1)* and cointegrated, ε_{it} is an *I(0)* process for all i.

$$cons_{it} = \delta_i + \gamma_i cons_{i,t-1} + \beta_{10i} income_{it} + \beta_{11i} income_{i,t-1} + \beta_{20i} hpi_{it} + \beta_{21i} hpi_{i,t-1} + \beta_{30i} smi_{it} + \beta_{31i} smi_{i,t-1} + \beta_{40i} ir_{it} + \beta_{41i} ir_{i,t-1} + \eta_{it} \quad (2)$$

If all the variables of interest are *I(1)*, and cointegrated (which is our case), the error term is an *I(0)* process for all the countries. Statistically speaking, cointegrated variables show great responsiveness to any deviation from long-run equilibriums, an error-correction re-parametrization can be employed:

$$\Delta Cons_{it} = \phi_i * \left(cons_{i,t-1} - \gamma_{0i} - \gamma_{1i} smi_{i,t} - \gamma_{2i} hpi_{i,t} - \gamma_{3i} income_{i,t} - \gamma_{4i} ir_{i,t}\right) - \beta_{11i} \Delta smi_{it} - \beta_{21i} \Delta hpi_{it} - \beta_{31i} \Delta income_{it} - \beta_{41i} \Delta ir_{it} + \eta_{it} \quad (3)$$

where ϕ_i is the error-correcting speed of adjustment term[9] and $\phi_i = -(1 - \gamma_i)$, $\gamma_{0i} = \frac{\delta_i}{1-\gamma_i}$, $\gamma_{1i} = \frac{\beta_{10i}+\beta_{11i}}{1-\gamma_i}$, $\gamma_{2i} = \frac{\beta_{20i}+\beta_{21i}}{1-\gamma_i}$, $\gamma_{3i} = \frac{\beta_{30i}+\beta_{31i}}{1-\gamma_i}$, $\gamma_{4i} = \frac{\beta_{40i}+\beta_{41i}}{1-\gamma_i}$. We then use the PMG estimator (Pesaran *et al*., 1999)[10].

We use the Hausman test of long-run homogeneity of coefficients to choose the most appropriate estimator[11]. The homogeneity restriction is not rejected by the data for all panels, this fact implying the PMG estimator being appropriate and preferable to the MG estimator. According to Table 1, it is not possible to reject the hypothesis of poolability of long-run coefficients for all panels, the PMG estimator is efficient under the null hypothesis. Moreover, the adjustment coefficient has the correct negative sign and are statistically significant, cointegration between the variables does indeed exist.

We find a statistically significant and positive long-run housing wealth effect on consumption. The results are in line with the existing literature. Ciarlone (2011) and Rodil-Marzabal and Mendez-Ferreira-Junior (2016) also find a more pronounced housing wealth effect than

[9] We anticipate it to be statistically significant and less than zero, this indicating personal consumption changes in the short-run adjustment generated by permanent shocks to the economy.

[10] It is especially attractive when estimating the consumption function as it assumes homogeneous long-run coefficients and different short-run coefficients

[11] The MG estimator gives estimates of the mean of the long-run coefficients, but in the case of the slope homogeneity assumption, the coefficients will be inefficient. Thus, the PMG and DFE estimators are consistent and efficient (Pesaran *et al*., 1999).

the financial one in a panel of Emerging Asian countries and CEEC, and for 10 Eurozone countries, respectively.

Table 1: Baseline model of personal consumption

Variable	Estimates
Number of observations	603
Speed of adjustment ϕ_i	-0.1787 (0.0005) [0.0512]
Long-run coefficients	
Income	0.4156 (0.000) [0.0416]
HPI	0.1659 (0.000) [0.033]
SMI	0.0163 (0.0654) [0.009]
IR	-0.0079 (0.000) [0.0012]
Short-run coefficients	
Income	0.4181 (0.000) [0.087]
HPI	-0.0306 (0.399) [0.036]
SMI	0.0017 (0.8520) [0.009]
IR	0.002 (0.0653) [0.0011]
Log likelihood	2109.91
Hausman test	0.1244

Note: The estimates are performed using the PMG estimator by Pesaran *et al*. (1999); panel ARDL (1,1,1,1,1) model; all equations include a constant term; standard errors are in brackets, *p*-values are found in parenthesis. Hausman test PMG denotes the test for long-run homogeneity, the values found in the table are *p*-values.

There is a significant at 10% confidence level and positive long-run financial wealth effect in Central and Eastern Europe. Our results are similar to those of Ahec Sonje *et al* (2014), Bampinas *et al* (2017), Bertaut (2002), Carroll *et al* (2011), Ludwig and Sløk (2004), and Peltonen *et al* (2012), for whom the financial wealth effect is significant and positive. Our results suggest a significant and negative interest rate in the 10 CEEC under analysis. In the short-run, only income is significant in the countries under analysis.

Our model is subject to two robustness checks, see the results in table B1 and interpretation in Appendix B.

4. Conclusions and discussion on further research

Our paper contributes to the existing literature on wealth effect, with several conclusions being drawn from the presented analysis.

Firstly, according PMG method results, there is a long-run equilibrium relationship between personal consumption, stock market wealth, housing wealth, income, and interest rate in the ten CEEC under analysis. Secondly, according to the baseline model estimates, the long-run housing and financial wealth effects are significant and present in the CEEC under analysis, which corroborates the results of earlier studies. This means that these countries are more vulnerable to further adverse developments in the housing sector, should the contraction in real house prices continue at the recently observed rates. Thirdly, there is a significant and negative effect of interest rate on consumption. Fourthly, only income is significant in the short run.

To further this research, one could analyse the wealth effect in the above countries grouped according to their financial system characteristics. Another possibility would be to compare this analysis with that of countries that are already in the euro-area. The research would further clarify the reflection on the monetary policy management in the context of economic and monetary union. For policy makers, this thorough research could show the advantages of the efforts made for reforms that develop the degree of financial evolution.

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Appendix A.

We perform the first-generation unit root tests: Im-Pesaran-Shin (Im *et al*., 2003) and Fisher ADF (Maddala and Wu, 1999; Choi, 2001) and CIPS (2007) second generation panel unit root test. Table B1 summarizes the panel unit root test results for the four variables of interest (personal consumption, income, housing wealth and stock market wealth), all of them containing a unit root and being stationary in first difference.

Table A1: Panel unit root tests results

Test	Null hypothesis	*p*-Values				
		Personal consumption	**Housing wealth (HPI)**	**Stock market wealth (SMI)**	**Income**	**IR**
Variables in level						
Im-Pesaran-Shin (2003)	All panels contain unit roots	0.484	0.077	0.073	0.879	0.298
Fisher	All panels contain unit roots	0.109	0.1788	0.234	0.679	0.190
Maddala and Wu (1999)	All panels contain unit roots	0.689	0.967	0.977	0.877	0.100
CIPS (2007)	All panels contain unit roots	0.865	0.999	0.517	0.578	0.795
Variables in first difference						
Im-Pesaran-Shin (2003)	All panels contain unit roots	0.000	0.000	0.000	0.000	0.000
Fisher	All panels contain unit roots	0.000	0.000	0.000	0.000	0.000

Maddala and Wu (1999)	All panels contain unit roots	0.000	0.000	0.000	0.000	0.000
CIPS (2007)	All panels contain unit roots	0.000	0.000	0.000	0.000	0.000

Note: max lags used is four. All unit root tests entail a constant and a trend in order to avoid all dynamics being forced into the lags of the endogenous variable.

Appendix B.

The income coefficients are all significant and positive for the countries under analysis. The housing price indices and the stock market wealth effect are significant and positive. Thus, estimates of the four variables in the countries under analysis confirm the results that we had in the case of the PMG method and have the same sign for the three methods.

Table B1: Comparison between PMG, DOLS and FM-OLS methods

Variable	PMG	DOLS	FM-OLS
Income	0.4156 (0.000)	0.472 (0.000)	0.526 (0.000)
HPI	0.1659 (0.000)	0.106 (0.027)	0.102 (0.000)
SMI	0.0163 (0.0654)	0.008 (0.043)	0.018 (0.016)
IR	-0.0079 (0.000)	-0.008 (0.000)	-0.033 (0.000)

Note: *p*-values are found in parenthesis.