DOI: 10.28934/ea.20.53.1.pp118-132

ORIGINAL SCIENTIFIC PAPER

Modeling Wealth Effect in Consumption Function Based on System of National Accounts (SNA) Data

Ivana Jovanović[1*]

[1] Statistical Office of the Republic of Serbia, Belgrade, Serbia

ABSTRACT

The study explores the influence of housing wealth, as well as other wealth variables, on consumption in the frame of life cycle-permanent income theory. The sample consists of three former socialist countries and the model used was based on models initially developed for advanced economies, most notably Norway and the Netherlands. The paper, based, where necessary, on a compiled data set, uses a more complete list of variables than similar studies and relies on comparative analysis to come to plausible results and interpret them. The results differ from those obtained in other studies for the same or similar type of countries or even the same economies, and that is that movements in value of housing stock do not influence consumption of households. In addition, the paper explains why housing wealth is not part of consumption function in former socialist countries with certain macroeconomic structure, and that is low part of unpaid mortgage debt in the financing structure of housing wealth. The reason is that mortgage financing causes the price movements of housing wealth to influence consumption, especially in developed countries where workforce is highly mobile and financial innovations are present and mortgage financing dominates housing stock.

Key words: *system of national accounts, wealth effect, consumption function, economic transition, Johansen's procedure*

JEL Classification: C01, E01, E21, E37, E60, P1, P2, R20

INTRODUCTION

Wealth effect in consumption function is a phenomenon known since as early as the days of Keynes, and it means that consumption is influenced not only by current or permanent income but also by wealth. By wealth we mean housing wealth (HW), or value of houses influenced by physical stock and prices, securities or market shares held by households (SEC) and other financial assets like savings decreased by financial liabilities most notably mortgage liabilities (FAFL).

System of National Accounts (SNA) worldwide, and it counterpart in Europe, European System of Accounts (ESA), as internationally developed accounting framework for macroeconomic statistics is source of data for the wealth effect analysis. While data for other sample countries (Slovenia and Czech Republic) were readily available in the Eurostat´s database, Serbian data had to be constructed for this study as Serbia is still on its way to harmonize statistics with European and world standards.

* E-mail: ivanakirovic@gmail.com

Is wealth effect present in former socialist and transition countries similar to Serbia, as regards their economic history? Which components of wealth are statistically significant in their consumption function? Are there similarities between sample countries? How is their economic structure different from, for example The Netherlands whose macroeconomic model contains all components of wealth (See second part)?

The aim of the research was to explore the consumption function in similar countries like Serbia, i.e. former socialist (post) transition countries on the basis of system of SNA data by sectors and to compare the results within the sample but also with the models of developed countries. Comparative analysis was aimed to give answers about the mechanism of influence of wealth effect components on consumption. Not only we come to decisive and different result than similar studies, we also offer the explanation of mechanism of influence of the housing wealth on consumption which is original contribution of the study.

The paper consists of five parts: Literature Review, Data and the Methodology, Research Results and Interpretation, Mechanism of Impact of Housing Wealth and other Wealth Variables on Consumption and Conclusion and Implications.

LITERATURE REVIEW

This paper explores consumption modeling based on permanent income-life cycle theory models, in developed countries. According to the life cycle–permanent income hypothesis, consumers estimate their long–term ability to consume (Hall, 1978 in Jovanovic, 2016) based on wealth (Modigliani) or permanent income (Friedman). Hall (1978) points out that permanent income is unobservable category. The wealth effect – the effect of financial and non-financial asset prices and value on consumption – has been analyzed by several economists, including Keynes, as mentioned earlier ("Windfall changes in capital values as a major factor capable of causing changes in propensity to consume", Speight 1990, Ch.6 in Brodin and Nymoen 1992, p 433).

Park (1996, p. 48) points to Deaton (1972), who emphasized, in the context of a modified life-cycle hypothesis, that rapid changes in financial assets play a substantial role in determining private consumption. The relevance of physical assets (see Park 1996, p. 48), including land and housing, to consumption has been tested only sporadically in the literature. Perhaps the irrelevance of physical wealth like land in explaining private consumption behavior in the Western hemisphere is due largely to the fact that in recent years the region has experienced little change in physical asset prices compared to Far-East Asian countries (i.e., Japan, Korea, and Taiwan).

Deaton (Blinder & Deaton,1985), points out that consumption depends only on part of gross disposable income which is made up of salaries and not on capital income like dividends and rents, because their discounted value is a part of wealth.

We want to stress that other approaches, as regards the consumption function model, in developed countries, like the Netherlands (Centraal Planbureau, 2010, see second part) and Norway (Brodin, Nymoen, 1992; also see RIMINI model in Bårdsen, G. et al, 2010[1]), take wealth as a sum of all the wealth components, housing wealth as well financial saving and liabilities of the households. De Bonis and Silvestrini (2011) separate housing wealth but take stock market shares together with other forms of financial assets and liabilities and find for eleven OECD countries that all variables are significant. Wealth effect in developed countries is, as we have seen from the examples and before mentioned references, taken in models in those countries for the demand projections for conducting monetary policy for example the ECB (Jovanovic, 2012),

[1] The RIMINI model is based on quarterly data. The quarterly national accounts are the most important data source together with other statistics from the national accounting system and from Norges Bank's database for financial sector balance sheets (FINDATR). See, Kjetil & Fredrik, 2001. Also, see Appendix 2.

Norwegian central bank or for other governmenet policies (for example, the Netherlands). Due to a different structure of the post-communist and post socialist countries, we take housing wealth and financial assets and liabilities separately and stock market shares owned separately as well, as we suppose that components of wealth of households have a different impact on consumption than in developed countries, which make separation of wealth components necessary.

Other studies of under developed countries include countries from the sample, but also developing Asian countries (so called emerging economies). One study apply panel framework of analysis, without financial assets and liabilities component, with only stock market shares as regards financial assets and proves that housing wealth is significant (Ciarlone, 2012). Some individual studies concerning Czech Republic (Šonje, 2012) prove significance of housing wealth in a model with only two variables, real wage next to the housing wealth, in the short run. In Šonje et al. (2014) the authors do not come to decisive conslusion due to short time series for a group of former transition countries in a panel framework of analysis. Weyerstrass et al. 2001, in model for Slovenia, do not provide conclusion on the significance of the influence of housing wealth on consumption, as the model consists only of GDI and first lag of consumption and do not pass the specification tests (autocorrelation and heteroscedasticity). Our study takes in the account the full list of variables, based on developed countries model, but all taken separately. The importance of our study is that wealth components are taken separately and that their list is complete, and we come to the decisive conclusion as regards the influence of housing wealth on consumption, which turned out to be not significant by all three sample countries and the financial assets decreased by liabilities and market shares proved significant. Analysis was done on the basis of Johansen's procedure, and Error Correction Model which passed all specification tests.

DATA AND THE METHODOLOGY

Three former transition countries were analyzed: Serbia, Czech Republic and Slovenia.

Until the third quarter of 2008, there was a steady increase in the value of consumption and other macroeconomic variables like housing wealth, gross-disposable income and financial market shares in the world economy, and also in the sample countries, when the effects of financial and economic crises due the read from the mortgage market in the United States started to be visible, and a drop was witnessed in the sample and in the world economy. Even before the crisis, Slovenia and Czech Republic reached the level of highly developed countries, whereas Serbia is still middle income country. The sample for this research was formed with Czech Republic and Slovenia, because it was presumed that they should be compared due to the relatively similar economic history. As we will see, one of the similarities is the high proportion of fully owned houses by households, which turn out to be a crucial element to explain the result of this study and difference with other highly developed countries with different background, like the Netherlands.

The model used is compiled based on models in developed countries and differ from the existing models in relevant literature for the sample countries because the list of variables is more complete. It differs from the model of the Netherlands (see next section), in that, among others, that all wealth components are taken separately. In the Netherlands, the FAFL component is highly negative (see Table 4), whereas, HW had a steady growth (Graph1) so that adding of all wealth components including securities is understandable in case of the Netherlands.

Econometric model in use in Centraal Plaanbureau in the Netherlands

Centraal Planbureau (CPB) (De Jong 2011, Centraal Planbureau 2010)[2] has developed a long term and a short term consumption model - ECM, „equilibrium error correction model". Wealth variable is a sum of components in long term model. The idea is that as the wealth of the households as a total rises in the long run, the saving, securities, net housing wealth (housing wealth decreased by mortgage liabilities), consumption rises in the long run. In short run, on the other hand, taking loans, using savings or selling of securities (which leads to decerease of wealth) causes the rise of consumption. In short run, households can decide to refinance their mortgage under more favorable conditions because the rising of house prices is usually followed by the fall of the mortgage interest rate, or, in developed countries they can make use of financial innovation allowed in most developed countries, which is, to get consumption loan based on the overvalue (higher value of dwelling compared to mortgage debt) so that the consumption rises (Centraal Planbureau, 2010).[3]. This channel works in the long run as well (see Ludwig & Sløk, 2002)[4]. In short run, rise of the prices of market shares can result in fall of wealth, due to a selling of the securities, which boosts consumption in the short run.

In the ECM model of the CPB, which explains short term variations of consumption, for HW and SEC the price variations are taken in the account, next to the term which describes the adjustment to the cointegration relation, because of the explained influence of the prices of dwellings and securities in the short run on consumption and saving. Interesting is that, in the long run, increasing wealth leads to increase of consumption, whereas, in the short run, it is vice versa. The short term deviation from the cointegration relation is adjusted to it via the ECM coefficient. In the Dutch short run model, the effect of the prices of the dwellings is visible clearly, whereas in the long run model dwellings are part of a total wealth. Dutch mortgage debt is substantial, as we have seen before, so that decrease of total wealth with that figure substantially adjusts wealth total, and the correction of saving only, with mortgage liabilities, would yield a negative net financial assets (see Table 4, ratio FAFL/GDP is negative for the Netherlands which also means that FAFL variable is negative).

In Dutch model of CPB (De Jong, 2011), two types of households are distinguished: LCH households (those who behave in conformity with the „life cycle hypothesis") and ROT (From engl. „Rule of thumb") households. LCH households own financial and non-financial assets (dwellings) and are capable to adjust their consumption during the life cycle in accordance to their total life capital or LTW („life time wealth"). This aggregate consists of assets (financial, like stock market shares, savings, decreased by loans, mostly mortgage loans and non-financial i.e. dwellings) and salaries and social benefits. These households invest in houses, save in the form of stocks and other securities and have access to financial market. They take loans and invest to absorb the shocks and smooth the consumption during time. These households adjust their portfolio dependent on the relative performances of stocks and deposits. Even probability of death is a presumption which makes aggregate consumption function possible (Blanchard 1985, in De Jong 2011). ROT household, on the other hand, don't have access to a financial market and spend all their income every month. As a consequence, they don't accumulate financial assets and shocks in their GDI influences directly their consumption.

Long term model (CPB 2010)[5] is:

[2] Dutch Central Bank uses the similar model. See De Nederlandsche Bank 2011.
[3] This possibility is available in the Netherlands since 2004.
[4] Their model comprises of housing and stock market wealth and disposable income as a whole, not only labour income. Wealth components are proxied by their prices.
[5] First part of model concerns LCH and second of ROT households.

$$C = (ß + \lambda)\ (Wg_{t-1} + (1 - \phi_l)\ LD2_k + (1-\phi_u\ )OD2_k + \frac{(1-\phi_l)LD2_k + (1-\phi_u\ )OD2_k}{r_{\ln} - p_{\ln} + \theta + \lambda}) + \phi_l\, LD2_k + \phi_u\, OD2_k$$

$\bar{R}^2$= 0.99, time span 1971 – 2008 (annual data)

Description of variables abbreviation:

C – Long term level of consumption of households
ß– Rate of the time preference of money
λ –probability of death
Wg– Net assets of households (pension capital excluded)
ϕ_l – Proportion for ROT households
$LD2_k$– Income of work (without dividends and interest[6])
$OD2_k$ – Social benefits of the households
ϕ_u – Proportion for ROT households
$r_{\ln}$ – Long term interest rate, net (after tax on salaries and social security contributions)
$p_{\ln}$ – Expected rate of net salaries
Θ – risk premium

The fourth element is for discounting of the future flows of work income and social and pension benefits.

Short term model is (CPB, 2011):

$$\frac{\Delta c}{C_{t-1}} = c1\,\frac{\Delta ldc}{C_{t-1}} + c2\ (1\text{-}q65)\,\frac{\Delta odc}{C_{t-1}} - c3\ \Delta r_{kl} + c4\frac{\Delta w^h}{C_{t-1}} + c5 w^a_{bn}\ w^a_{qn}\,\frac{\Delta w^a}{C_{t-1}} + c6(1\text{-}w^a_{bn})\ \ w^a_{qn}\,\frac{\Delta w^a}{C_{t-1}} - c7\ (lnc - lnc^*)_{t-1} + c0$$

$\bar{R}^2$= 0.88, time span 1973 – 2008 (annual data)

Description of variables abbreviation:

c – Short term consumption
c* – long term consumption
ldc – available work income of households
q65 – pressure of ageing of the population (65^+/20-65- years)
odc – social benefits of households
w^h– Housing wealth (mutations concern average price[7])
w^a– Value of securities (shares) of households (mutations concern price movements)
w^a_{bn} – Binnary variable for shares (take value 1 when rise)
w^a_{qn} – Percentage of households that own shares
r_{kl} – Real interest
$(lnc - lnc^*)_{t-1}$– ECM term („error correction model")

We can see that in a short consumption function, components of wealth (housing and securities i.e. market shares) are given separately, while, in the long term function they are taken together. Reason for this is that in short run price movements of housing stock and stock market

[6] Dividends are implicitly captured in capital from shares, which is part of total net assets, under presumption that the price of shares is equal to the present value of future dividend flows, Idem, pg. 12. Interests are present in LTW (Life time wealth) ß, $r_{\ln}$, Idem, pg. 11. On the contrary to this concept, in model of Central bank of the Netherlands (De Nederlandsche Bank, DNB), GDI as a total income is a variable. (DNB, 2011)

[7] $w^h = p_h W^h_{t-1}$, housing wealth is a product of average change of annual price and average housing stock last year. Idem w^a. CPB, 2011, pg.12.

shares influence consumption markedly, presented as variables w^h and w^a. These price movements influence conscious decisions about augmentation and decrease of saving, i.e. consumption, and the measure in which the consumption will deviate from long term cointegration relationship (the level of the ECM parameter). For example, rising of share prices can result in their selling or additional taking of loans so that consumption can rise in comparison to the long term level defined by the cointegrating relation. With time, this decision about decrease of savings (or augmentation of liabilities) brings consumption back to the equilibrium level because lower level of wealth means lower level of consumption in the long run. Interest rate in the short run model is interest rate on commercial credits.

The Model

The base for analysing the wealth effect in sample countries` consumption function is the quarterly VAR model made up of the SNA defined variables, C, GDI, FAFL, SEC, HW and SAL where

C – Household consumption[8]

GDI – gross disposable income of households (excluding property and gross mixed income n case of Serbia)

SAL – salaries

FAFL – savings (S) and transaction deposits (D) of the households decreased by financial liabilities or loans (L) by banks, end of period

HW – housing wealth, value of household residential property, end of period

SEC – value of securities (shares) in the hands of households, end of period

Variable_SA – de-seasonalized variable

Quarterly data run from Q1 2004 up to Q2 2014. Seasonality was excluded by the use of X12 census model. Level data were available for Czech Republic and Slovenia from the Eurostat database, and it was somewhat necessary to construct quarterly data as regards HW variable, as quarterly stock data are not, whereas flow data are available on quarterly basis. Logarithms of data were used. For Serbia, the stock data of all variables were compiled and constructed by the author, based on data of the Statistical Office of the Republic of Serbia (SORS), the data of the National bank of Serbia, Financial Exchange and the Securities Commission of the Republic of Serbia. The data for the GDI were based on Household Budget Survey conducted by SORS. In Jovanovic (2016), more details are given about the construction of Serbian data.

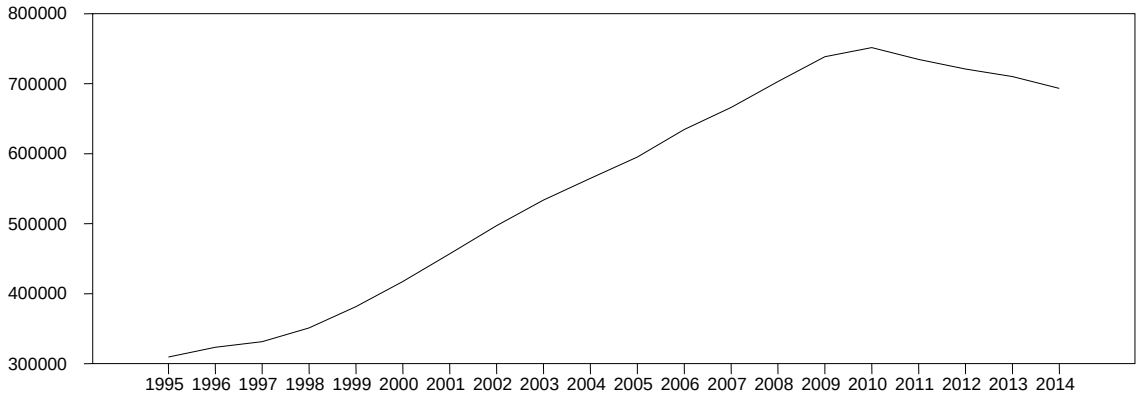
The Methodology

The paper employs cointegration analysis in order to determine the significance of individual wealth components in consumption, and analysis of macroeconomic ratios. In already mentioned paper, Jovanovic (2016), we have dealt with the methodology of the Johansen's procedure and all additional testing, on the example of Serbian data. The same was applied to two other countries of our sample, Czech Republic and Slovenia. The paper uses the relevant quantitative methods of time series analysis. Firstly, the presence of the season component is tested in the time series and the series de-seasonalized where necessary, then the non-stationarity of time series is established, and lastly cointegration and Vector Autoregression (VAR) analysis are implemented. Next to Johansen's procedure, which resulted in one cointegration vector in cases of Serbia and Czech Republic, augmented Dickey Fuller unit root and Zivot Endrews tests of unit root, in cases of structural breaks were applied. Specification tests were applied to VECM (vector error correction model). Also constrain tests with Bartlett

[8] Institutional household sector as defined in SNA

correction helped to establish appropriate model i.e. to determine variables that enter cointegration relation.

Comparative analysis of macroeconomic ratios which put into relation mortgage loans and housing stock, enabled deeper interpretation of the research results (the Netherlands versus sample countries) and to discover the mechanism of effect of housing wealth on consumption.



Graph 1. the Netherlands- Housing Wealth

Source: Eurostat

RESEARCH RESULTS AND INTERPRETATION

VECM passed all specification tests. Johansen's procedure, resulted in one cointegration vector in cases of Serbia and Czech Republic.

FAFL and SEC vaiables are found significant and enter the cointegration relation with consumption in both Serbia and Czech Republic. Their sign is positive. In case of FAFL variable, the sign can be negative in ECM, and that is the case for Serbia (see Table 2 in Appendix 1). In short run, households can take commercial loans and increase consumption, but after some time, increased loans or decereased FAFL will cause consumption to fall (via ECM parameter) to the equilibrium level found by cointegration relation.

The more detailed results are presented in Anex 1.

Here, we summarize in short, the research results presented in Table 1,2 and 3 and in Appendix 1.

SLOVENIA: NO COINTEGRATION FOUND

CZECH REPUBLIC : C = 0,101FAFL + 0,477SEC + 4,449

ECM (Error Correction Model) PARAM. = -0,3 (-4,428)

SERBIA: C = 0,098FAFL + 0,145SEC + 6.340

ECM PARAM. = -0,806 (-8,59)

In Tables 1, 2 and 3 the results after application of Johansen's procedure and ECM specification tests are summarized and results for Slovenia (VAR of differenced variables):

Table 1. Results of the Johansen´s Procedure for Serbia

results / variables	SERBIA	
	level of integration	cointegration relation (coeffic.)
consumption	I(1)	1
gross disposable income	-	-
salaries	I(1)	-
net financial assets	I(1)	0,098
securities	I(1)	0,145
housing wealth	I(1)	-

ECM parameter (t-statitics)	**-0.806 (-8.59)**
ECM, Jarque Bera norm. test	0,92
ECM, Breusch Godfry autocorrelation test	0,08
ECM R^2, adjusted	0,64

Source: Author's analysis based on application of Johansen's procedure and usual tests

Table 2. Results of the Johansen´s Procedure for Czech Republic

results / variables	CZECH REPUBLIC	
	level of integration	cointegration relation (coeffic.)
consumption	I(1)	1
gross disposable income	I(1)	-
salaries	I(1)	-
net financial assets	I(1)	0,101
securities	I(1)	0,477
housing wealth	I(1)	-

ECM parameter (t-statitics)	**-0.28 (-5.59)**
ECM, Jarque Bera norm. test	0,45
ECM, Breusch Godfry autocorrelation test	0,36
ECM R^2, adjusted	0,68

Source: Author's analysis based on application of Johansen's procedure and usual tests

Table 3. Results of the Johansen´s Procedure and VAR of first differences for Slovenia

results / variables	SLOVENIA	
	level of integration	cointegration relation (coeffic.)
consumption	I(1)	-
gross disposable income	I(1)	-
salaries	I(0)	-
net financial assets	I(1)	-
securities	I(1)	-
housing wealth	I(2)	-

ECM parameter (t-statitics)	-
ECM, Jarque Bera norm. test	-
ECM, Breusch Godfry autocorrelation test	-
ECM R^2, adjusted	-
VAR of first differences: variables	commerc. loans interest rate, GDI, SEC

VAR of first differences: normality	0,11
VAR of first differences: Portmanteau autocorrelation test up to lag 12	0.07-0.24
VAR of first differences, R^2, adjusted	0,24

Source: Author's analysis

We see from Tables 2 and 3 that ECM models for Serbia and Czech Republic, as well as the VAR of the first differences for Slovenia pass the specification tests. Additional variable, interest rate on commercial loans was introduced for Slovenia in order that model pass the specification test (autocorrelation and normality of residuals).

Now, we present the table 4 with comparative macroeconomic ratios, for the sample countries as well as for the Netherlands.

Table 4. Macroeconomic Ratios - Comparative Analysis

	FL/GDP	FAFL/GDP	HW/GDP	NETHW/GDP	SEC/BDP	NETHW/ HW	FL/HW
Serbia	14%	6%	5,41	5,27	5%	97%	3%
Slovenia	23%	14%	1,76	1,53	11%	87%	13%
Czechia	21%	15%	1,14	0,94	6%	82%	18%
Netherlands	**118%**	-52%	1,22	0,08	**24%**	**6%**	**97%**

Source: Eurostat and authors calculations

We see that relatively high proportion of housing is fully owned by households in former socialist countries (ratio NETHW/HW is almost 100 in three sample countries), whereas in the Netherlands predominant part of housing if financed by mortgage debt (ratio of financial liabilities of the households, which is predominantly mortgage debt FL/HW amounts to almost 100%).

MECAHISM OF IMPACT OF HOUSING WEALTH AND OTHER WEALTH VARIABLES ON CONSUMPTION

Several channels of influence of wealth variables on consumption in developed countries are presented in the relevant literature. Campbell & Coco (2005) have determined that the saving from precaution changes by households with mortgages when house prices change, and that this channel is insignificant at households with no budget restraint, or which own the house. They found that changes in consumption as a result of change in house prices are the biggest with elderly population and close to zero by young people who rent houses. Credit terms become more relaxed when house prices rise. In great part of literature for developed countries the macroeconomic effect of house prices on consumption is linked to financial liberalization which made possible the financing of consumption from the positive difference of the house in comparison to the mortgage value (for example Aouki et al., 2014). Ludwig & Sløk (2002)

Housing wealth is significant variable in the consumption function in the Netherlands as well as in other developed countries. If we look at Table 4, we see that almost all housing stock in the Netherlands is financed through the mortgage financing. The opposite is truth for the sample countries. Last column of table 4 shows that the percentage of financing of housing wealth in countries amounts 3 – 18% while in the Netherlands it is 97%. It is obvious, then, that here lies the answer how the housing wealth prices fluctuations impact consumption in the long run. The effect of the housing wealth on consumption goes through mortgage financing and workforce relocation. That is why the effect of housing wealth on consumption can be visible only if the proportion of mortgage financing is relatively high in the total of housing wealth, and that is not the case in sample countries, so the housing wealth effect is there not present.

Here we go in detail about the mechanism of housing wealth on consumption, next to the effect of financial innovations which we mentioned in the part about Centraal Planbureau methodology. In the periods when the house prices rise, the possibility to sell the dwelling present no burden to owner household, in a situation of divorce, moving to elderly accommodation (see Campbell & Cocco, 2005) or relocation for other reasons like work, which is common in the Netherlands. In the situation of bursting of big housing bubble like in 2010 in the Netherlands, when houses prices dropped by 15% and more, household naturally became more cautious with spending, increased their savings to cover the potential loss of selling the house, and therefore the negative impact on consumption is obvious to explain. The opposite happens when the house prices rise.

Given that FAFL variable is significant in sample countries, and effects positively consumption, mortgage finance that dominates FL obviously influences consumption, because mortgage loans present increase of financial burden on the households.

Share of securities in comparison to GDP is significant only in the Netherlands, so that we conclude that the channel through which securities influence consumption in the sample countries is through the expectations of the public captured on the financial exchange. Furthermore, as securities variable is highly correlated with the housing wealth (for Serbia, correlation coefficient is 0.57) we can expect that the studies which don't take into account SEC variable could find HW statistically significant (as Šonje, 2012).

CONCLUSION AND IMPLICATIONS

The main result of the paper is that housing wealth is not significant in the long run in sample countries. Effect of the housing wealth on consumption goes through mortgage financing and workforce relocation and financial innovations linked to mortgage financing which are present in developed countries. The insignificance of housing wealth in the sample countries is explained by the fact that relatively high proportion of housing is fully owned by households in former socialist countries, while in the Netherlands predominant part of housing if financed by mortgage debt. The effect, of mortgage financing on consumption will be visible on the macro level in countries where mortgages are dominant in the financing of the housing stock, which is not the case in countries from our sample.

The effect of stock market shares is most probably captured through the expectations channel. Securities enter the cointegrating relation in all sample countries. GDI is not significant except in the VAR of first differences in Slovenia. Salaries did not enter the cointegration relation. Net financial assets are found significant and enter the cointegration relation in all sample countries.

Until the mortgage proportion in financing the housing wealth stock is at the relatively low level, quarterly data on housing wealth will not be relevant for modeling consumption in Serbia. Future research could rely on the SORS data, once available, and panel data analysis, but it is not expected that this research avenues will yield relatively different results. Some other research study based on SORS time series can confirm or disapprove the soundness of compiled data from this study. However, same result for two analyzed countries with similar macroeconomic ratios, Serbia and Czech Republic, could be taken as a proof of soundness of the results and data quality compiled for Serbia.

This research, starting from models developed for countries like Norway and Netherlands, added more explanatory variables in the analysis. This way, the paper contributed to the existing literature in the field of studying wealth effect in former transition countries. By adding variables, separately, like net financial assets and stock market shares, anovel result different from those for other panel and individual studies (Ciarlone, Šonje et al.), emerged – housing wealth does not exert significant influence on private consumption in analyzed former transition economies.

ACKNOWLEDGEMENTS

This paper is the result of collaboration with Gorana Krstic, professor of economic statistics at the University of Belgrade who kindly initiated and defined the scope of this research and Zorica Mladenovic, professor of econometrics at the University of Belgrade, who kindly provided expert help in the field of applied econometrics.

REFERENCES

Aoki, K., Proudman, J., Vlieghe, G. (2004). "House prices, consumption and monetary policy: A Financial Accelerator Approach." *Journal of Financial Intermediation,* 13, pp. 414–435.

Bårdsen, G., Eitrheim, Ø., Jansen, E. and Nymoen, **R.** (2010). *The Econometrics of Macroeconomic Modelling*. Oxford UK: Oxford University Press

Blinder, A. S., Deaton, A. (1985). "The Time Series Consumption Function Revisited. Brookings Papers on Economic Activity, 2:1985, pp. 465–521. Washington DC, USA: Brookings Institution and Princeton University

Brodin, A., Nymoen, R. (1992). **"**Wealth effects and Exogeneity; The Norwegian Consumption Function." *Oxford Bulletin of Economics and Statistics,* 54, 3

Campbell, J.Y., Cocco, J.F. (2005). *How Do House Prices Affect Consumption? Evidence From Micro Data* (WP 11534, August), Cambridge, MA: NBER

Centraal Plaanbureau. (2010). *Saffier II, one model voor de Nederlandse economie in 2 hoedanighedenvoor 3 toepassingen*. CPB Document No 217, Decembar

Ciarlone, A. (2012). *Wealth Effects in Emerging Economies.* (Working Papers No 843), Rome Italy: Banca d' Italia

De Bonis, R., Silvestrini, A. (2011). *The effects of financial and real wealth on consumption:new evidence from OECD countries.* (Working Papers No 837), Rome Italy: Banca d' Italia

De Jong, J. (2011). *De Consumptievergelijking in SAFFIER II*. The Netherlands: CPB

De Nederlandsche Bank (2011). *DELFI DNB's Macroeconomic Policy Model of the Netherlands,* DNB Occasional Studies, Vol. 9/No1. Amsterdam, The Netherlands: DNB

Hall, R.E. (1978). "Stochastic implication of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence", *Journal of Political Economy,* Vol. 86, No. 6, pp. 971-987.

Jovanović I. (2012). "Značaj nacionalnih računa za monetarnu politiku." *Ekonomske ideje i praksa* br. 6, Septembar, Ekonomski fakultet Univerziteta u Beogradu

Jovanović I. (2016). "Modelling Consumption Based on the Complete System of National Accounts." *Economic Annals*, Vol. LXI, No. 208, January-March 2016.

Kjetil O., Fredrik W. (2001). *The role of assessments and judgement in the use o f the macroeconometric model RIMINI,* Economic Bulletin Q 2,

Ludwig A., Sløk, T. (2002). *The Impact of Changes in Stock Prices and House Prices on Consumption in OECD Countries*. IMF Working Paper, WP/02/1

Park, C. I., Kwon, J.K (1996). "The Hyper-Inflation of Land and Consumption Behaviour. *International Economic Journal*, Vol. 10, No 4, Winter.

Šonje, A.A., Čeh, A.Č., Vizek, M. (2012). "Does Housing Wealth Affect Private Consumption in European Post-Transition Contries? Evidence from Linear and Treshold Models*." Post-Communist Economies*. Vol 24, No.1, march 2012, 73–85.

Šonje, A.A., Čeh, A.Č., Vizek, M. (2014). "The Effect of Housing and Stock Market Wealth on Consumption in Emerging and Developed Contries." *Economic Systems* 38, 433–450.

Weyerstrass, K., Haber, G., Neck, R. (2001). SLOPOL1: "A Macroeconomic model for Slovenia." *International Advances in Economic Research*. February, Vol. 7, Issue 1, pp 20–37

APPENDIX

APPENDIX 1 MORE RESULTS OF JOHANSEN´S PROCEDURE

Table 1. Results for Serbia: testing imposing restrictions

ß (1)		α (1)	
Variables		Equations	
C_SA	**1 (NA)**	DC_SA	**-0.806 (-8.590)**
GDI_SA	0.000 (NA)	DGDI_SA	-0.467 (-2.682)
HW_SA	0.000 (NA)	DHW_SA	0.000 (0.000)
SEC	**-0.145 (-12.518)**	DSEC	0.000 (0.000)
FAFL	**-0.098 (-10.734)**	DFAFL	0.000 (0.000)
CONSTANT	-6.340 (-62.911)		
Test of restricted model:		$\chi^2(5) = 8.988$ [0.110]	
with Bartlett correction:		$\chi^2(5) = 5.166$ [0.396]	

Source: Author´s analysis

Table 2. ECM Model for Serbia

Variable	**Parameter estimate**	**t statistics**
Zt-1	-0.806	-8.59
DC_SAt-1	0.31	2.84
DSECt-1	-0.079	-2.133
DSECt-2	-0.152	-3.786
DFAFLt-2	-0.043	-2.123
DC_SAt-3	0.362	3.035
DFAFLt-3	-0.082	-3.961
DFAFLt-4	-0.089	-3.673

Source: Author´s analysis

Table 3. Matrices for Czech Republic

ß (1)		α(1)	
Variables		Equations	
C_SA	1 (NA)	DC_SA	**-0.300 (-4.428)**
FAFL_SA	**-0.101 (-1.846)**	DFAFL_SA	0.060 (0.487)
SEC	**-0.477 (-18.040)**	DSEC	-0.556 (-2.149)
CONSTANT	-4.449 (-8.527)		
Model adequacy:			
Autocoorelation tests:			
LM(1):		$\chi^2(9) = 14.861$ [0.095]	
LM(2):		$\chi^2(9) = 4.746$ [0.856]	
Normality test:		$\chi^2(6) = 5.612$ [0.468]	

Source: Author´s analysis

Note: see notes by table 5

Table 4. ECM Model for Czech Republic

Variable	**Parameter estimate**	**t statistics**
Zt-1	-0.28	-4.42
DC_SAt-1	-0.33	-1.6
DC_SAt-2	-0.5	-2.61
DFAFL_SAt-1	0.65	5.21
DFAFL_SAt-2	0.27	1.71
DFAFL_SAt-3	0.25	1.91

Source: Author´s analysis

Table 5. Trace test for VAR(4) C, FAFL, GDI, SEC, DHW - Slovenia

I(1)-Analysis		
r	p-value	p-value*
0	0.000	0.457
1	0.000	0.325
2	0.001	0.278
3	0.009	0.241
4	0.210	0.328
Model adequacy:		
Autocoorelation tests:		
LM(1):	$\chi^2(10) = 23.710$ [0.536]	
LM(2):	$\chi^2(25) = 23.838$ [0.529]	
Normality test:	$\chi^2(25) = 11.918$ [0.291]	

Source: Author´s analysis

Notes:

a) p is Bartlett-corrected p-value*

b) LM(1) is the Ljung Box Test based on the estimated auto- and cross-correlations of the first T/4 lags. See Dennis (2006), p.51

c) LM(2) is the test for the n^{th} order autocorrelation, idem

d) Test for Normality is the Doornik-Hansen test, idem

APPENDIX 2

Interest rate transmission mechanism from RIMINI model (Norway Central bank)

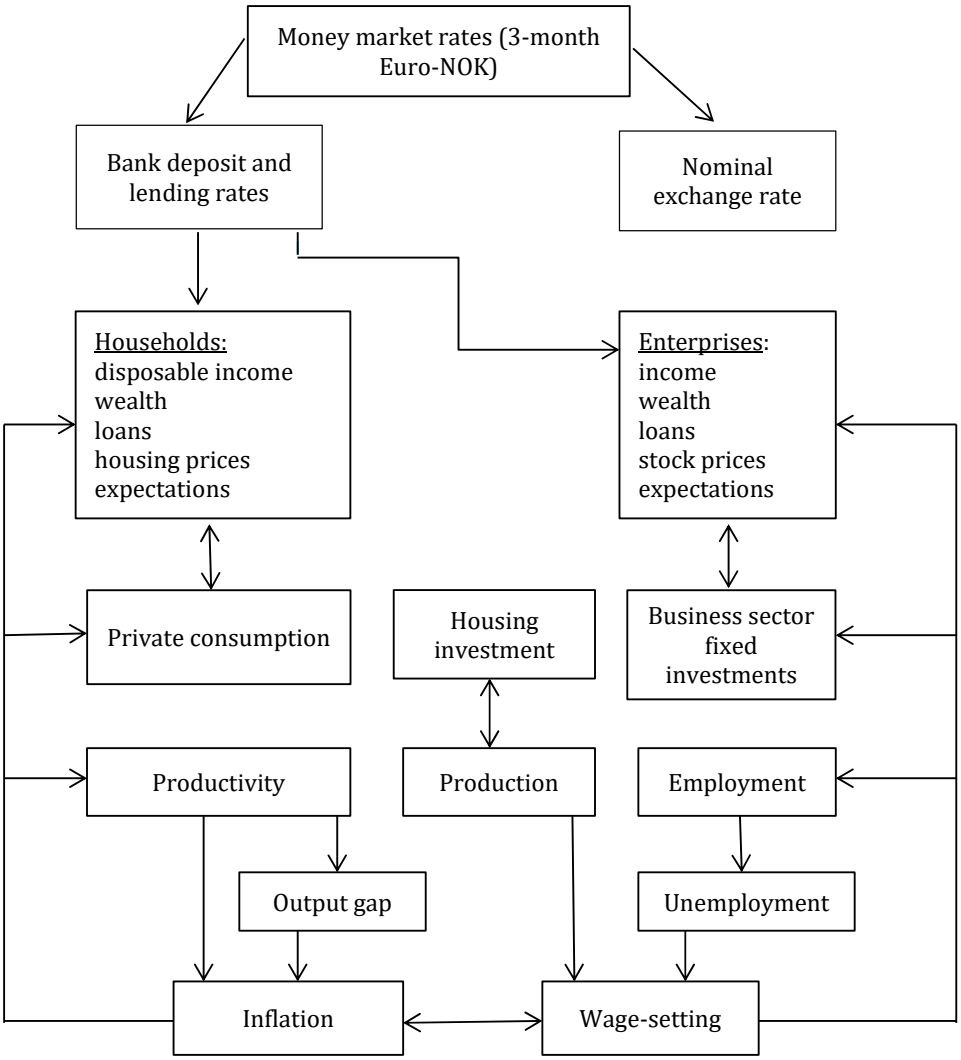


Figure 1. Interets rate channels in RIMINI given constant exchange rate

Source: Bårdsen, G. et al., 2010, pg. 13

Article history:	Received: November 27, 2019
	Accepted: May 23, 2020