XXVII Интернационални научни скуп
Стратегијски менаџмент
и системи подршке одлучивању
у стратегијском менаџменту
SM2022
Subotica (Srbija), 20. Maj 2022. godine

Stefan Stojkov
Економски факултет у Суботици, Asistent
Суботица, Србија
stefan.stojkov@ef.uns.ac.rs

Emilija Beker Pucar
Економски факултет у Суботици
Суботица, Србија
emilija.beker.pucar@ef.uns.ac.rs

Olgica Glavaški
Економски факултет у Суботици, Суботица,
Србија
olgica.glavaski@ef.uns.ac.rs

Marina Beljić
Економски факултет у Суботици, Asistent
Суботица, Србија
marina.beljic@ef.uns.ac.rs

EXCHANGE RATE PASS-THROUGH ASYMMETRY: THE CASE OF THE EURO-ZONE

Abstract: An essential aspect of deepening the level of economic integration between European economies is the reduction of mutual economic disparities, which is especially emphasized by the formation of the supranational monetary authority of the Euro-zone member states. However, fixing the currency for the euro and losing monetary sovereignty in the circumstances of a structurally heterogeneous system meant that the same monetary policy provoked different repercussions for member states. This research aims to point out the differences in the exchange rate transmission mechanism between the representatives of two groups of Euro-zone member states: the core of the EZ (Germany, Finland, Belgium, and France) and the periphery of the EZ (Greece, Spain, Portugal, Ireland), in the 1999M1-2021M1 time horizon. Empirical findings are based on estimates of the VAR model, i.e. derived impulse response functions in the circumstances of shock transmission (nominal effective exchange rate) to inflation (consumer price index). The results of the research indicate the asymmetry of the exchange rate transmission mechanism in terms of a more pronounced and longer degree of exposure of peripheral economies to shocks of the nominal exchange rate compared to the representatives of the core of the Euro-zone. Empirical findings confirm the asymmetry of the exchange rate transmission mechanism as one of the indicators of the weakness of the Euro-zone, given the inflationary diversity and the consequent anomalies of the monetary union with heterogeneous membership.

Keywords: Exchange rate, Euro-zone, Monetary policy

АСИМЕТРИЈА ТРАНСМИСИЈЕ ДЕВИЗНОГ КУРСА: СЛУЧАЈ ЕВРО-ЗОНЕ

Апстракт: Суштински аспект продубљивања нивоа економске интегрисаности између Европских економија представља редуковање међусобних економских диспаритета, што се посебно акцентује формирањем супранационалне монетарне власти земаља чланица Евро-зоне. Но, фиксирањем валута за евро и губитак монетарног суверенитета у околностима структурно хетерогеног система значило је да иста монетарна политика изазива различите реперкусије по земље чланице. Ово истраживање има за циљ да укаже на разлике трансмисионог механизма девизног курса између представника две групе земаља чланица Евро-зоне: језгра ЕЗ

(Немачка, Финска, Белгија и Француска) и периферије ЕЗ (Грчка, Шпанија, Португалија, Ирска), у временском периоду 1999М1-2021М1. Емпиријски налази су базирани на оцени ВАР модела односно изведеним функцијама импулсног одзива у околностима трансмисије шока (номинални ефективни девизни курс) на инфлацију (индекс потрошачких цена). Резултати истраживања указују на асиметрију трансмисионог механизма девизног курса у смислу израженијег и дужег степена изложености периферних економија на шокове номиналног девизног курса у поређењу са представницима језгра Евро-зоне. Емпиријски налази потврђују асиметричност трансмисионог механизма девизног курса као једног од показатеља слабости Евро-зоне, с обзиром на инфлаторни диверзитет и последичне аномалије монетарне уније са хетерогеним чланством.

Кључне речи: Девизни курс, Евро-зона, Монетарна политика

INTRODUCTION

Immediately after the losses brought by the Second World War, the concept of economic integration clearly took hold. The development of integrations itself in the years to come is reflected in the creation of numerous foreign trade agreements that eventually culminate in the establishment of the European Union (EU). However, economic integration reaches the peak of its development with the emergence of monetary integration. The idea of the European Monetary Union (EMU) was to promote the liberalization of capital and monetary flows and to reduce transaction costs through the introduction of a single currency (Devereux, Engel & Tille, 2003). The benefits of the Euro-zone (EZ) were mainly intended to reduce the great heterogeneity of European economies between the EZ core and the EZ periphery in terms of their economic development. On the other hand, fixing the exchange rate of all EMU members meant not only giving up sovereign monetary policy, but much more. It is feared that policy inadequacies could lead to spillover effects that would bring about the collapse of economically connected countries much more quickly. This poses the greatest threat to members whose macroeconomic situation in the country is not consistent with the monetary policy actions of EMU. The key indicator related to the design of an appropriate monetary policy is the exchange rate, which, through its transmission to consumer prices, influences the formation of inflation expectations and the allocation of government spending (Burlon, Notarpietro & Pisani, 2018).

This research aims to compare two groups of countries, EZ core and EZ periphery, in order to determine the strength of exchange rate transmission to domestic consumer prices and thus greater sensitivity of peripheral countries to exchange rate shocks. Knowing the intensity of exchange rate transmission to the domestic economy makes it easier to determine whether the monetary policy of the observed country is pro-cyclical or counter-cyclical.

France, Germany, Belgium, and Finland were taken as representatives of the EZ core, on the other hand, the EZ periphery consists of Greece, Spain, Ireland, and Portugal. The aim of the research is related to proving a lower degree of elasticity of domestic consumer prices due to the exchange rate shock in the EZ core relative to the EZ periphery in the period 1999M1-2021M1. A lower degree of price elasticity indicates fewer fluctuations in the inflation rates of the EZ core countries in the observed period and thus a higher degree of economic stability in the event of external shocks. This indicates the adjustment of economic policy is oriented toward the macroeconomic state of the EZ core countries. In order to isolate the reaction of domestic prices to exchange rate changes, the authors use the VAR model that is most suitable for showing the strength of transmission effects through the impulse response function (Tsagkanos, Evgenidis & Vartholomatou, 2018). Determining the existence of endogenous asymmetry of exchange rate transmission in the EZ points to different levels of pass-through effects among the structurally different economies. This indicates to us that the members of the EZ may need to fight against certain monetary problems and that the policy they are pursuing is not directed towards solving them.

The paper is structured as follows: After the introductory section, Section 1 deals with a descriptive analysis of key EZ indicators. Section 2 explains the model used in the research along with the interpretation of the key research results. Concluding remarks are presented in the last section of the paper.

1. DESCRIPTIVE ANALYSIS: EZ CORE VS EZ PERIPHERY

Understanding the implications of the exchange rate transmission mechanism is particularly relevant when we consider the structural heterogeneity of EZ member states. A higher degree of reaction of the domestic economy may indicate a higher level of vulnerability of the observed country to external shocks. What does this mean? If we have low levels of nominal exchange rate transmission to the domestic economy, any shock affecting foreign producers in terms of limiting production will not have a relevant impact on domestic consumers (Devereux & Engel, 2002). The answer is based on the fact that relative product prices will not fluctuate to the extent of high levels of substitution between the observed countries. On the other hand,

high levels of transmission can lead to exponential reactions of consumer prices in the direction of growth or decline, which can further have their implications on the domestic economy (Comunale & Kunovac, 2003). In such volatile situations of high exchange rate transmission, the existence of an autonomous monetary policy is extremely relevant. Why? The main reason is that the central monetary institution can react to the consequences of high levels of transmission with counter-cyclical measures (Ortega & Osbat, 2020). Such a reaction is possible if the central bank of a country has the credibility and trust of the real sector that the instruments applied will lead to the desired results. From the point of view of the real economy, changes in the exchange rate can directly affect the dynamics of prices of imported final products, which in turn affects the consumer price index. Indirectly, the dynamics of the exchange rate due to currency devaluation can lead to an increase in wages, which in turn can increase the prices of consumer goods (Ca'Zorzi, Hahn & Sánchez, 2007).

As noted above, the Euro-zone is characterized by a high degree of structural heterogeneity, but also by incentives to reduce differences in economic development among members. The less-developed members (EZ periphery) compared to the EZ core are taking advantage of the opportunities arising from the liberalization of monetary flows and have started to promote imports (Campa, Goldberg & Minguez, 2005). It should be pointed out that the increase of imports in the current account brings the problem of the current account deficit. The problems of the Euro-zone are highlighted here in the context of emphasizing the degree of divergence of European economies, where the same exchange rate policy for all members does not suit every country (Beker Pucar & Glavaški, 2020). In other words, some members face a current account deficit while others face current account surpluses. Without the option of a monetary policy response, countries with deficits must bear economic costs until the current account is adjusted (Beker Pucar & Glavaški, 2019). A higher level of imports implies higher volatility in the exchange rate, which activates consumer price transmission, which can negatively affect the country's level of economic activity. Figure 1 shows the evolution of the current account balance for the selected EZ core countries (Finland, France) compared to the current account balance for the countries of the selected EZ periphery (Portugal, Ireland) during the period 1999-2021. We can observe that the countries of the EZ periphery have a current account deficit during most of the observed period (as a consequence of import-oriented policies), in contrast to the core EZ countries, which have a surplus in the balance.

Figure 1: Current account balance (% od GDP), EZ core vs EZ periphery
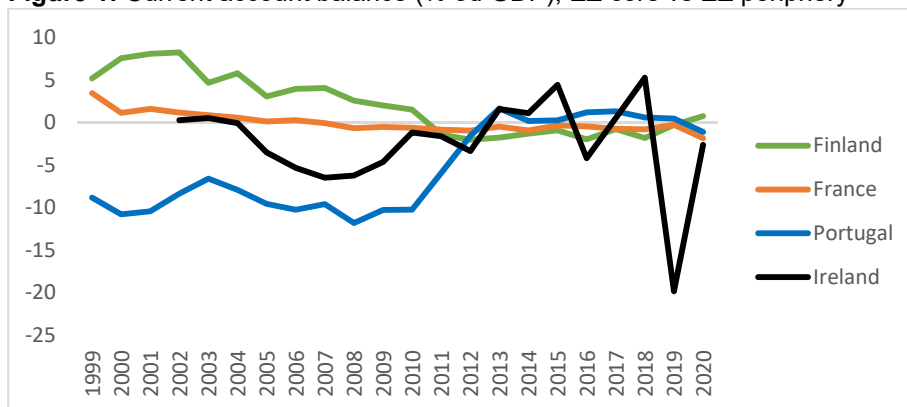
Source: authors' review according the yearly OECD data

We see that Portugal initially occupies the worst position in the current account during the observed period, with a deficit of up to 10% of GDP, while Finland initially occupies the best position. In addition to the surplus of the EZ core countries, we can see that in the period around 2014 there is an adjustment in the current account of the EZ periphery countries, which exponentially improves their deficit position in the current account. Ireland has high deficit rates due to a lack of investment income just before the pandemic crisis. Figure 2 shows us a comparison between the remaining members of the EZ core and the EZ periphery, where we see that the situation is relatively identical.

**Figure 2:** Current account balance (% od GDP), EZ core vs EZ periphery
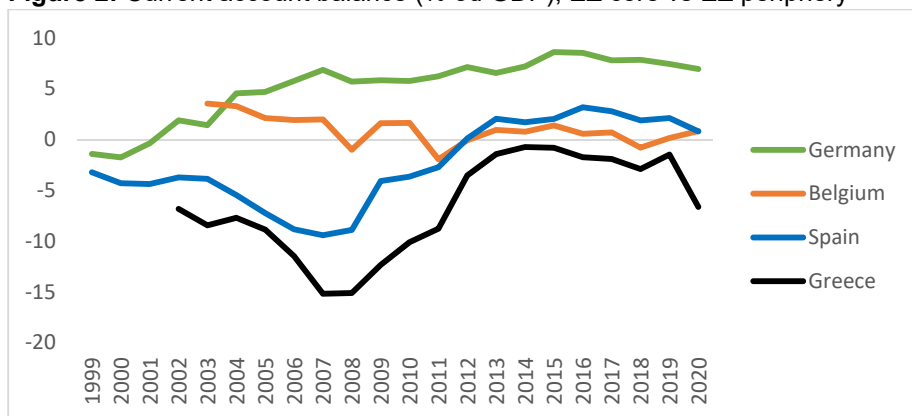
The worst position during the observed period is also the member of the EZ periphery, in this case Greece, while Germany is in the best position during most of the period as a member of the EZ core. After the 2014 period and the adjustment of the current account of the EU periphery, Greece still records a current account deficit, but at a correspondingly lower rate, while Spain improves its position toward a surplus.

Large current account deficits in the EZ periphery will increase countries' vulnerability to exchange rate fluctuations. Exchange rate pass-through can affect the economic activity of the Euro-zone member countries through direct or indirect channels, leading to deeper fiscal or monetary consequences (Cheikh & Rault, 2015). In countries where transmission is more pronounced, the negative effects will be more relevant in the absence of available monetary policy instruments. In terms of transmission, the degree of openness of the economy to non-EZ countries is important, as it leads to varying degrees of consumer price inflation from imported products (Campa & Minguez, 2004). Figure 3 shows that, on average, the countries of the EZ core register a higher level of GDP than the EZ periphery throughout the observation period. We also see that in the event of an external shock in the form of the Great recession of 2008, the EZ periphery countries experience a relevant decline in economic activity compared to the EZ core countries. This suggests that the EZ periphery is exposed to deeper and stronger effects of exchange rate transmission without the possibility of a sovereign adjustment mechanism (Cheikh & Rault, 2017) . We can observe that the EZ periphery faces the costs of recession until 2015, in contrast to the EZ core, which initially experiences a decline in economic activity, after which the movement returns to the previous growth trend. This means that the costs induced by the external shock will have to be borne for a much longer period than if it is possible to adjust the sovereign monetary policy to the macroeconomic state of the country.

Figure 3: Average GDP, EZ core vs EZ periphery
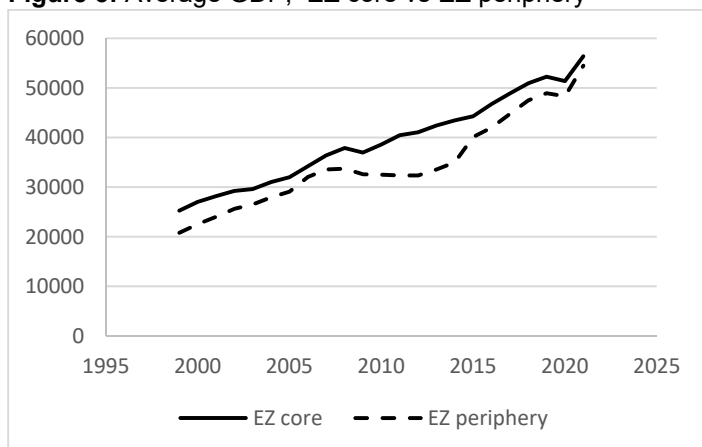
Figure 4 shows how the more pronounced effects of nominal transmission negatively affect consumer price movements. Milder exchange rate adjustments can lead to stronger inflation or deflation in the peripheral EZ member countries compared to the core EZ members. Initially, we see significant inflation rates in the EZ periphery, and then a constant alternation of expansionary and restrictive policies takes place, with the EZ periphery having a much stronger than desired effect relative to the EZ core. This indicates deeper repercussions of the same policies on the members of the EZ periphery which leads to more significant costs to their countries relative to the EZ core.

Figure 4: Average inflation level, EZ core vs EZ periphery
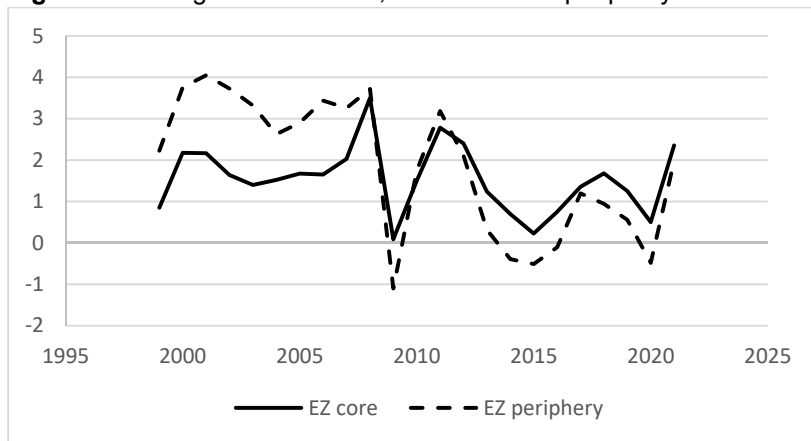
Source: authors' review according the yearly OECD data

2. Methodological framework
2.1 VAR model

The model consists of two groups of observed countries: EZ core countries (Belgium, Germany, France, Finland) and EZ periphery countries (Greece, Portugal, Spain, and Ireland). The motive for excluding Italy from the group of EZ periphery countries is related to the fact that in some studies Italy is considered an EZ core country; in order to obtain more transparent results, it is excluded from this research. The VAR methodology has been applied to each country separately so that the results obtained can be compared. All variables used in the research have a monthly frequency and are taken from the OECD database and the Federal Reserve Economic Data (FRED) for the period 1999M1-2021M1. The following variables were used in the research: (i) consumer price index, growth rate; (ii) nominal effective exchange rate of the Euro-area.
The VAR technique is best suited for constructing the impulse response function to determine the degree of transmission of the shock from one variable to another (Jin & Nadal De Simone, 2020). The first step was to test the stationarity of the observed variables using two formal stationarity tests: the augmented Dickey-Fuller (ADF) test and the Phillips-Perron unit root test. For all variables where the null hypothesis of non-stationarity is accepted, the variable is differenced to obtain its stationarity. The next step is to test the long-run cointegrated relationship between the observed variables of the same order of integration (Cheikh & Louhichi, 2013). The presence of cointegration was tested by the Johansen test, which indicated the absence of a long-run relationship in each of the observed countries. The VAR model includes the first differences of the non-stationary variables and all the original stationary variables. After confirming the stability of the VAR model and the absence of autocorrelation, we proceed to run the impulse response function showing the response of the consumer price index to the exchange rate shock.
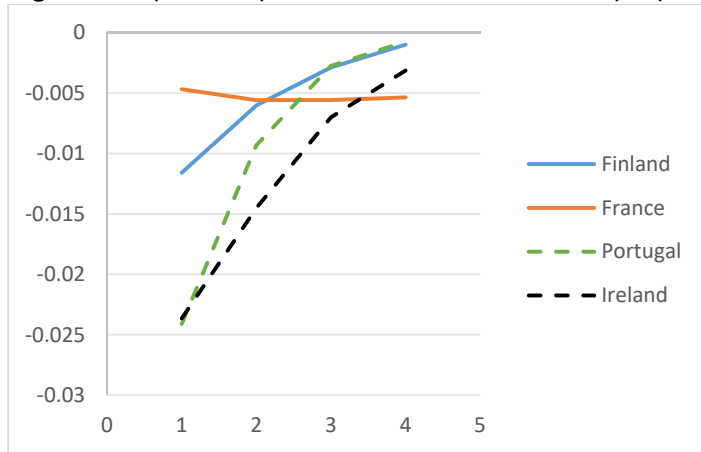
2.2 Results

As already indicated, the calculated impulse response function tells us the strength and duration of the transmission of the exchange rate shock (NEER) to the consumer price index (CPI). Economies exposed to longer and stronger transmission are more sensitive to both external shocks and policy measures (Özyurt, 2016). In other words, currency appreciation can lead to a differential decline in consumer prices due to changes in import prices. The impact on the real economy can be mitigated

by active monetary policy measures, which emphasize the importance of the country's sovereignty (Colavecchio & Rubene, 2020).

Looking at Figure 5, we see a key difference between the two groups of observed countries. On one side we have the members of the EZ core (Finland and France), on the other the members of the EZ periphery (Portugal and Ireland). The graph shows us how the appreciation of the nominal effective exchange rate leads to a decline in the consumer price index (inverse correlation). Figure 5 is based on the stronger effect of exchange rate transmission on the domestic consumer prices of the EZ periphery countries compared to the EZ core. We see that the impact of the exchange rate shock is most pronounced in the first month of each observed period, after which a gradual weakening occurs by the end of the fourth observed month. The stronger transmission within the EZ periphery suggests that the spillover effects on the domestic economy are more pronounced, implying that countries in the EZ periphery are much more exposed to exchange rate fluctuations than countries in the EZ core (Bandt, Banerjee, Koźluk, 2008).
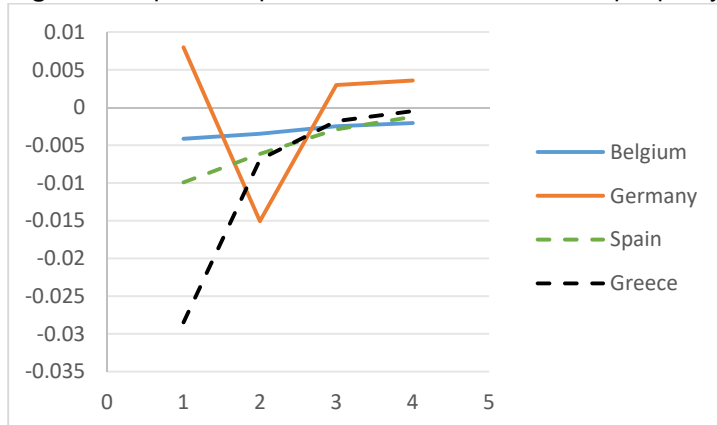
Figure 5: Impulse response function, EZ core vs EZ periphery

Source: Authors' estimations

Figure 6 shows us similar results when we compare the remaining EZ core countries (Belgium and Germany) with the remaining EZ periphery countries (Spain and Greece). The results show that in Germany the impact of exchange rate transmission on the domestic economy is more pronounced at the end of the second month, but this strong influence weakens at the beginning of the next period. Belgium exhibits weak transmission effects throughout the whole four months, which corresponds to the EZ core stability. Spain's transmission effects are not initially as strong as Germany's, but the shock effect persists until the end of the four-month period, indicating a long-term effect of transmission. Finally, looking at Greece, we find that the exchange rate transmission to the domestic economy is much more pronounced compared to the countries in the EZ core, and the effects are long-lasting.

Figure 6: Impulse response function, EZ core vs EZ periphery

Source: Authors' estimations

To better see the sensitivity of the EZ core and the EZ periphery to exchange rate fluctuations, we look at Figure 7, which compares the average values of the impulse response functions of the two groups of countries. We see that the transmission effects are much more relevant and stronger for the EZ periphery countries, indicating the asymmetry of the exchange rate pass-through between member countries. This finding is in line with Saiki (2011), as well as Bandt & Razafindrabe (2014). This is a consequence of the structural economic heterogeneity of the EZ member countries. The impact of exchange rate transmission on domestic prices is most pronounced in the first month presented for the countries of the EZ periphery, after which its influence becomes weaker. On the other hand, the impact of exchange rate transmission on consumer prices is strongest in the second month for the EZ core countries due to the lagged effects in Germany. After the second month, the effects weaken. This suggests that identical supranational monetary policies will lead to different effects on the domestic economy for both groups of countries.

Figure 7: Average impulse response function, EZ core *vs* EZ periphery
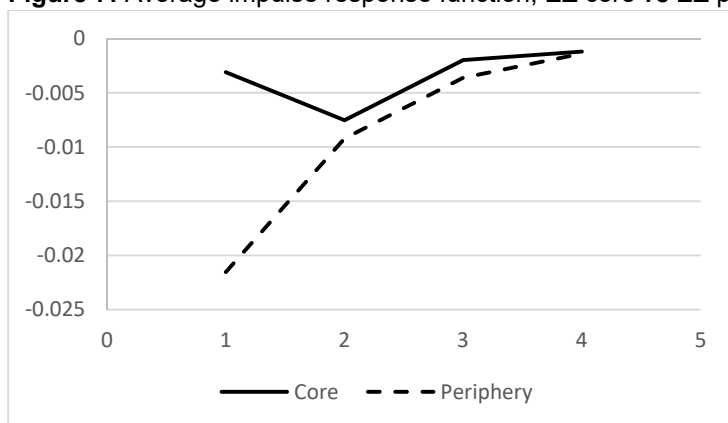
Source: Authors' estimations

3. CONCLUDING REMARKS

The focus of economic integration on reducing the divergence of European economies was originally a good idea in terms of diminishing economic disparities between countries. It culminated with the creation of the European Monetary Union (EMU) or the Euro-zone (EZ), when 19 EU countries have joined to date. EZ member states gave up their monetary sovereignty in exchange for promoting other aspects of economic development. The liberalization of capital movement restrictions allows for the stimulation of economic development, the development of financial markets, and the increase of trade flows between EZ member states.

However, the fixing of the exchange rate has brought monetary problems caused by the regular functioning of an overly divergent monetary system. Namely, the countries of the EU periphery (Greece, Spain, Portugal, and Ireland) promote their share of imports towards the EZ members, but also towards other countries of the EU. This leads to an increase in exchange rate fluctuations, which affect each member state differently. The question is why? Primarily because of the structural heterogeneity of the countries belonging to the monetary union, the different levels of development of financial markets, the functioning of transmission channels to the real sector, and political solidarity. In the absence of sovereign monetary policy instruments that allow for countercyclical movements, the effects of transmission will be much more pronounced for the countries of the EZ periphery. The negative effects of more pronounced transmission will persist over a much longer period of time, affecting the real sector of these countries.

The focus of this paper is to highlight the different degrees of exchange rate transmission in core and peripheral EZ countries and to point out the sacrifice of peripheral EZ countries in terms of sovereign monetary and exchange rate policies. The main difference between the observed countries lies in the degree of structural development as well as in the orientation of policies toward imports. As a result, peripheral EZ countries are more exposed to exchange rate shocks, which have a greater impact on the domestic economy through consumer prices. Euro-zone adjustment mechanisms are concentrated toward the more stable EZ core, suggesting a long-term response to the costs of the EZ periphery.

The VAR model was used to point out the differences in exchange rate transmission to consumer prices between the two groups of countries over the period 1999M1-2021M1. The transmission is presented separately for each EZ core country (Germany, France, Belgium, Finland) and EZ periphery (Greece, Portugal, Spain, and Ireland) to clearly compare the different strengths of the effects between the two groups. The results of the VAR model suggest stronger and longer effects of the

exchange rate shock on consumer prices in the EZ periphery, with the EZ core countries also showing significantly lower results. In particular, EZ periphery countries are more exposed to exchange rate fluctuations, and policy measures to absorb the negative effects are not implemented, as EZ core countries do not need severe adjustments. Therefore, the question is whether the benefits of the monetary union outweigh the losses of monetary sovereignty having in mind specific heterogeneous groups of EZ membership.

REFERENCES

Bandt, O., Banerjee, A. & Koźluk, T. (2008). Measuring Long-Run Exchange Rate Pass-Through, Economics, Volume 2 Issue 1, https://doi.org/10.5018/economics-ejournal.ja.2008-6

Bandt, O., & Razafindrabe, T., (2014). Exchange rate pass-through to import prices in the Euro-area: A multi-currency investigation, *International Economics*, Volume 138, August 2014. https://doi.org/10.1016/j.inteco.2014.01.001

Beker Pucar, E. & Glavaški, O. (2020). The Role of Exchange Rate on the Road towards the Euro Area: The Case of Baltic and Central Emerging European Economies, *Ekonomický časopis*, 68.

Beker Pucar, E. & Glavaški, O. (2019). MACROECONOMIC EXTERNAL (IM)BALANCES WITHIN THE EUROZONE: CORE VS PERIPHERY, *ECONOMIC THEMES* (2019) 57(3): 257-272, DOI 10.2478/ethemes-2019-0015

Burlon, L., Notarpietro, A. & Pisani, M. (2018). Exchange rate pass-through into euro area inflation. An estimated structural model, *Banca D'Italia*, Working Papers, Number 1192.

Campa, J., Goldberg, L. & Mínguez, J. (2005). EXCHANGE-RATE PASS-THROUGH TO IMPORT PRICES IN THE EURO AREA, *NATIONAL BUREAU OF ECONOMIC RESEARCH*, NBER Working Paper No. 11632

Campa, J. & Mínguez, J. (2004). Differences in Exchange Rate pass-through, *Center for Economic policy research*, Discussion paper No. 4389, May 2004.

Ca' Zorzi, M., Hahn, E. & Sánchez, M. (2007). Exchange rate pass-through in emerging markets, *ECB Working Paper*, No. 739

Cheikh, N. & Rault, C. (2015). Recent Estimates of Exchange Rate Pass-Through to Import Prices in the Euro Area, *Center for Economic Studies*, CESifo Working Paper No. 5341.

Cheikh, N. & Rault, C. (2017). Investigating First-Stage Exchange Rate Pass-Through: Sectoral and Macro Evidence from Euro Area Countries, *Center for Economic Studies* , CESIFO WORKING PAPER NO. 6366

Cheikh, N. & Louhichi, W. (2013). The Exchange Rate Pass-Through in a Cointegrated VAR Model, MPRA Paper No. 53250

Colavecchio, R. & Rubene, L. (2020). Non-linear exchange rate pass-through to euro area inflation: a local projection approach, ECB Working Paper, No. 2362

Comunale, M. & Kunovac, D. (2003). Exchange rate pass-through in the euro area, *ECB Working Paper*, No. 2003, http://dx.doi.org/10.2866/743801

Devereux, M., Engel, C. & Tille, C. (2003). Exchange rate pass-through and the welfare effects of the euro, *International economic review*, Vol. 44, February 2003.

Devereux, M. & Engel, C. (2002). EXCHANGE RATE PASS-THROUGH, EXCHANGE RATE VOLATILITY, AND EXCHANGE RATE DISCONNECT, *NATIONAL BUREAU OF ECONOMIC RESEARCH*, NBER Working Paper 8858.

Ortega, E. & Osbat, C. (2020). Exchange rate pass-through in the euro area and EU countries, *ECB Occasional Paper*, No. 241

Özyurt, S. (2016). Has the exchange rate pass through recently declined in the euro area?, *ECB Working Paper*, No. 1955

Saiki, A. (2011). Exchange Rate Pass-Through and Monetary Integration in the Euro Area, *DNB Working Paper*, Working Paper No. 308

Tsagkanos, A., Evgenidis, A. & Vartholomatou, K. (2018). Financial and monetary stability across Euro-zone and BRICS: An exogenous threshold VAR approach, *Research in International Business and Finance*, Volume 44, April 2018, Pages 386-393

Jin, X. & Nadal De Simone, N. (2020). Monetary policy and systemic risk-taking in the Euro area investment fund industry: A structural factor-augmented vector autoregression analysis, *Journal of Financial Stability*, vol. 49, DOI: 10.1016/j.jfs.2020.100749