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Original Scientific Paper

SUPPORTING IMMIGRATION FOR AN ENHANCED AGRICULTURAL SUSTAINABLE DEVELOPMENT WITHIN THE EUROPEAN UNION

UDC 314.742(4-672EU)
338.43: 502.131.1(4-672EU)

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Abstract. *Given the amplitude of migration in Europe and its potential to encourage or hinder the agricultural development, the general objective of this paper is to assess this possible potential on the long term, within a sustainable development frame of reference. Along these lines, we have built up several scenarios that focus on the agricultural results attained by ten EU Member States mainly targeted by immigrants, throughout the 2020-2025 period (sustainable development extrapolation). We have elaborated a set of indicators and within a panel in order to implement the spatial analysis and structural equation modelling (SEM), as methodological endeavour. The results obtained, verified by testing four hypotheses, show that a positive tendency in terms of increased government agri-innovation support is revealed on the long run, through the economic (labour) migration. Our findings outline that conclusive results of labour immigration could reverse generating unbalances in the agricultural sector. Thus, the need to develop accurate tailored policies is more than necessary by acknowledging the complex problems of the rural areas and those of international migration, as well as the major discrepancies among countries and stronger socio-economic interconnections.*

Key words: *agriculture sector, international migration, European integration, sustainable development, econometric modelling*

JEL Classification: J61, Q10, C31

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1. INTRODUCTION

Around the world, agriculture represents an important sector, especially by considering its development potential (37% agricultural land out of the total land area in 2014, according to the World Bank, 2017). Still, "due to its dependence on natural factors" (Arisoy et al., 2017, p. 234), agriculture generates annual fluctuations of producers' income, due to the specific uncertainties (Cristea et al., 2008). This fact, in the long run, "leads to the migration of farmers" (Arisoy et al., 2017, p. 246), thus inducing complex implications upon the agriculture's results.

The global updated statistics reveal the magnitude of international migration, from which a high share of migrants are rural people, "revealed by the fact that around 40 percent of international remittances are sent to rural areas" (FAO, 2017a, p. 98).

A series of migration research (e.g. Card et al., 2010; Krause et al., 2016), and especially those focused on the Brexit implications after the June 2016 decision (e.g. Kierzenkowski et al., 2016), have mainly analysed its effects by considering various factors. However, the overall implications of migration, in Europe, on the agriculture field have been less analysed by specialists, although this sector has a considerable potential, mainly through the agricultural land. At the same time, there are a number of studies that have studied the impact of migration upon agriculture in North America (e.g. Barkley, 1990; Martin, 1993), Latin America (e.g. Balan, 1983; Aide & Grau, 2004) and Asia (e.g, Sunam, 2017). In Europe, however, there are few studies taking into account the migration implications upon the agricultural sector and most of these have outcomes for a particular country, such as Albania (Miluka et al., 2010). In a previous research into this field, we have investigated (Cristea & Noja, 2019) these complex implications at the level of the main targeted ten European Union (EU) countries, for the period 2000-2016.

Based on this framework, the general objective of this research is to forecast the implications of immigration upon the agriculture field on the long term (2020-2025 period), within the sustainable development goals (SDGs), for ten European Union Member States (MS) mainly targeted by immigrants (namely Germany, France, the UK, Austria, Sweden, Italy, Spain, Belgium, Denmark and Finland). Thus, this research represents a further enhancement of that made by Cristea and Noja (2019), on the fore of sustainable development. The SDGs are applied to all 193 countries of United Nations (UN), globally, without any distinction for "developed" or "developing" states. The SDGs are also centralized by the European Union (EU) Statistical Office (Eurostat database) for each country, both MS, and non-EU countries.

The next section of the paper comprises a synthesis of literature review, summarizing the main findings on migrants' implications upon the agricultural sector in different economies, along with the current situation of migration flows and main agricultural outcomes in the EU. Further are presented the data and the methodology applied, followed by main results, discussions and concluding remarks in the final stage of our research.

2. THE LITERATURE REVIEW

2.1. Main findings of previous researches

There are several studies, which analyse the agriculture under the impact of the migration process around the world; still, in Europe, these potential implications did not represent a prevailing subject for researchers.

Thus, for *the North America* region, Barkley (1990) applied aggregate data for migration in the United States of America (USA) and „a two-sector model of occupational choice" (Barkley, 1990, p. 567) for the labour outputs in agriculture. He highlighted the importance of accurate policies for increasing the farms' income, with a further impact on the employment levels in agriculture. Martin (1993) studied the impacts of trade and migration upon agriculture in Mexico under the North American Free Trade Agreement (NAFTA). He pointed out that this kind of agreement between USA and Mexico would generate annual increase of migration from Mexico towards USA on the short-term by 100,000 persons. For the long-term, NAFTA is a keystone for reducing emigration from Mexico by enhancing the economic growth and better job creation in Mexico. The author found that the policies on the labour market of the hosting countries (e.g. USA), and also the regulation on the migrants' countries (e.g. Mexican land reforms, privatization, and deregulation) would influence the migration process.

For Latin America, Balan (1983) investigated internal migration in relation with the social structure of agriculture for a period of 100 years, which, in the last stage, "led to the declining importance of peasant production and the increasing importance of wage labour" (Balan, 1983, p. 151). Studying migration in Latin American on the background of globalization, Aide and Grau (2004) have drawn up into attention the need for "social programs on preparing rural migrants for an urban environment and promoting ecosystem recovery in the marginal agriculture" (Aide & Grau, 2004, p. 1915). They underlined the impact of the urbanization process determined by rural-urban migration on the agricultural field, especially, on ecosystem conservation.

For Asia, Sunam (2017) highlighted the fact that for some researchers and policy-makers the path to prosperity would be the non-agrarian sectors, while others consider land of major importance, especially, in poverty decreasing. He criticizes the narrow framework of their analysis, which overtakes the "strong linkages between agriculture, migration and rural labour, but also stay silent on how rural people interpret changes or continuities in their livelihoods" (Sunam, 2017, p. 67).

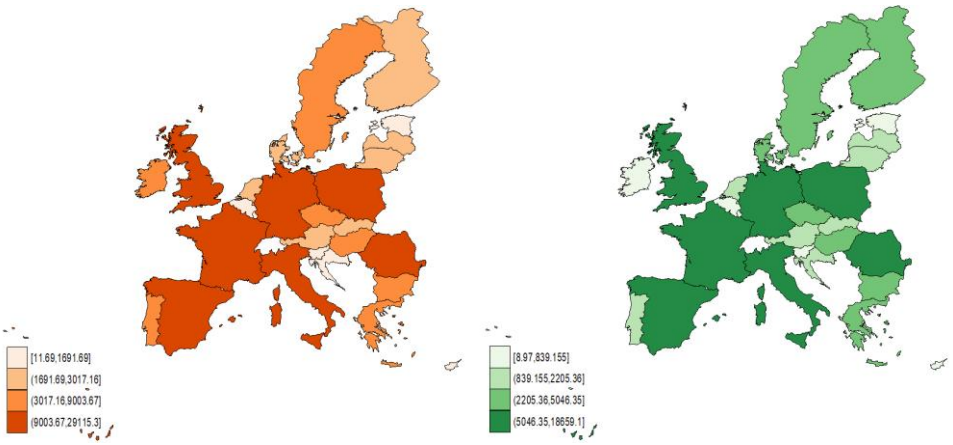
Working in the agricultural area, "is associated with low and insecure incomes, poor occupational safety and health conditions, gender inequality in pay and opportunities, and limited access to social protection" (FAO, 2017a, p. 100). Also, Barone and Mocetti (2011) attest that low-skilled migration tends to grow participation among native women to labour market, thus generating the increase of productivity and output in the agricultural sector. Therefore, Boswell (2016) underlines the necessity for better "*training and education policies (ALMPs)"* for natives (e.g. British labour force) since a significant reduction of labour will generate damaging effects, including in the agricultural sector. Card et al. (2010) identified and evaluated another variable, "*the passive labour market policies (PLMPs)",* with major effects over the labour market, which refer mainly to: keeping the income for "the unemployment period through unemployment benefits; the earlier retirement which

facilitate total or partial retirement of elder workers with decreased possibilities in finding a job" (Cristea & Noja, 2019, p. 120).

Regarding migration, since most policy-makers from developing countries tried to diminish it, or even to ignore it, they recommend to sustain migration, "becoming aware of its potential", by following priorities: "reducing the costs and risks faced by migrants; ensuring that entitlements to state services are portable; facilitating remittances; improving accountability and transparency in labour markets; and raising awareness of labourers' rights" (Wiggins & Deshingkar, 2007, p. 3). In Europe, the Brexit decision (being in process of finalization at the end of October 2019) will have a significant impact upon migration flows. A possible diminishing of migration inflows could generate negative effects (especially for the UK), particularly for low-salary fields, mainly targeted by migrants, such as manufacturing, care jobs, food processing (Rienzo & Vargas-Silva, 2012).

2.2. Current situation of agriculture and international migration within the EU

In 2015, within EU-28, *the total utilized agricultural area* was of 43% of EU land area, and comprised the following components: *arable land*, 59.74% of the total utilized area; *permanent grassland*, 33.36%; *permanent crops*, 6.55%; "*other agricultural land such as kitchen gardens* (small areas of total utilized agricultural area)" (European Commission, 2018). The highest share of *the total utilized agricultural area* (Figure 1a) is owned by France (16.06% of the EU-28), Spain (13.18%), the UK (9.46%), Germany (9.23%), Poland (7.94%), Romania (7.64%) and Italy (6.98%) (European Commission, 2018). The same countries accounted for the most significant *arable land* within the EU, in the following order: France, Spain, Germany, Poland, Romania, Italy and the UK (Figure 1b).



a) b)

Fig 1 Utilized agricultural area (a) and arable land (b) in EU, 2015
Source: Authors' processed in Stata, Eurostat data

However, although the share of agricultural land in the EU is quite high (above the average worldwide level of 37%) with considerable potential alongside farms and fisheries,

the agriculture's share in EU's GDP is very low, representing an average of 2.32% in 2016, compared to 4.26% in all EU MS, respectively 4%, globally (World Bank, 2017). Thus, we can notice that, on the one hand, among the countries with high agricultural potential there are mostly developed countries (France, Spain, the UK, Germany, Italy), even though the share of agriculture in these countries' GDP is not significant (1% of GDP for the UK and Germany, 2% for France and Italy, and 3% for Spain) (World Bank, 2017). On the other hand, Poland and Romania have a large share of agricultural area among EU-28 (ranks 5 and 6), being the most important agricultural producers from the EU-28 (Marcu et al., 2015; Done et al., 2012). Furthermore, these two countries face large emigration flows, with important negative spillovers "on the size and structure of the labour force" (Noja et al., 2018, p. 3), particularly in agriculture. Moreover, the highest contribution of agriculture to GDP among the EU countries is for: Bulgaria (5%), Croatia, Greece, Hungary, Latvia, Romania and Slovak Republic (4% of GDP in each country). These countries are mainly emigration or labour-exporting countries so as the migration process reflects negatively in terms of long-term economic development.

Nowadays, agriculture represents "the world's biggest employer and largest economic sector for many countries. Yet rural people – who produce 80 percent of our food – make up four-fifths of the global poor" (FAO, 2017b, p. 5). Thus, if at the global level, *the employees in agriculture* registered a share of 26.7% (866.3 millions) in the total number of employees in 2016 (3240 millions), for EU-28 this share was 4.3% in 2016 (9,771 thousand employees out of 226,716 thousand overall) found in a decreasing trend from 7.9% in 2000 (ILO, 2017). By comparing Eastern with Western Europe, the largest share of agricultural workers can be found in Eastern Europe with 9.4% of total employees, compared to 2.1% in Western Europe (Figure 2).

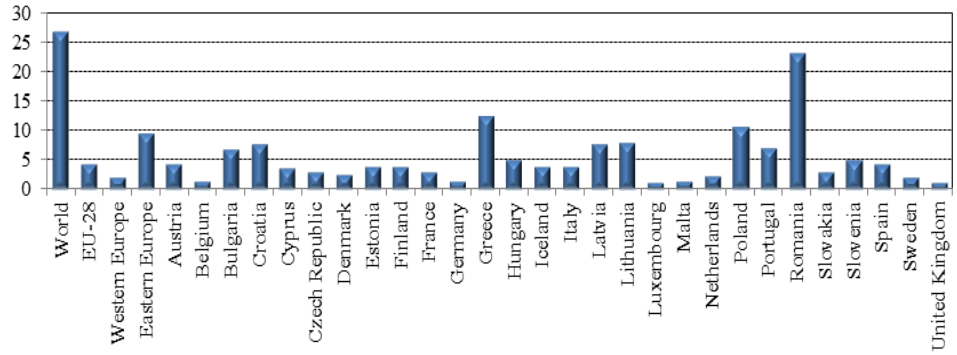


Fig 2 Shares of employment in agriculture in EU-28, 2016
Source: Own process data offered by the International Labor Organization (ILO)

Regarding *the international migration situation*, in 2015, large shares of international migrants were accounted for by Europe (over 31%), followed by Asia (up to 31%) (UN DESA, 2015). The total number of migrants in Europe (over 76 million people) has increased with almost 4 million people compared to 2014, representing 31.25% from the total stock of migrants at the worldwide level (over 243 million persons) (UN DESA, 2015). The highest share of migrants' stock in Europe is in Western Europe (35.96%), followed by Eastern

Europe (25.85%), encompassing mostly rural people, "revealed by the fact that around 40 percent of international remittances are sent to rural areas" (FAO, 2017a, p. 98).

The most targeted 10 EU countries by migrants in 2015 were: "Germany (12 million migrants stock), the UK (8.5 million), France (7.8 million), Spain (5.9 million), Italy (5.8 million), Sweden (1.6 million), Austria (1.5 million), Belgium (1.4 million), Denmark (572 thousands), Finland (315 thousands)" (Noja et al., 2018, p. 4). Bilaterally, the main migrant sending economies are in fact developing countries, with an important rural field into the economy and a high share of agricultural employees looking for cross-border low-skilled jobs (e.g. Poland, with 3.6 million of migrants, Romania, almost 3 million).

The inflow trend in 2016 compared to 2015 increases into the following EU-10 countries: Germany (by 30%), France (by 4%), Spain (by 18%), Sweden (by 26%), Austria (by 3%), Belgium (by 7%) and Finland (by 8%). The decreasing is registered into the UK (by -6%), Italy (by -21%), and Denmark (by -5%) (OECD, 2017). At the end of 2016, *the refugees' situation* registered "a total of 22.5 million displaced people, being considered the highest on record, although the annual rate of growth has slowed since 2012" (OECD, 2017, p. 31). Large shares of *asylum seekers* in Europe were registered by Germany and Italy, "Germany remained the top recipient, with over 720,000 applications, followed by the United States (262,000) and Italy (123,000)" (OECD, 2017, p. 32).

Thus, we can see a double trend in international migration, one regarding the *labour mobility* (migrants searching for better jobs), and the other, the flow of refugees and asylum applicants (called *"humanitarian migration*"). On these credentials reflecting the migration amplitude and agriculture potential in Europe, along with the Brexit phenomenon and attaining the SDGs by all countries, we further investigate our general and specific research objectives.

3. Data and Methodology

3.1. Data used

In our investigation, we analyse the data on the long term (2020-2025), within a sustainable development frame of reference, especially after the Brexit negotiation deadline (October 2019). Thus, we take into account the following dimensions for our data (variables), most of them included into the SDGs: *reducing poverty* (SDG1, "No Poverty"), highly connected with the agricultural sector; *well-being* (SDG3) through the life expectancy at birth; *quality of education* (SDG4), by educational attainment for tertiary education; *decent work* (SDG8) for which we measure labour market indicators, such as employment and unemployment rate, the labour market policies (ALMPs and PLMPs respectively); *industry innovation implications* (SDG9), by the research and development (RD) expenses for the business enterprise sector; *income and living conditions*, measured through net earnings. These dimensions are included into 3 categories of data, representing: *a) the main agricultural outcomes*; *b) the immigration situation*; *c) SDGs* presented above and other *representative indicators for the international activity*, namely: Foreign Direct Investment (FDI) (UNCTAD, 2017), and KOF index of globalization (KOF) (ETH Swiss Federal Institute of Technology Zurich, 2017).

Thus, *for the agricultural outcomes*, we've considered the following data: "Value Added by kind of economic activity (VA_AGRI), including agriculture, hunting, forestry,

fishing" (UNCTAD, 2017); "agricultural factor income per annual work unit (AGRI_AWU); government support to agricultural RD (GOV_AGRI)" (European Commission, 2018); "merchandise trade matrix - food group (X_FOOD); merchandise trade matrix - agricultural raw materials (X_AGRI_RM)" (UNCTAD, 2017). *The immigration situation* is measured by "flows of immigrants and foreign population (IMIG)" (European Commission, 2018; OECD, 2017), and "flows of asylum applicants" (ASYL) (UNHCR, 2017). *For SDGs attainment* (European Commission, 2018), we include in our research the following indicators*:* "at-risk-of-poverty rate" (POV); "life expectancy at birth" (LE); "educational level reflected through the educational attainment for tertiary education" (EDU_T); "employment rate" (ER); "unemployment rate of foreign population" (UR_F); "the active labour market policies" (ALMPs) and "the passive labour market policies" (PLMPs); "RD expenditures for the business enterprise sector" (BERD); "annual net earnings of a two-earner married couple with two children" (EARN).

The panel includes ten EU countries having highest immigration flows, analysed during 2020-2025 in order to reveal the long run effects (sustainable development), as extrapolation series based on statistical data for 2000-2016.

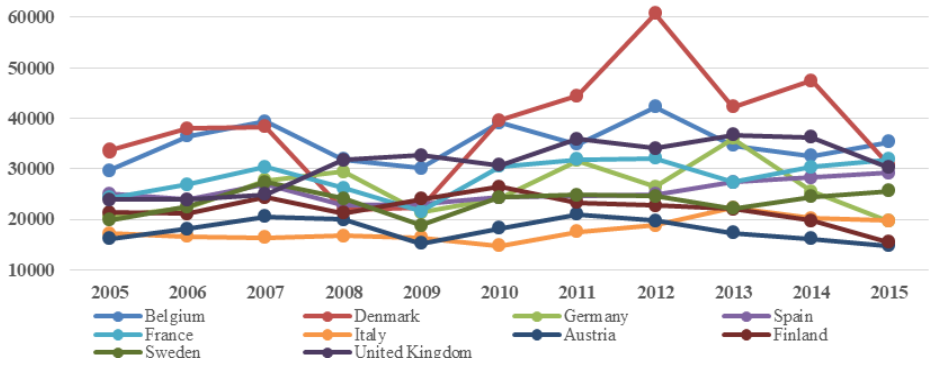


Fig 3 AGRI_AWU trends in EU-10 migrant receiving countries, during 2005-2015
Source: authors' process of Eurostat data

VA_AGRI, in 2015, is at the highest level in Italy and Spain (UNCTAD, 2017). AGRI_AWU appraises the productivity for the agriculture field, by counting "the income generated by farming, which is used to remunerate borrowed or rented factors of production (capital, wages and land rents) as well as own production factors (own labour, capital and land)" (European Commission, 2018). Annual work unit (AWU) represents "full-time equivalent employment (corresponding to the number of full-time equivalent jobs), i.e. as total hours worked divided by the average annual number of hours worked in full-time jobs within the economic territory" (European Commission, 2018). AGRI_AWU has registered extremely high levels in Denmark, especially after the global economic crisis in 2009, reaching a peak of 60,716 euro in 2012, well above the ones accounted by the other countries considered. However, Denmark currently faces major problems in this respect since AGRI_AWU has fallen severely starting with 2014 (Figure 3). Relatively constant high levels are registered in France, Belgium and Sweden during the entire time period.

GOV_AGRI data have registered a major increase in Germany after 2004, this country following an upward path afterwards, well above the one accounted by the other EU countries considered. At the same time, Spain has made important efforts to support RD in agriculture, with important positive output during 2004-2008 period. However, after the global crisis in 2008-2009 this support has significantly diminished, even though it is still above the one performed by most EU economies (Fig 4). France registered important contribution in RD for agriculture in 2016, and the UK saw a visible decrease in the amounts allocated for RD in agriculture.

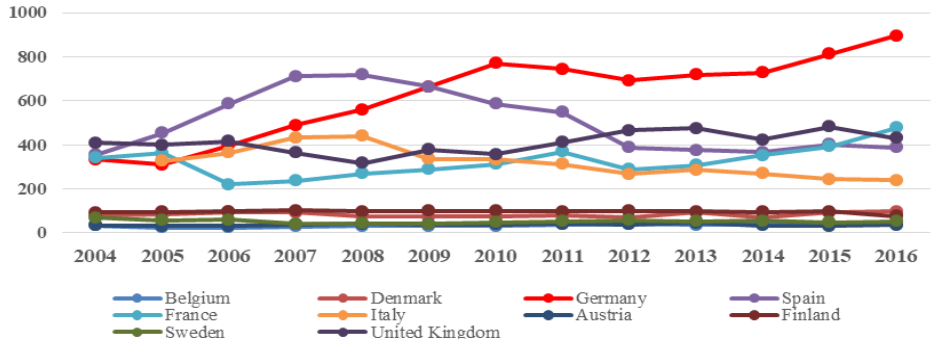


Fig 4 GOV_AGRI in EU-10 migrant receiving countries during 2004-2016
Source: authors' process of Eurostat data

X_FOOD and X_AGRI_RM capture "the international trade performance of the agricultural field" (Cristea & Noja, 2019, p. 117) in selected countries and reveal the importance of this sector for EU-10 economies. These two indicators highlight the dominant position for Spain (food) and Austria (raw materials) (UNCTAD, 2017).

3.2. Methodology applied into research

Based on our general objective and by reviewing the current state of the literature on agricultural results under the immigration impact, we have set out the following *research hypotheses (H)*:

- ***H1.*** *There is a strong relationship between VA_AGRI and IMIG/ASYL;*
- ***H2.*** *There is a strong relationship between AGRI_AWU and IMIG/ASYL;*
- ***H3.*** *IMIG and ASYL induce increased GOV_AGRI;*
- ***H4.*** *IMIG and ASYL improve X_FOOD and X_AGRI_RM.*

First, we have applied *the standardisation procedure* on our data, for a proper equivalence among EU-10 MS, and to remove the fluctuation and associated disparities within the panel, according to the Eq. (1) (OECD, 2005):

$$\text{“}y_i = \frac{x_i - mean}{sd}\ , \tag{1}$$

where: y_i represents the composite indicators, x_i is the crude value of the indicator; and *sd*, the standard deviation".

To forecast the variables during 2020-2025 we have applied *the linear extrapolation*, based on statistical time series for 2000-2016. "The extrapolation formula used is described by Eq. (2).

$$y(x) = y_1 + \frac{x - x_1}{x_2 - x_1}(y_2 - y_1), \quad (2)$$

where: x_1, y_1 and x_2, y_2 are the two endpoints of a linear graph; and x represents the point of which value is to be extrapolated" (Noja et al., 2018, p. 6).

Then, we have applied *particular macro-econometric models* in order to appraise the effects lead by immigration flows upon receiving economies' agricultural results, namely, *spatial analysis models* (lag and error), Eq. (3a) and (3b) (Viton, 2010).

- *"Spatial lag* models:

$$y = \lambda W y + X\beta + u, \quad (3a)$$

- *Spatial error* models:

$$y = X\beta + u, \;\; u = pWu + \upsilon, \quad (3b)$$

where: *W* is the *inverse distance weights matrix".*

The standard macro-econometric model for VA_AGRI as dependent variable is built up as "*a baseline panel regression model, but reconfigured through the spatial procedures"* (Eq. 4a) for lag model, and Eq. 4b for error model):

$$VA\_AGRI_{it} = \lambda WVA\_AGRI_{it} + \beta_0 + \beta_1 IMIG_{it} + \beta_2 ASYL_{it} + \beta_3 ER_{it} + \beta_4 BERD_{it} + \beta_5 ALMPs_{it} + \\ + \beta_6 EDU\_T_{it} + \beta_7 EARN_{it} + \beta_8 FDI\_I_{it} + \beta_9 FDI\_O_{it} + u_{it}, \quad (4a)$$

$$VA\_AGRI_{it} = \beta_0 + \beta_1 IMIG_{it} + \beta_2 ASYL_{it} + \beta_3 ER_{it} + \beta_4 BERD_{it} + \beta_5 ALMPs_{it} + \beta_6 EDU\_T_{it} + \beta_7 EARN_{it} + \\ + \beta_8 FDI\_I_{it} + \beta_9 FDI\_O_{it} + \rho Wu_{it} + \upsilon_{it}. \quad (4b)$$

The final stage of our methodology consists in applying the *structural equations modelling (SEM)*. SEM reveals the integrated analysis of immigration interlinkages (direct, indirect and total) with agriculture field. The general representation of SEM is shown into "equation system (5).

$$\begin{cases} b_{11}y_{2t} + \ldots + b_{1m}y_{mt} + c_{11}x_{1t} + \ldots + c_{1n}x_{nt} = \varepsilon_{1t} \\ b_{21}y_{2t} + \ldots + b_{2m}y_{mt} + c_{21}x_{1t} + \ldots + c_{2n}x_{nt} = \varepsilon_{2t} \\ \ldots\ldots\ldots \\ b_{m1}y_{1t} + \ldots + b_{mm}y_{mt} + c_{m1}x_{nt} + \ldots + c_{mn}x_{nt} = \varepsilon_{mt} \end{cases} \quad (5)$$

where: *t* is the number of time periods; b_{ij} represents the y_{ij} endogenous variable's parameters; c_{ij} are the x_{ij} exogenous variable's parameters, *i=1, …, m*; *j=1, …, n"* (Noja et al., 2018, p. 8).

4. Results and Discussions

4.1. Variables extrapolation

Figure 5 reveals the 2025 timeline forecast of the agricultural indicators included in our analysis (the sustainable development frame) for EU-10 countries. Thus, VA_AGRI is at the highest level in the UK and Belgium for 2025 (Figure 5a). These forecasts shed initial

lights on the importance of agriculture for the UK's economy after the major challenges encountered within the Brexit context. Relatively constant high levels for AGRI_AWU are registered in France and Belgium (the same tendency as in 2015) (Figure 5b). Considering GOV_AGRI, the UK saw a visible decrease in the amounts allocated for RD in agriculture due to Brexit (Figure 5c). High levels of RD in agriculture will be registered by France and Germany. X_FOOD will tend to increase in Germany and Spain (Figure 5d). X_AGRI_RM of the UK will tend to decrease considerably until 2025 (Figure 5e).

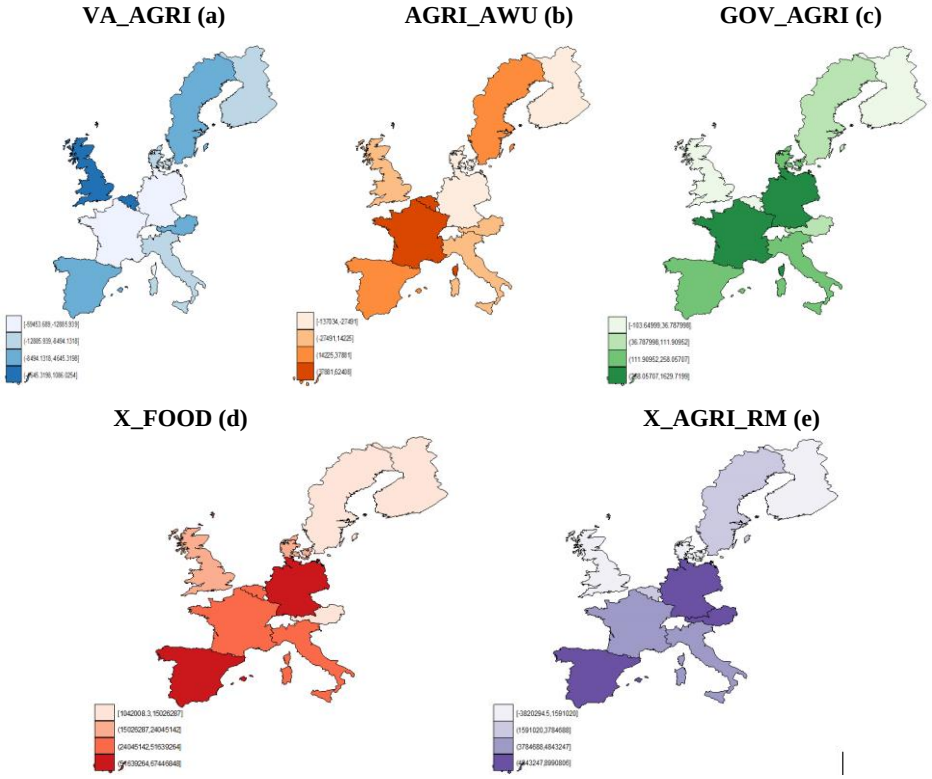


Fig 5 Agriculture outcomes forecast in 2025 for EU-10 MS
Source: authors' process in Stata

4.2. Spatial analysis models

Spatial results (Table 1) show that the immigration process requires a particular attention from policy makers across Europe, since our estimations for the 2020-2025 period reveal that *the positive outcomes of IMIG could reverse leading to unbalances even in the agricultural sector (the statistically significant estimated coefficient is –0.0569)*. This is also the case of humanitarian migration (ASYL), since the results point out that *increased inflows of ASYL tend to rather induce negative spillovers upon the VA_AGRI (the estimated coefficients are -0.111 and –0.131)*.

The uncertainty brought after 2020 reflects negatively also considering *FDI inwards, which generate a slight diminishing in the agricultural results*. Negative impacts are also registered for the ALMPs, and EDU_T, similar with those obtained for the period 2000-

2016 (Cristea & Noja, 2019). In contrast, beneficial results can be registered in case of *FDI outwards, with positive impacts on the agriculture's productivity*, thus raising the contribution of agriculture to GDP. Positive effects will be registered in terms of ER and EARN. Moreover, the results highlight *the significance of BERD in growing the VA_AGRI* (the estimated coefficients are positive and extremely significant at a threshold of 1%).

Table 1 Spatial lag and error models (robust and bootstrap) for VA_AGRI, 2020-2025

Variables	(1) Spatial_lag (robust)	(2) Spatial_lag (bootstrap)	(3) Spatial_error (robust)	(4) Spatial_error (bootstrap)
IMIG_st	-0.0354	-0.0354	-0.0569*	-0.0569*
	(0.0244)	(0.0310)	(0.0242)	(0.0275)
ASYL_st	-0.111***	-0.111***	-0.131***	-0.131***
	(0.0164)	(0.0168)	(0.0155)	(0.0174)
ER_st	0.273**	0.273*	0.286**	0.286*
	(0.0839)	(0.135)	(0.0875)	(0.114)
BERD_st	0.337***	0.337*	0.362***	0.362**
	(0.0904)	(0.148)	(0.0941)	(0.126)
ALMPs_st	-0.182***	-0.182***	-0.219***	-0.219***
	(0.0249)	(0.0178)	(0.0167)	(0.0230)
EDU_T_st	-0.0870***	-0.0870**	-0.0919***	-0.0919***
	(0.0182)	(0.0296)	(0.0192)	(0.0248)
EARN_st	0.0923***	0.0923*	0.102***	0.102**
	(0.0258)	(0.0407)	(0.0285)	(0.0326)
FDI_I_st	-0.0600**	-0.0600*	-0.0550**	-0.0550*
	(0.0197)	(0.0250)	(0.0212)	(0.0277)
FDI_O_st	0.0139	0.0139	0.0163	0.0163
	(0.0329)	(0.0368)	(0.0344)	(0.0435)
_cons	0.431	0.431	0.0426	0.0426
	(0.236)	(0.299)	(0.143)	(0.157)
Rho				
_cons	0.603*	0.603**		
	(0.304)	(0.227)		
Sigma				
_cons	0.220***	0.220***	0.223***	0.223***
	(0.0241)	(0.0203)	(0.0253)	(0.0242)
Lambda				
_cons			0.562	0.562
			(0.381)	(0.719)
Test parameters	chi2(10)= 141.29 p=0.0000	chi2(10)= 602.05 p=0.0000	chi2(10)= 675.34 p=0.0000	chi2(10)= 753.39 p=0.0000
LM	1.899	1.899	0.949	0.949
	(0.168)	(0.168)	(0.330)	(0.330)
Wald test	3.936	3.936	2.174	2.174
of rho/ lambda	(0.047)	(0.047)	(0.140)	(0.140)
Acceptable range for rho: -3.509 < rho < 1.000; Acceptable range for lambda: -3.509 < lambda < 1.000				
Moran's I IMIG I=0.429; p=0.000; ASYL I=0.241; p=0.000; VA_AGRI=0.254; p=0.000				
N	60	60	60	60

Note: standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: authors' research in Stata

These aspects were also underlined by Kierzenkowski et al. (2016), Jirasek (2017) and Cristea and Noja (2019), which proved that a reorient to innovation strategies combined with supporting the international trade activity, could overcome the potential difficulties registered after the Brexit.

The spatial lag models show that the positive evolution based on increased GOV_AGRI, X_FOOD and X_AGRI_RM is registered on the long-term (Table 2), but only under the influence of IMIG. For ASYL, the negative coefficients highlight the significance of "accurate strategies, policies and targeted measures to be applied by the major receiving countries to manage with growth immigration inflows and to properly cope with the refugee crisis in Europe" (Cristea & Noja, 2019, p. 118). The immigrants can be well integrated into receiving countries and can therefore increase the agricultural and overall outcomes, as reflected by our estimations, given an accurate harmonized strategy applied at the European level.

Table 2 Results of Spatial lag models, 2020-2025

Variables	(1) AGRI_AWU_st	(2) GOV_AGRI_st	(3) X_FOOD_st	(4) X_AGRI_RM_st
IMIG_st	0.0458	0.311***	0.486***	0.280***
	(0.0349)	(0.0275)	(0.0294)	(0.0461)
ASYL_st	-0.379***	-0.0835***	-0.0288*	-0.0335**
	(0.0408)	(0.0110)	(0.0127)	(0.0120)
ER_st	0.0606	-0.531***	-0.410***	-0.0639
	(0.148)	(0.0855)	(0.0806)	(0.0745)
BERD_e_st	0.483**	0.709***	-0.0630	0.213**
	(0.148)	(0.0757)	(0.0746)	(0.0647)
ALMPs_st	-1.144***	0.115***	0.321***	-0.190***
	(0.102)	(0.0283)	(0.0191)	(0.0371)
EDU_T_st	-0.0359	-0.131***	-0.127***	0.0305*
	(0.0261)	(0.0160)	(0.0159)	(0.0135)
EARN_st	-0.171**	-0.0612**	-0.374***	-0.323***
	(0.0640)	(0.0226)	(0.0285)	(0.0513)
FDI_I_st	0.296***	0.102***	-0.110***	0.0420**
	(0.0404)	(0.0189)	(0.0160)	(0.0134)
FDI_O_st	-0.203***	-0.371***	0.352***	-0.0504**
	(0.0507)	(0.0282)	(0.0219)	(0.0166)
_cons	2.089***	1.031***	1.162***	0.278**
	(0.201)	(0.0986)	(0.114)	(0.107)
Rho				
_cons	-0.0122	0.899***	-0.135	0.116
	(0.260)	(0.0992)	(0.132)	(0.426)
Sigma				
_cons	0.465***	0.253***	0.202***	0.197***
	(0.0383)	(0.0244)	(0.0226)	(0.0197)
N	60	60	60	60

Note: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: authors' research in Stata

Based on spatial lag models, we can say that: *H1. There is a strong relationship between VA_AGRI and IMIG/ ASYL is partially fulfilled (only for ASYL); H2. There is a strong relationship between AGRI_AWU and IMIG/ ASYL is partially fulfilled (only for ASYL);*

H3. IMIG and ASYL induce increased GOV_AGRI is partially fulfilled (only for IMIG); H4. IMIG and ASYL improve X_FOOD and X_AGRI_RM is partially fulfilled (only for IMIG).

4.3. SEM models

Considering SEM, we have verified Wald tests for equations, compared Likelihood Ratios (LR) outcomes (LR test for model versus saturated and baseline versus saturated) and Information criteria (Akaike's, Bayesian). Thus, we have obtained 5 models (VA_AGRI, AGRI_AWU, GOV_AGRI, X_FOOD and X_AGRI_RM) with conclusive results for 2020-2025 (Figure 6).

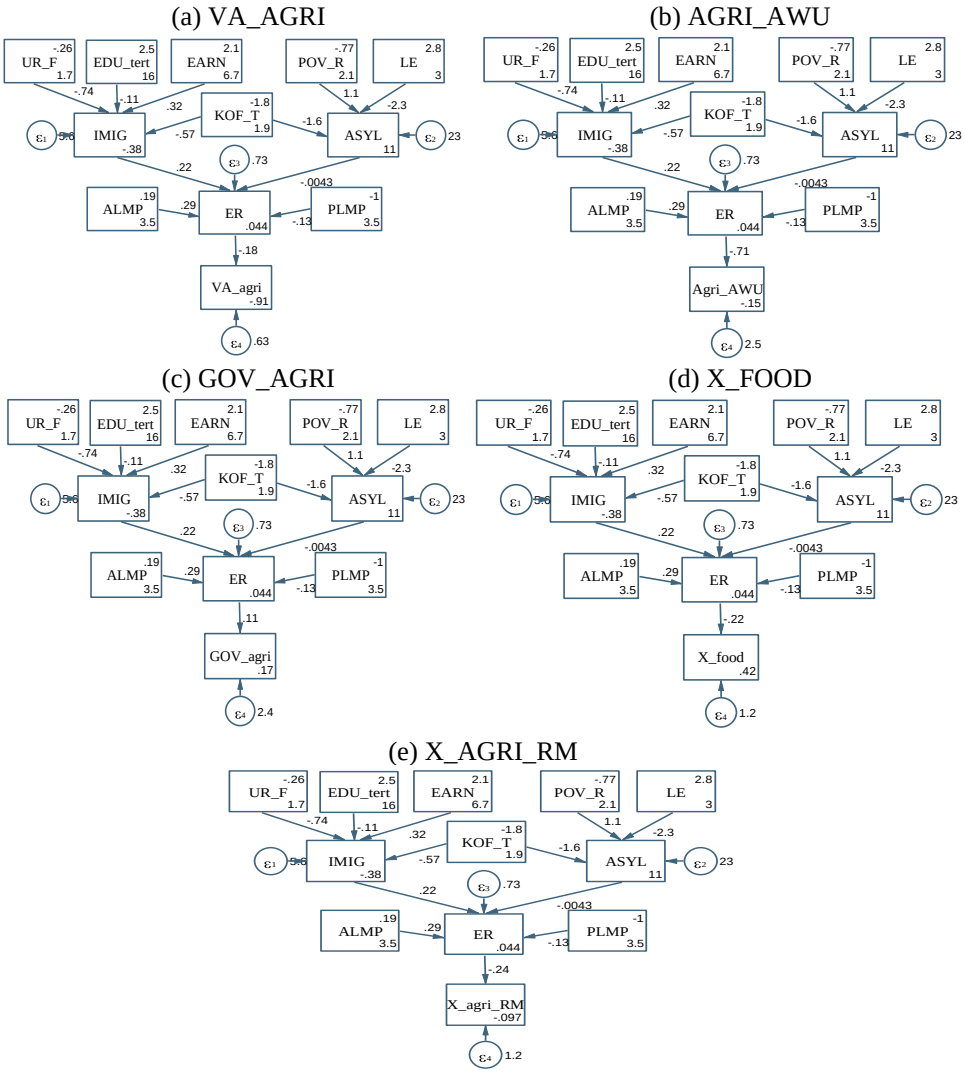


Fig 6 SEM models, EU-10 MS, 2020-2025
Source: authors' process in Stata

Thus, in the 2020-2025 sample, we acknowledge that the extrapolation procedure is subject to increasing uncertainty and the results obtained must be interpreted with caution. Still, also in this case, the major determinants of the migration decision are the employment opportunities for the foreign population, and the living standards at destination reflected here particularly through the earnings levels (0.32 estimated coefficient associated with the EARN variable). The results are opposite to Rienzo and Vargas-Silva (2012), which revealed a reversed connection between migration flows and migrant's earnings (especially for the UK), but also to Cristea and Noja (2019), revealing negative implications for the period 2000-2016. Moreover, the total employment rate (ER) increases significantly under the labour immigration effects (extremely statistically significant estimated coefficients for the IMIG variable, 0.22; while the ASYL coefficients are negative, but statistically insignificant). The further *impact of all these implications upon the agricultural sector for the 10-EU MS is positive only in terms of increased GOV_AGRI*, opposite to those obtained for the period 2000-2016 (Cristea & Noja, 2019). However, the estimations reveal that there is evidence to attest that an unfavourable implication on agricultural productivity (AGRI_AWU has a negative estimated coefficient of -0.71^{***} that is extremely statistically significant) at on this sectors' contribution to GDP (VA_AGRI estimated coefficient is -0.18^{*} significant at the 0.05 level), if the immigration process is not properly managed in the Brexit framework (deadline negotiations 2019). Moreover, there are also negative effects upon the international trade activity deployed in the agricultural sector as reflected through a reduction both in X_FOOD (-0.22 less statistically significant) and X_AGRI_RM (-0.24^{*} significant at the 0.05 level) in the light of new trade agreements established after the Brexit.

Thus, considering the SEM models, *H1, H2, H3 are fulfilled, and H4 is rejected*.

5. CONCLUSIONS

The results obtained, verified by testing 4 hypotheses (through both econometric modelling procedures applied, spatial analysis and SEM, respectively), highlight: a strong direct linkage between the value added by the agricultural sector and the immigration flows (mainly humanitarian migration) (H1); instead, the productivity in the agricultural sector (measured through the agricultural factor income per AWU) is affected (negatively) only by humanitarian migration, labour migration having no statistical significance (low intensity) (H2); immigration flows (economic migration) induce increased governmental efforts focused on research and development to sustain the agricultural sector (H3); immigration flows (economic migration) improve the international trade outcomes for the agricultural sector (basic food and raw materials) (H4).

Thus, the need to develop policies for building a *new Europe* is more than necessary by acknowledging the complex problems of the rural areas and those of international migration, especially on the background of Brexit decision, characterized by the redemption of major discrepancies and stronger socio-economic connections.

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PODRŠKA IMIGRACIJI ZA POBOLJŠANJE POLJOPRIVREDNOG ODRŽIVOG RAZVOJA UNUTAR EVROPSKE UNIJE

Uzevši u obzir veličinu migracija u Evropi i njihov potencijal da poboljšaju ili unazade poljoprivredni razvoj, opšti cilj ovog rada je da proceni njihove potencijalne dugoročne posledice, u okviru referentnog okvira održivog razvoja. S tim u vezi, razradili smo nekoliko scenarija koji se fokusiraju na poljoprivredni razvoj deset zemalja-članica EU sa najvećim prilivom imigranata, u period 2020-2025 (ekstrapolacija održivog razvoja). Razradili smo set pokazatelja da bismo implementirali prostornu analizu i modeliranje strukturalnih jednačina (SEM), kao metodološki napor. Dobijeni rezultati, verifikovani tertiranjem četiri hipoteze, pokazuju da se na duge staze otkriva pozitivna tendencija u smislu povećane državne podrške agri-inovacijama, kroz ekomomsku migraciju (migraciju radne snage). Naši nalazi u glavnim crtama daju da bi konačni rezultati migracije radne snage mogli da promene stvaranje disbalansa u poljoprivrednom sektoru. Stoga, potreba da se razviju precizne prilagođene politike je više nego potrebna, time što će se prepoznati kompleksni problem ruralnih oblast ii međunarodnih migracija, kao i velike razlike među zemljama i veća socio-ekonomska povezanost.

Ključne reči: *sector poljoprivrede, međunarodne migracije, Evopske integracije, održivi razvoj, ekonomski modelling*

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Original Scientific Paper

EFFECTS OF APPLYING DIFFERENT RISK MEASURES ON THE OPTIMAL PORTFOLIO SELECTION: THE CASE OF THE BELGRADE STOCK EXCHANGE

UDC 336.76(497.11)

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Abstract. *Despite its wide use in practice, Modern Portfolio Theory and Markowitz's approach to optimization, which is based on quadratic programming and the first two moments of the probability distribution of returns as major parameters, was faced with criticism. Therefore, standard Mean-Variance approach had been modified by applying more appropriate risk measures in optimization algorithm. The aim of this paper is to indicate efficiency of these models as well as justification of their usage in managing stocks portfolio on the Belgrade Stock Exchange.*

Key words: *portfolio optimization, alternative risk measures, Belgrade Stock Exchange*

JEL Classification: G32, G11, O16.

1. INTRODUCTION

Portfolio optimization represents one of the most important aspects of making investment decisions, based on the possibility of a successful assessment of the relationship between return and risk. For decades, in the selection of financial assets and the formulation of an optimal portfolio strategy investors have been dominantly using the Mean-Variance (MV) model (Markowitz, 1952), which forms the basis of Modern Portfolio Theory. Simplified starting assumptions regarding investors' preferences and return distribution, make it possible to form an optimization model, which, according to Markowitz's approach, is based only on the expected return and risk. However, none of the conditions of this model are sustainable in reality. Normal probability distribution is not an adequate model of empirical distribution of returns, characterized by asymmetry and heavy tails, so

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that in situations where there is a significant deviation from the expected value, the measures of central tendency and dispersion are no longer sufficient parameters to describe the distribution of returns or to optimize the portfolio.

In the mid-1990s, the MV model began to be critically observed and innovated to respond to investors' demands. Most of the criticisms relate to the parameters of the return distribution - the mean, as a measure of expected return, and the standard deviation, as a measure of risk, and their role in portfolio optimization. Due to the fact that the normal distribution does not have empirical significance in modeling financial series from contemporary markets, in many cases it has been observed that the form of distribution significantly influences portfolio performance as well as the criteria for selecting financial assets (Lamm, 2003). Technological development, especially the development of digital technologies, has transformed many industries and enlarged the number of available investment options. In cases where a large number of financial instruments are being considered, high dimensionality can prevent the precise evaluation of a complex correlation structure and risk. Under the radically changed risk-return trade-off, investors' risk aversion and investment conditions, the application of Markowitz's model in the optimization can result in the allocation of financial resources to suboptimal investment alternatives.

One of the possible ways to improve the MV model is to incorporate various risk measures into the portfolio optimization model (Konno et al., 2002; Chang et al., 2009). New technologies allow designing improved computational frameworks and decision algorithms for portfolio optimization. Modern research shows that optimization models that involve extreme risks and encompass the entire return distribution would provide more adequate solutions to the problem, especially in emerging markets (Stevenson, 2001; Gilmore et al., 2005). Therefore, the aim of this paper is to point out the shortcomings of the MV model in the optimization of the securities portfolio of the Belgrade Stock Exchange by comparing the performance of the optimal portfolios obtained by using different risk measures. The measures used to evaluate portfolio risk in this study are the measures most commonly used in research, as described in the second part of this paper. The method of their calculation and implementation in the optimization algorithms is explained in the third part of the paper, while a comparative analysis of the results of portfolio optimization by applying different risk measures is presented in the fourth part. Concluding remarks and further directions for research are presented in the fifth part of the paper.

2. Literature Review

The effects of portfolio diversification on emerging markets can be highlighted as the most significant feature of financial globalization (Mensi et al., 2017). Emerging and frontier markets are usually considered separately from developed ones because of their specificities - depth and width, legal and institutional infrastructure. These new capital markets of transition countries in Europe, South America, Asia, the Middle East and Africa offer investors unusually high returns, comparing to developed markets, but also higher level of volatility (Bekaert & Harvey, 2017). The peculiarities of the functioning of these markets make it impossible to establish a strong correlation with other world markets, preserving them from the impact of global trends (Berger et al., 2011). Therefore, after the financial crisis, the economic importance of emerging markets significantly increased and the share of emerging market companies' stocks in the MSCI All Country World Index

reached 14% (Melas, 2019). Nevertheless, investments in the frontier and emerging markets are fraught with numerous risks, which cannot be adequately measured by the application of classic risk assessment models. Moreover, in post-crisis period modeling of market risk is heavily re-examined, due to the fact that existing risk management models and practices have not provided a reliable framework for measuring and managing risk (Ball, 2009; Hansen, 2013).

Despite numerous empirical studies conducted from the 1950s till now, there is no fundamental theory that offers a generally accepted statistical model based on some theoretical return distribution that takes into account all the observed characteristics of financial time series, such as: volatility clustering, autoregression and return asymmetry, and heavy tails and their properties (Stojanov et al., 2011). Therefore, it is necessary that the methodology for quantifying risk is based on a model that captures the stated properties of financial time series and, accordingly, an appropriate measure of risk. Research shows that investors prefer securities whose distribution is positively asymmetric if the expected return and standard deviation are constant for all considered securities (Guidolin & Timmermann, 2008; Xiong & Idzorek, 2011). This characteristic of investors is particularly evident when referring to risk managers in mutual funds and insurance companies (Zuluaga & Cox, 2010). In accordance with investors' preferences, it is necessary to apply an appropriate risk assessment model, since an inadequate model for risk assessment in portfolio analysis can lead to the application of wrong diversification and risk hedging strategies (Lee, 2011). The appearance of new financial instruments, the different types of investors and the circumstances under which investment is made in the capital markets, has conditioned the consideration of an alternative risk measures to the variance (Hoe et al., 2010; Zhang and Guo, 2018). Implementation of these measures enabled simplification of portfolio optimization algorithms, since the optimal portfolio can be determined by using linear programming.

In order to overcome the disadvantages of variance as a measure of risk, Konno and Yamazaki (1991) proposed a new portfolio optimization model that captures risk with the measure of mean absolute deviation. This model can be used to select assets from a large set of available investment alternatives and, unlike the Markowitz's model, it does not require calculation of the covariance matrix. However, despite the fact that variance and mean absolute deviation are adequate risk measures in a large number of cases (Byrne and Lee, 2004), investors' preferences towards positive deviations from expected returns cannot be incorporated in these models (Lamm, 2003).

By applying downside risk measures in the securities selection model, especially when investing in emerging markets, these deficiencies can be eliminated (Stevenson, 2001; Estrada, 2006). One of the commonly used downside risk measures, introduced by Markowitz (1959) into portfolio analysis, is semivariance. The semivariance is often considered as more appropriate investors' risk measure than the variance. However, computational issues have affected academics and practitioners to use preferably MV approach (Estrada, 2008). The other widely used downside risk measure is the semi-absolute deviation proposed by Speranza (1993). Although, it can be shown that, under certain assumptions, the semi-absolute deviation is equal to one half of the absolute deviation, as well as equivalent to the variance (Chiodi et al., 2003), from a computational point of view, implementation of the semi-absolute deviation in the portfolio optimization model makes its evaluation simplified (Liu and Qin, 2012).

In recent years, due to finance and insurance regulation, Value at Risk (VaR) and Conditional Value at Risk (CVaR) have been used in financial and risk management. The

problem of the choice between VaR and CVaR in portfolio optimization is affected by the differences in mathematical properties of these risk measures, stability of statistical estimation and complexity of optimization procedures (Sarykalin et al., 2008). Practical applications indicate that the minimization of CVaR usually leads to near optimal solutions in VaR terms, so it can be concluded that portfolios characterized by low CVaR should have low VaR as well. However, CVaR as a coherent measure of risk can be used in solving optimization problems of large portfolios and a large number of scenarios with linear programming (Krokhmal et al., 2002).

The previous researches on the portfolio optimization conducted on the Serbian and neighboring capital markets, in which Markowitz's model in portfolio selection was applied, identified numerous limiting factors, such as market illiquidity, low turnovers, high oscillations of returns, as well as positive correlation among the returns (Zaimović and Delalić, 2010; Kočović et al., 2015; Radović et al., 2018). Therefore, the main contribution of this paper is to investigate the effects of different risk measures implementation on optimal portfolio selection model on the Belgrade Stock Exchange.

3. Data and Methodological Framework

In order to form a portfolio that will provide investors on the Belgrade Stock Exchange a better performance comparing to the market portfolio, optimization algorithms are applied to a group of stocks – constituents of the market indexes BELEX15 and BELEX*line* baskets. The value of BELEX*line* and BELEX15 indexes are determined by the prices of the most liquid stocks which are continuously being traded on the regulated market of the Belgrade Stock Exchange. An adequate evaluation of the basic characteristics of financial time series requires certain duration of the series, which reduces the number of available stocks to 29. Taking into consideration the required conditions which the companies issuing the stocks need to meet in order to be included in these lists, the starting point in this study is the assumption that they are the most liquid securities on the Belgrade Stock Exchange.

The data used in this study were taken from the website of the Belgrade Stock Exchange (www.belex.rs). The series of values of the indexes, as well as of individual stocks, include records from January 1st, 2008 to December 31st, 2018, which in total includes 2775 trading days. Optimization algorithms are executed using 29 assets observation, each of which with the 2524 in-sample trading data and tested in out-sample period of 250 trading data in the last year. In the models we use the logarithmic returns of the selected stocks' values. The distributions of such returns deviate significantly from the normal distribution, while the stocks' returns have been positively correlated (Stanković et al., 2015).

If it is assumed that investor considers investing financial means in i, $i = 1, 2, 3, \ldots, N$ different securities, which returns in the time period t, $t = 1, 2, 3, \ldots T$ are $R_i(t)$, the expected return of the investment portfolio $E(R_P)$ can be determined using the following formula:

$$E(R_p) = \sum_{i=1}^{N} w_i E(R_i) \tag{1}$$

where $E(R_i)$ represents the expected return of i security measured by the mean value in the observed period ($\bar{R}$), while w_i is a share of the i security in the investment portfolio.

To determine the optimal portfolio, we use different criteria. If we assume that investors are risk-averse, they will select securities in such a manner to provide the maximum return for an acceptable level of risk or to minimize risk for a given level of return. Portfolio risk

assessment includes evaluation of correlation between securities in the portfolio, which determine the level of diversification. The maximum reduction of risk is achieved by a combination of securities, whose returns are perfectly negatively correlated. The degree and magnitude of changes in securities' return may be measured using covariance between the securities' returns. The risk of the portfolio, according to MV model, is measured using variance, and can be determined as follows:

$$\sigma_P^2 = \sum_{i=1}^{N} w_i^2 \sigma_i^2 + 2 \sum_{\substack{i,j=1 \\ i \neq j}}^{N} w_i w_j \, cov(R_i, R_j) \tag{2}$$

where σ_i^2 presents expected risk on investment in i security measured as a dispersion of the returns around the expected returns $E(R_i)$, while $cov(R_i, R_j)$ is covariance between the securities' returns.

As an alternative measure to variance, absolute deviation (AD) is used. The main advantage of applying AD in portfolio optimization is simplicity of its computing, because the assessment of risk in this manner can be made without the need to calculate covariance matrix. Moreover, when the securities are highly correlated, such as the securities in the observed sample, it is unnecessary to determine the covariance matrix. Assuming that there are T different scenarios, i.e. T observations, AD can be calculated as follows:

$$AD = \frac{1}{T} \sum_{t=1}^{T} \left| \sum_{i=1}^{N} (R_i - m(R_i)) w_i \right| \tag{3}$$

where $m(R_i)$ represents the measurement of central tendency and in this study, it is the mean of the return of the observed sample.

Since investors are more sensitive to the returns' decline than to the potential returns' increase, they will follow "safety-first" rule, meaning that they will select assets with the lowest probability of loss below a certain or disaster level. Downside risk measures enable investors to assess the risk below average or expected return, thereby not assuming that assets' return distribution follow the normal probability distribution. Lower semivariance (LSV) is a statistical measure, which represents the squared deviation of the values lower than the mean, and can be calculated in the following manner (Boasson et al., 2011):

$$LSV = \frac{1}{T} \sum_{t=1}^{T} \sum_{i=1}^{N} (m(R_i) w_i - R_i w_i)^2, \, m(R_i) > R_i \tag{4}$$

Accordingly, lower semi absolute deviation (LSAD) is a statistical measure, which shows the absolute deviations of the values from the mean, and can be calculated using the following formula:

$$LSAD = \frac{1}{T} \sum_{t=1}^{T} \left| \sum_{i=1}^{N} (m(R_i) - R_i) w_i \right|, \, m(R_i) > R_i \tag{5}$$

Computational setting of Value at Risk (VaR) as a risk measure was presented within Modern Portfolio Theory (Holton, 2002). Today VaR is a standardized risk measure, which is applied in the risk assessment and capital adequacy of both financial and nonfinancial institutions. The VaR model is determined by two main parameters: confidence interval α, $\alpha \in (0,1)$ and holding period h within the VaR is assessed. For the given confidence interval α and holding period h, VaR_α can be defined as the least number l, such that in the future period it will not be greater than expected loss L with probability 1-α. According to the probability theory, VaR is a lower quantile of return distribution (McNeil et al., 2002), that in the case of a portfolio can be summarized as follows:

$$VaR_{P,h} = -Q_{1-\alpha}(R_{P_{h-1}}, R_{P_{h-2}}, \ldots, R_{P_1}) \quad (6)$$

However, VaR as a risk measure is not subadditive. Moreover, VaR does not provide information regarding the value of the loss that exceeds the value of VaR. Implementation of this measure in optimization problem and risk management, contrary to the expectations, does not contribute to risk reduction and investors' utility maximization rather recommending the positions with higher risk exposure, due to which investors suffer grater losses under the terms of significant volatility (Basak & Shapiro, 2001, Yamai & Yoshiba, 2002). The drawbacks of VaR can be mitigated by Conditional Value at Risk (CVaR) which is a conditional expectation that gives the expected loss beyond the VaR. Correspondingly to VaR model, computational setting of CVaR model is determined by two main parameters: confidence interval α, $\alpha \in (0,1)$ and holding period h within the risk is assessed. For the given confidence interval α and holding period h, $CVaR_\alpha$ can be defined as a mean value of α-quantile of empirical distribution of L, and, according to the formula (6), it can be quantified in the following manner:

$$CVaR_\alpha(R_P) = E(R_P | R_P \leq VaR_\alpha(R_P)) \quad (7)$$

Portfolio optimization model under the assumption that investors tend to minimize the risk of the portfolio (L_P) is defined using the above described measures of risk and in general can be summarized as follows:

$$minimize\ L_P \quad (8)$$

subject to:

$$\sum_{i=1}^{N} w_i E(R_i) = m(R_P) \quad (9)$$

$$\sum_{i=1}^{N} w_i = 1, 0 \leq w_i \leq 0.2 \quad (10)$$

The set constraints should enable comparison with market portfolio approximated by the market indexes BELEX15 and BELEX*line*. Detailed explanation of applied optimization algorithms can be found, for example, in the studies of Byrne and Lee (2004), Krokhmal et al. (2002) and Liu and Qin (2012).

4. Results and Discussion

Optimizing allocation of financial means on the Belgrade Stock Exchange using various measures of risk presented in this study results in five different investment portfolios, which achieve better performance compared to market portfolios in the out-sample period (Table 1). The effects of these investments are measured by total return, total risk and the Sharpe ratio. Although none of the obtained portfolios can be considered effective in terms of Sharpe ratio, all have higher Sharpe ratio than BELEX15 and BELEX*line* index, with significantly higher returns and almost identical risk, but higher risk comparing to market portfolios, at a level of approximately 15%.

Implementation of the standard MV approach in portfolio optimization lead to portfolio that consists of 27 stocks and it enables investors to achieve 3.30% return within holding period of 250 days. Investors should invest in a similar number of stocks according to MSV model (26) and MVaR model (23) in order to realize 2% higher return comparing to market portfolio. However, transaction costs and Belgrade Stock

Market illiquidity may reduce the possibilities to invest in stocks according to these models of optimization. On the other hand, the use of AD and SAD measures of risk in the portfolio optimization model resulted in portfolios, whose structures make smaller number of shares (5) and significantly better performances in comparison to other alternatives. The optimal portfolios determined by using MSAD and MAD models realize identical Sharpe ratio (0.81124) and return of 12.87%.

Table 1 Optimal portfolios performances

Optimizaton method	No. of stocks	Sharpe ratio	Holding period return	Holding period variance
Mean – Variance (MV)	27	0.21258	3.30%	15.54%
Mean – Semi Variance (MSV)	26	0.13973	2.19%	15.64%
Mean – Absolute Deviation (MAD)	5	0.81124	12.87%	15.87%
Mean – Semi Absolute Deviation (MSAD)	5	0.81124	12.87%	15.87%
Mean – Value at Risk (MVaR)	23	0.17024	2.68%	15.71%
BELEX15	11	0.02759	0.25%	9.00%
BELEXline	21	-0.65957	-4.50%	6.83%

Source: Authors' calculation

In order to compare the structure of obtained portfolios we estimate similarity index. Portfolio similarity index, as a measure of similarity of portfolios' structures, includes both similarity in terms of portfolios' compositions, as well as similarity between the weights attached to common assets in two portfolios. The similarity in portfolio composition is measured by the portfolio overlap index that is calculated as the share of common stocks in two portfolios in the average number of stocks in observed portfolios. However, portfolios even of exactly the same composition may differ in the weights attached to common assets. Therefore, portfolio weight index is assessed by summing the minimum weight attached to each asset that overlaps two portfolios. Following Byrne and Lee (2004) the portfolio similarity index is calculated by multiplying the portfolio overlap index by portfolio weight index and the results of portfolio similarity analysis are presented in Table 2.

Table 2 Portfolios similarity indexes

	MV	MSV	MAD	MSAD	MVaR
MV	100.00%				
MSV	92.68%	100.00%			
MAD	17.72%	18.65%	100.00%		
MSAD	17.72%	18.65%	99.22%	100.00%	
MVaR	84.68%	87.81%	20.77%	20.77%	100.00%

Source: Authors' calculation

Comparing the structures of optimal portfolios achieved by using different risk measures in optimization algorithms, it can be concluded that the structures are significantly different. Portfolios obtained by implementing MSV model is the most similar to MV portfolio with 92.68% of similarity. The structure of MVaR optimal portfolio is different in 15.32% from MV portfolio. On the other hand, MAD as well as MSAD optimal portfolios show the least similarity with MV portfolio with a value of similarity index of 17.72%. Considering the fact that mean values of the selected stocks' returns are mostly negative

with insignificant deviations from zero, the structures of the MAD and MSAD optimal portfolios are almost identical. However, these portfolios provide the best performances and, despite the investment conditions on the Serbian capital market, are realizable to investors.

5. CONCLUSION

Modern portfolio theory was the common framework for the development of many theories and concepts in finance that are still widely used, but also the subject of constant criticism. The assumption that most certainly brings into question the appearance of this theory is the probability distribution of returns on financial assets, and thus the basic parameters of the optimization model. Financial time series show numerous anomalies in comparison with the normal distribution, which require consideration of additional parameters necessary for the adequate assessment of return and risk. The emergence of new financial instruments, as well as different types of investors, have made it necessary to consider the effects of extreme risks in the portfolio optimization models. Considering the statistical parameters of return distributions, investors will prefer to allocate their funds in the financial assets, whose return distribution is positively asymmetrical, while they will be averse toward the financial assets, whose return distribution is long tailed. In such terms, the variance as a commonly used measure of risk in portfolio optimization models should be replaced by the downside risk measures. The need to incorporate alternative risk measures in portfolio optimization algorithms is even more pronounced on the emerging capital markets, such as the Belgrade Stock Exchange, considering the statistical characteristics of the financial time series.

The contribution of this research results is substantial, taking into consideration that portfolio specialists working at the Serbian capital market, as an emerging market, have not widely incorporated optimization models into their common practice. One possible explanation of such a situation is that extreme events and economic disturbances, such as global financial crisis from 2008, change financial environment so that past data have low importance when predicting future. However, global changes in living and business environment are posing a complex set of emerging risks, so the future research will be aimed at sustainable portfolio management.

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EFEKTI PRIMENE RAZLIČITIH MERA RIZIKA NA IZBOR OPTIMALNOG PORTFOLIJA: SLUČAJ BEOGRADSKE BERZE

Savremena portfolio teorija i Markovicev pristup optimizaciji, koji se zasniva na kvadratnom programiranju i čiji su osnovni parametri prva dva momenta raspodele verovatnoće prinosa, uprkos širokoj primeni u praksi, suočila se sa brojnim kritikama. Stoga su razvijeni modeli, koji na adekvatniji način inkorporiraju rizik u model optimizacije. Cilj ovog rada je da ukaže na efikasnost ovako formiranih modela optimizacije i opravdanost njihove primene u upravljanju portfoliom hartija od vrednosti na Beogradskoj berzi.

Ključne reči: *optimizacija portfolija, alternativne mere rizika, Beogradska berza.*

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Original Scientific Paper

MACROECONOMIC DIVERGENCES AND ASYMMETRIC RESPONSES WITHIN THE EURO ZONE

UDC 336.7(4-672EU)

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Abstract. *The paper deals with the nominal and real divergences within the Euro-zone (EZ) as a background for asymmetric European Central Bank's (ECB's) monetary transmission. In order to shed more light into these issues, the descriptive analysis of key nominal and real indicators confirms the core-periphery dichotomy within original EZ12 members, as well as the specific position of the emerging EZ19 members. Monetary (interest rate) transmission is explored via estimated Vector Autoregression (VAR) model for the representatives of the core (Germany, France, Belgium), as well as the periphery (Portugal, Spain and Greece), in the period 1999Q1-2018Q4. Observing the transmission of ECB's interest rate (the shock) to gross domestic product (GDP) growth (the response), the results of variance decompositions and impulse responses indicate that interest rate channel works countercyclical in general. However, while stabilizing (countercyclical) effect is evident for the core (especially Germany), it is almost absent in the case of Greece. The conclusions highlight the vulnerability of the EZ in the sense of heterogeneous membership and, accordingly, asymmetric response to ECB's monetary impulse. Our findings support the arguments of numerous research papers in emphasizing core-periphery dualism, German dominance hypothesis, and "one size fits some" monetary policy.*

Key words: *Euro-zone, the core, the periphery, real and nominal divergence, ECB, monetary transmission.*

JEL Classification: E52, E58, E61, F45.

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1. INTRODUCTION

Monetary union, as a final stage of European economic integration, was formed in 1999. Euro-zone (EZ) initially consisted of 11 EU members (12^{th} member was Greece starting from 2001) which accepted common currency by sacrificing monetary sovereignty. Until now, 19 EU members accepted the euro after demanding process of a monetary convergence. Monetary union is rigid exchange rate arrangement where crucial sacrifice is loss of monetary and exchange rate policy. Member countries expect higher benefits from common currency having in mind lower exchange rate risk, lower transaction costs, minimized risks from speculative attacks and, above all, an ambient of macroeconomic stability. Mentioned benefits outweigh sacrifices if trade and financial integration is deeper between member states, if production structure is more diversified, while capital and labour are mobile (Ricci, 1997; Horvath & Komarek, 2002). If criteria for optimum currency area (OCA) are fulfilled (Mundell, 1961) the need for national monetary policy is mitigated making thus monetary union more sustainable (Rose, 2008). However, EZ is not created as an OCA (Vrňáková & Bartušková, 2013; Koziara, 2016).

Some of doubts whether Europe fulfils OCA criteria were hypothetically exposed during eighties and nineties, even before concrete plans for monetary union were set, by for example Eichengreen (1991) and Feldstein (1997). Although Europe was seen as an ideal candidate for testing Mundell's OCA theory, some economists were aware of divergent economies in economic reality that impede the functioning of European monetary union. Burning problem of the EZ is the dichotomy between the core and periphery countries. On the one hand, there are export-oriented and mostly industrialized countries, such as Germany, the Netherlands, and Austria. On the other hand, there are countries dependent on imports and inflows of foreign direct investment, largely based on the service sector, such as Greece, Italy, Ireland, Portugal and Spain (named PIIGS by the acronym for the names of these periphery economies) (De Larosicre, 2012). It is the dichotomy that exposes the currency zone to asymmetric shocks with the resulting imbalances between member states. As Mundell (1961) also pointed out different economic conditions (differences in GDP per capita, labour mobility and/or productivity), different levels of development or different sectorial diversification may initiate the dysfunction or sub-optimality of the currency area.

The EZ crisis can be understood as the outcome of a structural imbalance between the core and the periphery countries (Lapavitsas et al., 2010; Sklias, 2012; Bartlett & Prica, 2016). This paper analyses intra-EZ divergence as a background for asymmetric monetary responses to ECB's monetary contraction/expansion through descriptive and econometric analysis. After the Introduction section, Section 2 includes descriptive analysis of macroeconomic divergences of nominal (Subsection 2.1) and real indicators (Subsection 2.2) concerning the relation core-periphery-emerging EZ members. The econometric analysis within Section 3 is based on the estimated VAR model in which are included ECB's interest rate and GDP of selected core (Germany, France, Belgium) and periphery EZ countries (Greece, Spain, Portugal). The aim of the above analyses is to understand the divergent positions of the core and periphery, as well as the divergent responses of economic activities to ECB's monetary expansion/tightening for selected representatives of the core and the periphery. Finally, Section 4 highlights crucial concluding remarks.

2. The Divergence of Nominal and Real Variables within the Euro-Zone

It has emerged that one currency cannot fit all unless the member countries move swiftly to address the underlying causes of economic divergence (Micossi, 2015). Namely, the common monetary framework cannot function adequately with divergent members subject to asymmetric shocks. Nominal and real convergence of economies is important in analysing the optimality of the EZ because the closer the countries are, the more effective unique monetary authority will be. More effective monetary authority implies its successful counter-cyclical or stabilizing effect. Real convergence is primarily related to rising GDP growth rates in the process of catching up with developed EZ members, including narrowing differences of GDP per capita and productivity. The Maastricht criteria emphasize nominal convergence defined through nominal variables of inflation, interest rates, exchange rates, public debt and budget deficits. OCA theory stresses the degree to which real convergence is sufficient to allow economies to function synchronously within the EZ in order to reduce the risk of asymmetric shocks (Auf dem Brinke, Enderlein, & Fritz-Vannahme, 2015; Franks et al., 2018).

It is a well-known fact that countries in the EZ are extremely heterogeneous from an economic viewpoint. Countries with large external surpluses, high GDP per capita levels, good GDP growth rates and low unemployment rates coexist with others faring worse along several of such economic indicators (Bonatti & Fracasso, 2017). The descriptive analysis that follows will first look at the divergence of the initial member states (EZ12) in relation to the core-periphery EZ12. The core of EZ12 consists of Germany, France, Austria, Belgium, the Netherlands, Luxembourg, Finland, while the periphery of EZ12 are represented by Greece, Spain, Italy, Portugal and Ireland. The emerging part of EZ19 consists of the later integrated economies, that is, the former transition countries. Emerging EZ economies are Slovenia (since 2007), Cyprus and Malta (since 2008), Slovakia (since 2009), Estonia (since 2011), Latvia (since 2014) and Lithuania (since 2015).

2.1. Nominal EZ Divergence

Given the ECB's strict anti-inflation policy, the inflation rate converges (Figure 1, left) between the periphery, core and emerging EZ members in the period 2007-2018. Prior to the accession of the emerging EZ economies (2007-2015), their significant deviation was evident, but monetary convergence and meeting the Maastricht convergence criterion led to accelerated adjustment to the rest of the EZ. The overview of inflation stability in 2018 indicates the persistence of differences (Figure 1, right). The latest figures indicate that in 2018 the average inflation rate in the EZ was 1.8%, which is in line with the ECB's proclaimed monetary strategy. However, there is a clear difference of about three percentage points between the least inflationary economy (Ireland - 0.7%) and the most inflationary economy (Estonia - 3.4%).

Greater convergence of interest rates than inflation produced lower real interest rates during the early years of the EZ, helping to fuel unsustainable capital inflows into lower income countries. However, the divergence of the nominal interest rate variable (another Maastricht criterion) is particularly pronounced in the post-crisis period (Figure 2). Markets were "blind" to whether the EZ was truly an OCA due to the prevailing assumption that a common currency entails shared risk. Nowhere is this false assumption more evident than in examining the interest rates of key EZ countries (De Larosičre,

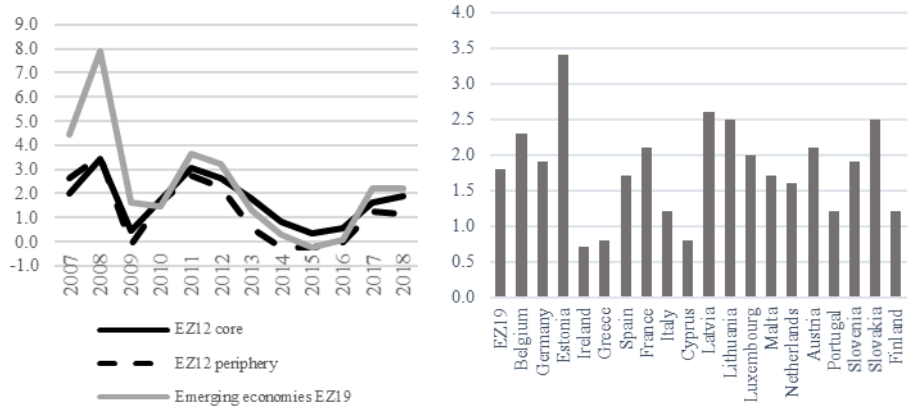

Fig. 1 Inflation rate for the core, periphery and emerging part of EZ19 in the period 2007-2018 (left) with the overview in 2018 (right)
Source: authors' review based on yearly Eurostat data (https://ec.europa.eu/eurostat/data/database).

2012). Due to shared risk beliefs, interest rates of EZ countries, from Germany to Greece, were on an almost identical trajectory in the period 2000-2009. It is only in 2009 that markets "woke up" with the understanding that Greek bonds (later bonds of other periphery economies) are not as secure as bonds of other EZ countries, mainly as a result of divergences between EZ members. When markets "awoke" to accept the reality of the divergence of EZ countries in 2009 and 2010, long-term interest rates diverged between countries and rose sharply for the countries considered most at risk.

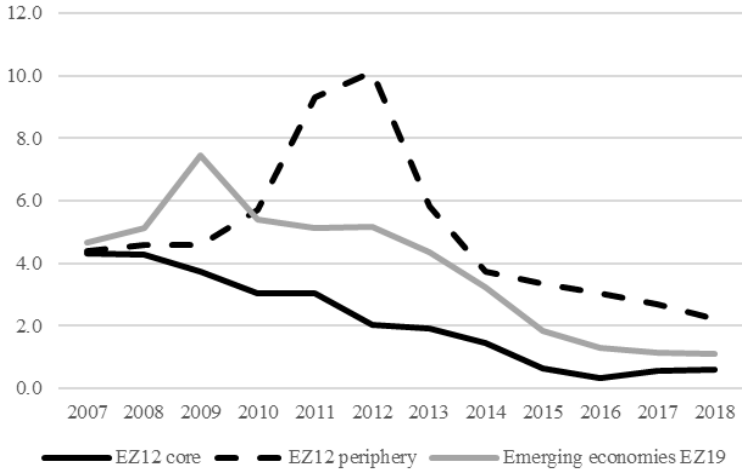

Fig. 2 The divergence of long-run interest rate (Maastricht criteria) in the core, periphery and emerging part of EZ19 in the period 2007-2018
Source: authors' review based on yearly Eurostat data (https://ec.europa.eu/eurostat/data/database).

Having in mind that monetary policy is not under national monetary control, excessive fiscal easing was seen as the main problem within the EZ (Alessandrini et al., 2014; Schiliro, 2017). Each of the EZ member is responsible for implementing its own fiscal policy but is obliged to respect the Maastricht convergence criteria concerning low budget deficits (upper limit 3% of GDP) and public debt (up to 60% of GDP). If a country's budget deficit is estimated to be excessive (exceeding the long-term benchmark), it may be possible to initiate procedures for sanctioning and monitoring the budget of a particular member state. Although fiscal discipline has been emphasized as one of the most important preconditions for EZ membership, most EZ countries have failed to stay within the set limits of the budget deficit. Figure 3 identifies the largest discipline in the public finance for the core countries in the period 2007-2018. In the process of monetary convergence and the EZ accession, emerging countries are rapidly approaching the EZ core. The problem is in the periphery EZ12 countries with the huge and deepening budget deficit (average 14% in 2010) with the onset of shocks from the global crisis and the debt EZ crisis. The EZ debt crisis is evident in Figure 3. In addition to the budget deficit relative to GDP, another Maastricht criterion concerning public finance and fiscal policy can be observed in Figure 3. Figure 3 (right) shows the trend of public debt in the period 2007-2018 for the EZ12 core and periphery, as well as the emerging part of the EZ19. In the core countries, the public debt indicator was within the planned range, just like the budget deficit indicator. On average, emerging economies in the observed period recorded even lower levels of public debt compared to the EZ12 core and periphery. A key divergence in the core-periphery relation occurs in the post-crisis period when public debt rose sharply (on average) in the periphery countries. The finding is compatible with the previous indicator of an excessive budget deficit in the post-crisis period.

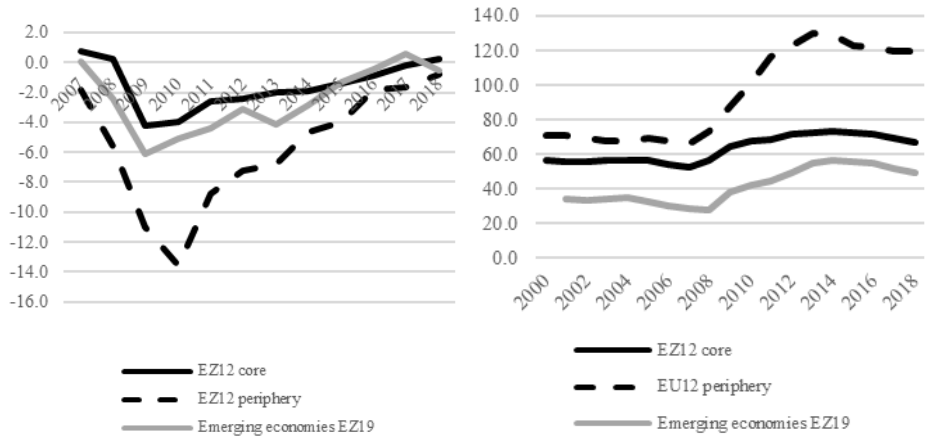

Fig. 3 Maastricht criteria related to public finance: budget deficit/GDP (left) and public debt/GDP (right) of EZ19 members in the period 2007-2018

Source: authors' review based on yearly Eurostat data (https://ec.europa.eu/eurostat/data/database).

Due to the divergent positions of public finances in the EZ member states, as well as the role of fiscal destabilization in the debt 2010 crisis, there is a perception that stronger fiscal integration is a necessary step for the EZ. Close coordination of fiscal policies would ensure compatibility of macroeconomic policies among member states to minimize economic

fluctuations and maximize the effectiveness of the common monetary policy (European Council, 1989; De Grauwe, 2018). If countries reach a consensus on fiscal union with financial transfers between member states, then these transfers can serve as a replacement for the missing flexible exchange rate and even as a substitute for a rigid labour market (immobile labour and rigid wages). EZ members should implement a mechanism that provides financial support to member countries affected by asymmetric shock (Eichengreen, 1991; Feldstein, 1997; Dibooglu & Horvath, 1997; Verdun, 2007; De Grauwe, 2009). The implemented stabilization mechanism would be of benefit not only to the recipient countries but also to all members due to economic and political stabilization of the unique currency area. Assuming that it is implemented reasonably, such a mechanism would be available to all monetary union member states and would not lead to permanent and unilateral transfers. Such an instrument should be available automatically and quickly. Otherwise, if decisions are to be made on a case-by-case basis, it will take a long time to reach political consensus (Baldwin & Wyplosz, 2012).

2.2. Real EZ Divergence

While nominal convergence is more recent from the European integration point of view, underlined by the Maastricht treaty in the form of convergence criteria, real convergence is a longer-term phenomenon. Namely, real convergence is related to the approximation of real variables, such as the level of economic development, standard of living, productivity, etc. within countries that seek greater degree of economic integration. It can be stated that the initiators of European integration (Germany, France, Italy, Belgium, the Netherlands, Luxembourg), with the later accession of other EU countries (and later the EZ members), insisted from the very beginning on the real convergence for the sake of sustainability of shallower integration levels than monetary union. For the functioning of the customs union (common customs policy since 1967) and the common market (Single European Act since 1987) it was necessary to reduce the differences in the levels of economic development of the member states. However, sharing the same currency as the last stage of economic integration, imposed the need to adjust nominal variables that was formalized by the Maastricht criteria.

Although there was steady income convergence across EZ members in the decades leading up to the Maastricht treaty, income convergence among EZ12 countries slowed after Maastricht, while productivity among the EZ12 diverged under the single currency (Franks et al. 2018). Real convergence has not occurred among the initial EZ members. GDP growth and productivity growth have not reduced income disparities between richer and poorer countries. In contrast, there has been significant convergence among emerging EZ19 who have joined the EZ in the period 2007-2015. The lack of convergence between EZ12 could be attributed to several factors, notably structural rigidities, weak productivity growth, weak institutions and insufficient policies to address asset price booms (Del Hoyo et al., 2017).

Several years before the onset of the global economic crisis, all EZ members were in expansion and all went into recession after the crisis. The accumulation of imbalances in the first decade of the EZ became unsustainable and triggered a painful correction, which led to a double-dip recession in the EZ between 2009 and 2012 (Pierluigi & Sondermann, 2018). However, significant differences are evident in terms of their post-crisis adjustment. While some countries have regained a stable economic growth trajectory and pre-crisis output levels, other countries have experienced a recurrent economic crisis (Figure 4).

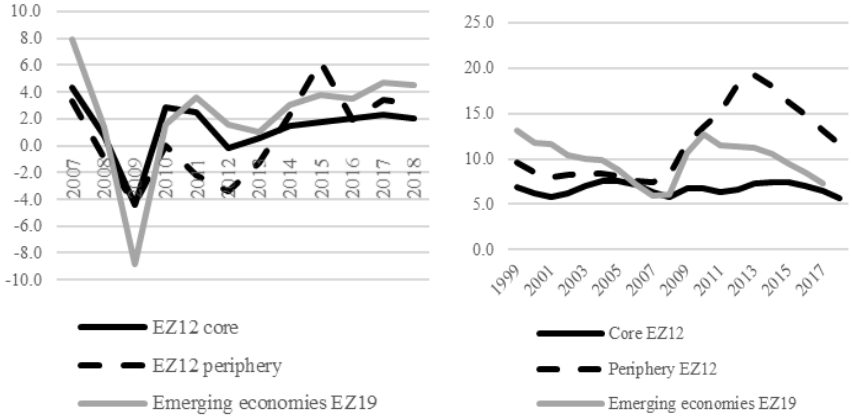

Fig. 4 The divergence of economic growth (left) and unemployment rate (right) between core-periphery-emerging economies of the EZ in the period 1999-2018
Source: authors' review based on yearly Eurostat data (https://ec.europa.eu/eurostat/data/database).

As Figure 4 shows, the structural break in the economic growth (left) and related unemployment rate (right) was evident in the EZ, especially for the periphery and emerging parts with the outbreak of the 2007/2008 global crisis. However, an asymmetric shock has hit the EZ since 2010 as a result of the debt crisis. Asymmetry due to the fact that periphery economies experienced another structural break in the wake of the 2011/2012 economic downturn. The debt crisis has severely affected the economic growth of mentioned economies, while other countries have been affected indirectly and, at worst, in a moderate manner. Cyprus, Greece, Ireland, Portugal and Spain had to seek financial support. Italy has attracted the attention of investors who doubted the sustainability of Italian long-term solvency. The bonds of the Italian government therefore recorded a high risk premium and the country faced significantly higher refinancing costs (Ehmer, 2017). This is why Italy is generally considered to belong to the EZ periphery. Other than Italy, the other founding members of European integration are the so-called EZ core (along with Austria and Finland). Their economic growth was mostly threatened by economic ties with the periphery economies, and in their case a slight decline in economic activity was evident as a result of the debt crisis (Figure 4, left).

Widening gap between the EZ core and the periphery concerning the unemployment rate as a real economy indicator is evident in the post-crisis period (Figure 4, right). While the core is close to full employment and their potential growth has not been affected by the last global crisis, secular stagnation is a concern in the periphery economies (Bartlett & Prica, 2016, Onaran, 2018). Since the global crisis, the periphery has experienced a permanent reduction in their growth potential. Eleven years after the crisis, their economies still register unemployment rates higher than pre-crisis levels and, in most cases, at unacceptable two digit levels. Figure 4 (right graph) indicates that there was convergence of unemployment rates in the pre-crisis period, but it has been mainly reversed in the post-crisis period. The global crisis initiated sharp rise of unemployment in the case of EZ periphery and milder rise of unemployment in the case of emerging EZ economies.

3. HETEROGENEOUS REAL RESPONSES TO ECB'S MONETARY IMPULSE

Weaker EZ economies recorded generally higher levels of inflation and unemployment. On the other hand, there are countries like Germany with the main priority of maintaining low inflation. The ECB's monetary decision-making was mostly criticized because it affects EZ members differently and could drive their economies out of alignment (Salvatore, 2002). The literature on the topic suggests a theory also known as the German Dominance Hypothesis (GDH), which explains the prevailing role of German's economic goals on the ECB's decision-making process. As Aizenman (2014) states, the euro is a currency without a state, under the dominance of Germany. Besides highlighting the divergence of EZ members, the main purpose of this paper is to shed some light into the question if the ECB's monetary policy is beneficial for the EZ members as a whole or only for a select group of countries, which have similar economic profiles. This research establishes the differential interest rate impact of the ECB's monetary policies on the EZ members with the expectations that the policy will benefit mostly the German economy and other economies with similar low-inflation targeting needs (the core), in contrast to others which face generally higher unemployment rates (the periphery).

The ECB's monetary policy is not effective if monetary transmission is asymmetric to the member states. Moreover, "one-size-fits-all" monetary policy has created problems for periphery economies with different needs from the core countries. The countercyclical or stabilizing effect of the ECB's policy on the core countries, with the absence of stabilization in the case of periphery economies, is empirically investigated by the forecast error variance decompositions and impulse response functions of the estimated VAR model. This type of model is widely used in the empirical literature dealing with the monetary transmission mechanism, as well as transmission of external shocks, e.g. Borghijs & Kuijs (2004), Ito & Sato (2006), Galesi & Lombardi (2009), Polito & Wickens (2012), Arratibel & Michaelis (2014), Kapuściński et al. (2016), Serwa & Wdowiński (2016), Ulrich (2018), etc. The VAR model is bivariate because it involves changes in the ECB's short-term interest rate[2] and national GDP[3] of the core (Germany, France, Belgium) and the periphery (Greece, Spain, Portugal). The impulse or the shock represents an unexpected change in the ECB's interest rate. The monetary transmission of the shock (interest rate channel) to variations in economic activities (the response) has been tracked for the aforementioned economies during four quarters. Counter-cyclicality is reflected in negative reaction of economic growth to the rise of supranational interest rate. The research period covers the start of EZ functioning until the last quarter of 2018, 1999:Q1-2018:Q4. Figure 5 shows the tendency of the ECB's interest rate over the mentioned period. In addition to the rigid position of supranational monetary authority at the beginning of the EZ functioning and another tightening with the outbreak of the debt crisis, the ECB takes a more relaxed stance with a sharp interest rate drop in the post-crisis period.

[2] Money market interest rate – quarterly data, the period 1999:Q1-2018:Q4, Eurostat.
[3] Nominal GDP (seasonally adjusted) – quarterly data, the period 1999:Q1-2018:Q4, International Financial Statistics, IMF.

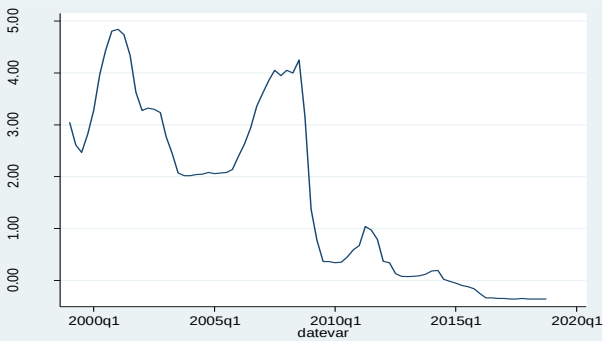

Fig. 5 ECB's money market interest rate in the period 1999:Q1-2018:Q4
Source: authors' review based on quarterly Eurostat data.

Figure 6 shows nominal GDP (seasonally adjusted) for Germany, France, Belgium (upper graphs) and Greece, Spain and Portugal (below graphs). The divergence in GDP trend is clearly evident in presented figures. In addition to a structural break in the crisis year, the core countries continue the path of economic expansion. On the other hand, Greek GDP has not yet recovered since the global crisis. In the case of Portugal and Spain, the recovery was slow. The induction of growth followed in 2015, after years of economic stagnation.

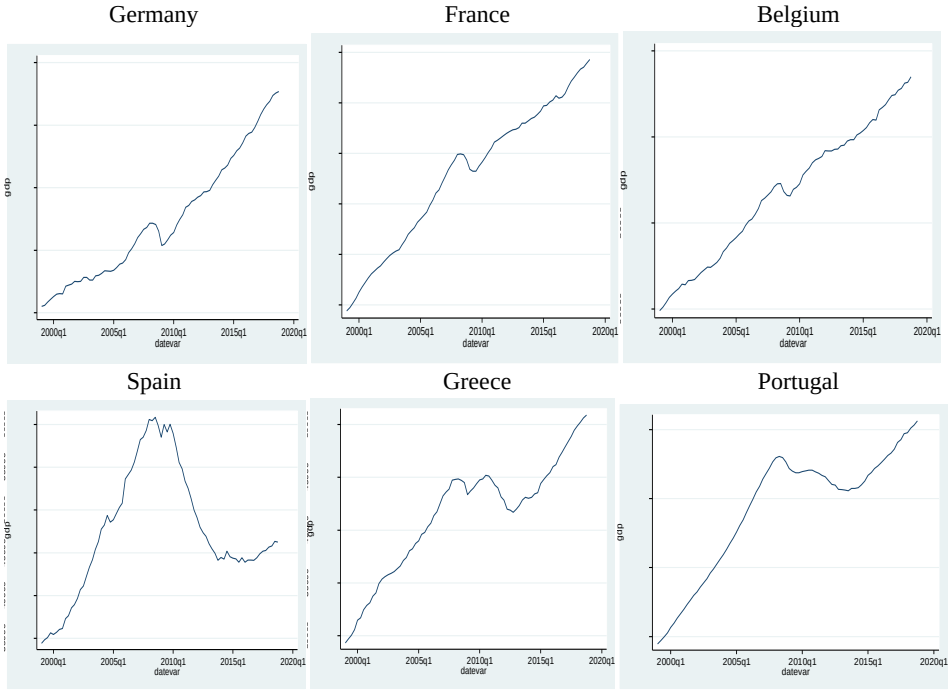

Fig. 6 Nominal GDP (seasonally adjusted) of EZ core (above) and periphery (below) representatives in the period 2000-2019
Source: authors' review based on quarterly data IMF International Financial Statistics.

The VAR model estimation is preceded by stationarity tests of the ECB's interest rate and national GDP levels of selected core and periphery countries. The Dickey-Fuller and Phillips-Perron stationarity tests for both variables, and in all the economies examined, indicate acceptance of the null hypothesis. Therefore, the time series of the ECB's interest rate and the GDP of the EZ core and periphery countries are non-stationary. Non-stationarity indicates that the economic shock has a lasting effect on these time series and that after the effect of the asymmetric shock it is difficult and slow to return to the equilibrium path. The non-stationarity of GDP levels is not a good signal from the point of view of the functioning of monetary union, as asymmetric shocks initiate longer-term destabilization. The relation between individually non-stationary time series can be examined through the concept of cointegration or long-term equilibrium relationship. A confirmation of the cointegration of non-stationary time series via Johansen's cointegration test indicates the estimation of VEC (Vector Error Correction) model. Or, the rejection of the long-run equilibrium relationship of individually non-stationary time series (cointegration) suggests the estimation of VAR (Vector Autoregressive) model. The cointegration between the ECB's interest rate and national GDP levels is not confirmed. Therefore, the first differences of interest rate and national GDP are included in the VAR model estimation. The order of the VAR model is determined on the basis of information criteria (Akaike-AIC, Hana-Quinn-HQIC, and Schwartz-Bayesian-SBIC). VAR model estimates do not automatically allow the derivation of forecast error variance decompositions and impulse response functions. Specifically, the stability of the VAR model, the absence of autocorrelation, and the normal distribution of the residuals of the estimated VAR model, should be previously confirmed. The results of variance decompositions and impulse responses are performed in order to analyse the effect of economic policy measures. In this case, it is of interest to find out how the sudden change in the ECB's short-term interest rate reflects on the economic activities of the selected core and periphery EZ countries. If a change in ECB's interest rate is differently transmitted to economic activities of investigated economies, then the action of the EZ supranational monetary authority is undoubtedly ineffective and asymmetric.

Table 1 shows the correlation coefficient between the ECB's interest rate and GDP of the selected countries. This numerical indicator, although cursory, indicates monetary asymmetry in the ECB's action for the core and the periphery.

Table 1 Correlation coefficient between short-run ECB's interest rate and GDP for selected EZ core and periphery countries in the period 1999:Q1-2018:Q4

Germany	France	Belgium	Portugal	Spain	Greece
-0,80	-0,79	-0,82	-0,68	-0,65	-0,07

Source: The authors.

The effect of the ECB's monetary policy is counter-cyclical, as indicated with negative signs of correlation coefficients. However, it is clearly observed that counter-cyclical influence is more pronounced in the case of the core countries. Significant stabilizing effect is evident in the case of Belgium, Germany and France, while stabilization is moderate in the case of Portugal and Spain, and almost absent in the case of Greece. Figure 7 shows the results of forecast error variance decomposition for the economic growth of selected EZ economies over the observed period.

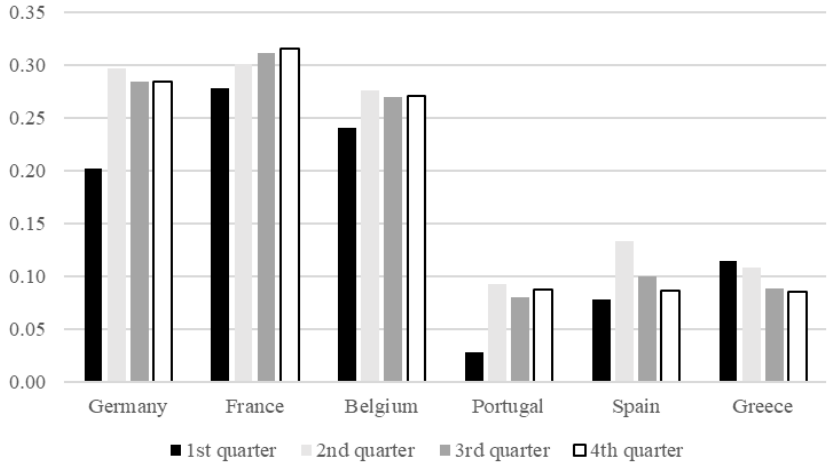

Fig. 7 Forecast error variance decomposition of economic growth/fall as a response to the ECB's interest rate change (shock) during four quarters
Source: The authors.

The results of variance decompositions of the economic growth for selected core and periphery EZ countries confirm the expectation that the countercyclical effect of the ECB's monetary policy is more pronounced for the core. In the case of Germany, a change in ECB's interest rates causes a 20% change in economic activity, with an impact growing in the second quarter to 30%. A similar effect is evident in the case of France and Belgium. However, the change in the ECB's interest rates affects only 3% of GDP variations in the first quarter and 9% of variations in the second quarter in the case of Portugal. More generally, about 9% of GDP variations in all periphery countries can be explained by the impact of the ECB after four quarters. The same impact in the core countries is in range of 27-32% after four quarters. The strength of the countercyclical impact or monetary asymmetry between core-periphery is clear on the basis of above mentioned empirical findings.

Further analysis of the ECB's interest rate transmission to the real economic activities of the core and the periphery implies examination of the impact direction (pro- vs. counter-cyclicality), the intensity (stronger or weaker real effect), as well as the length of the monetary impact during 4 quarters. The variance decomposition results do not indicate the direction and duration of the mentioned monetary transmission. In that purpose, impulse response functions are presented in Figure 8.

The results indicate that the effect of ECB's monetary policy is generally countercyclical in the case of the observed EZ members. Countercyclical effect occurs mainly in the 2nd quarter (Figure 8). However, this countercyclical effect on the real economy is relatively weak in the case of Greece, Portugal and Belgium. The impact is relatively stronger in the case of Spain, but the strongest in the case of two key core economies – France and Germany. As the Figure 8 shows, by far the strongest countercyclical effect is observed in the case of Germany, confirming the best fit of the ECB's policy to this key core economy.

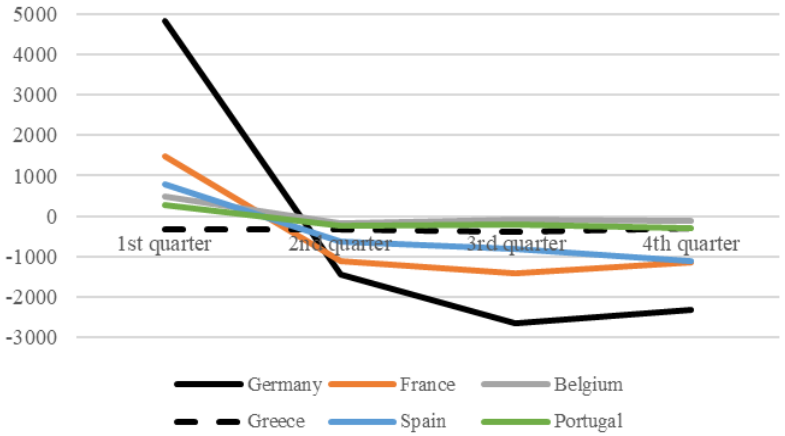

Fig. 8 Impulse response functions – the response of GDP growth of selected EZ members to the change of ECB's money market interest rate during 4 quarters
Source: The authors.

Asymmetric and heterogeneous responses of EZ member states to ECB's monetary impulses, especially related to the core-periphery dichotomy, German dominance hypothesis, and "one size fits some" monetary policy are also emphasized in Kool (2005), Hendricks & Kempa (2008), Petrova (2010), Micossi (2015), Wortmann & Stahl (2016), Botta, Tippet & Onaran (2018), etc.

4. Concluding Remarks

"Diversity in unity" is the famous European slogan, and as far as economic diversity is concerned, this motto seems appropriate. Economic heterogeneity in the EZ is a well-known phenomenon, ranging from employment to growth rates, from public debt and budget deficit to wage and price dynamics. Convergence criteria should not be viewed as a temporary adjustment aimed at adopting a common currency. Specifically, the common currency and monetary union are threatened *per se* if convergence is not maintained in the long run. The global crisis has highlighted already accumulated macroeconomic imbalance and vulnerability of the EZ in the pre-crisis period, culminating with the debt EZ crisis. The lesson of crisis episodes underlines the need to prevent the aforementioned imbalances within the single currency area, as divergence will lead sooner or later to the EZ crisis under sudden external shocks.

Despite vast literature dealing with the issue of EZ vulnerability, the paper aims to contribute with an up-to-date descriptive and econometric analysis of macroeconomic divergences among core-periphery-emerging EZ members and consequential asymmetric responses to supranational monetary measures. This paper argues that the EZ seems to be a rather complicated framework for certain EZ members like Greece, Portugal, Spain, Ireland, and Italy, namely the weaker or periphery economies. Here we especially stress nominal and real divergences having in mind original EZ12 core-periphery dichotomy, with even more diversity added by emerging EZ19 economies. In the periods during which asymmetric

shocks create fundamentally different economic conditions in the EZ, monetary policy is not a very efficient stabilizer. The ECB's monetary policy has to do justice to the needs of all member states simultaneously and may not be geared to the requirements of individual member states only. However, the effectiveness or stabilization role of supranational monetary policy is weak in mutually divergent economies, subject to asymmetric shocks. The results confirm that ECB's interest rate monetary transmission is counter-cyclical for the core countries, while for the periphery countries it is a relatively weak stabilization mechanism. Especially, the ECB's impulse is most compatible with the German countercyclical need, then French, and in the least extent adjusted to the Greek situation.

The convergence of key nominal and real variables is necessary for the proper functioning of the monetary union. However, structural differences of EZ members can hardly be narrowed significantly in a relatively short period of time. Therefore, persistent economic divergence is a key challenge to keep European monetary union sustainable. Important actions have already been taken in establishing the Banking Union, monitoring and coordinating macroeconomic policies more closely, and pushing for greater structural reforms through the European Semester, Macroeconomic Imbalances Procedure, and other initiatives. Nevertheless, long term success of the EZ depends on continuing process of political unification. Budgetary union (and thus political union) is needed, but the willingness today to move in the mentioned direction is relatively weak. This will continue to make the EZ a fragile monetary arrangement, without possibility to predict and guarantee its long-term success.

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MAKROEKONOMSKE DIVERGENCIJE I ASIMETRIČNE REAKCIJE UNUTAR EVRO ZONE

U radu se ispituje nominalna i realna divergencija unutar Evro-zone (EZ) kao osnova asimetrične monetarne transmisije Evropske centralne banke (ECB). Kako bi se rasvetlila pomenuta pitanja, deskriptivna analiza ključnih nominalnih i realnih indikatora potvrđuje dihotomiju jezgro-periferija unutar originalnih EZ12 članica, kao i specifičnu poziciju emergentnih članica EZ19. Monetarna transmisija (kanal kamatne stope) ispitana je pomoću ocenjenog Vektorskog autoregresionog (VAR) modela za zemlje predstavnike jezgra (Nemačka, Francuska, Belgija), kao i zemlje periferije (Portugal, Španija i Grčka) za period 1999Q1-2018Q4. Posmatrajući transmisiju kamatne stope ECB (šok) na promene rasta bruto domaćeg proizvoda (odgovor, reakcija), rezultati dekompozicije varijanse i impulsnih odgovora ukazuju da generalno kanal kamatne stope deluje kontraciklično. Međutim, dok je stabilizirajući (kontracikličan) efekat evidentan za jezgro (posebno Nemačku), skoro da izostaje u slučaju Grčke. Zaključci naglašavaju osetljivost EZ u kontekstu heterogenog članstva i, posledično, asimetričnog odgovora na monetarne impulse ECB. Naši nalazi podržavaju argumente brojnih istraživačkih radova u kojima se naglašava dualizam jezgro-periferija, hipoteza nemačke dominacije, kao i "jedna odgovara nekima" monetarna politika.

Ključne reči: *Evro-zona, jezgro, periferija, realna i nominalna divergencija, ECB, monetarna transmisija.*

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THE CROWDING-OUT EFFECT OF FISCAL POLICY ON CAPITAL INFLOWS IN NIGERIA

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Abstract. *The study investigated the effect of fiscal policy on crowding out capital inflows in Nigeria using annual data between 1970 and 2011 by using the foreign direct investment (FDI) as proxy to capital inflows represent the dependent variable, budget deficit (BD), foreign borrowing (FL) and domestic borrowing (DL) as proxies to fiscal policy are placed as explanatory variables. Cointegration and ECM technique were employed. Our finding showed that in both the short and long run, BD does not crowd out but rather crowd in FDI. In the short run, DL averagely has significant positive impact on FDI. However, in the long run, DL has significant negative impact on FDI. More so, in both short run and long run period, FL has significant negative impact on FDI, therefore, FL crowds out FDI. The speed of adjustment back to equilibrium showed that the explanatory variables have capacity to adjust FDI significantly. The study recommends that the government could try to be aware of the implication of its fiscal policy in running a budget deficit and making proper decision in sourcing for funds to finance the deficit. Foreign borrowing is less expensive in financing budget deficit, so if the government must borrow, it should give preference to this source. Generally, the government should reduce deficit because of the implications inherent in it.*

Key words: *FDI, budget deficit, foreign borrowing, domestic borrowing*

JEL Classification: B22, B23, C22, E62, H62

1. INTRODUCTION

Prior to the great depression in the 1930s, nearly all economies were operating a classical theory of no intervention of government in economic activities except to maintain law and order. Keynesian ideas were given prominence during this severe economic recession which

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started from the United States, as the Classicals could not find any lasting solution to the depression which rocked the advanced economies. Keynes (1936) brought the idea that the government intervention (through fiscal policy) is necessary to boost aggregate consumption and revamp the economy back to recovery. This idea was adopted and it gave solution to the economic crisis. Also, after the global economic meltdown between 2008 and 2009, the use of expansionary fiscal policy such as increase of government expenditure and decrease of taxation to push the economy forward has been on the increase most especially in developed and developing countries. This is contrary to the prediction of both Keynesian model for a non-open economy and Mundel-Fleming proposition of a small open economy (Fleming, 1962, Mundell, 1963 and Bhaduri, 2002). This reaction has therefore sparked up a re-newed interest of many economists to the effect of expansionary fiscal policy with respect to capital mobility into an economy, especially foreign direct investment (FDI).

According to Keynesian economists, discretionary fiscal tools can be employed to influence the aggregate demand through its effect on disposable income. However, the multiplier effect will be reduced because of the crowding out effect on private investors. The theory postulated that the higher the level of openness of a nation is, the less significant the effect of fiscal tools. This theory was extended by Mundell-Fleming model to a small open economy where an inverse relationship between fiscal policy and output or employment was also established.

While the advocates of government intervention through fiscal policy say, it will boost and bring back the economy to recovery, the contenders, most especially the Monetarists, believe that it will crowd-out the participation of private investors nationally and internationally since it will affect the interest rates of investing. Fiscal deficit in Nigeria is mostly financed in two ways, through either domestic borrowing or foreign borrowing. Monetarists judge that, due to easing fiscal policy through spending increase, the government would necessarily obtain loan through sale of government bonds, which would push up interest rates in the financial market, and thus result in high cost of borrowing which 'crowds out' private investment in the same market.

Since the Nigerian government is a mixed economic system with both government and private participation, the main question is, which of the two ways of financing budget deficit will have less effect on capital mobility (direct investment) into Nigeria? Should the government incur budget deficit going by crowding out effect? In perfect capital mobility situation, fiscal policy amplification would result in increase in both income and rate of interest especially in a small open nation. Therefore, exchange rate of the home nation appreciates, thereby reducing the effect of fiscal stimulus. Besides, under a fixed exchange rate system, the effect of fiscal rule is positively felt when there is perfect capital movement. This is because perfect capital mobility enhances domestic fiscal policy since interest rate cannot rise. As a result, there will be no possibility for crowding out private investors. However, since the Nigerian economy only practices guided floating system, the argument remains on which is a better way of getting funds to finance fiscal deficit. Three ways could be employed to finance this deficit. First is through tax increase, which tends to cut down disposable income of individuals as well as corporate bodies, reduce savings and then reduce the aggregate demand of the economy which could discourage investment and make employers of labour lay off workers. Second is through money finance (seignior-age) by printing more money whose consequence is majorly inflation induced, especially if it is not during recession according to Keynes (1936). This method is seldom employed by most

economies because of its inherent and conspicuous consequence. Third is through borrowing from foreign or domestic sources. This means is used by most economies and Nigeria. This is done when the government sells bond to private investors through the central bank to raise funds. The consequence is that the private investors, who buy these government bonds would be left with less capital for further investment in private quarter and hence, government borrowing through this means, would have crowded out private investment. It also has its implication on interest rate hike as explained earlier.

In the present day economy where financial integration of economies is very high because of the globalization process, economists have questioned the size of fiscal multiplier in both boom and recession periods (Barro, 2009), however, there is no consensus among economists. In Nigeria, the research on monetary policy and capital mobility is more pronounced than relationship of capital mobility and fiscal policy. Many researchers on fiscal policy focused on the implication it has on economic growth without considering the degree of capital mobility. Therefore, this effort is aimed at studying the impact of fiscal policy, proxy of fiscal borrowing, on capital mobility in Nigeria.

The paper is ordered as follows: Second section highlights the relevant literature. The third section discusses the model specification and a full description of the dataset. The fourth section analyses data and results of findings. The fifth section showcases conclusion and policy implications.

2. Review of Relevant Literature

2.1. Conceptual Review

One of the major policies usually utilized for stabilization in an economy is fiscal policy. This is the use of government expenditure and revenue to regulate the economy in order to achieve a predetermined macroeconomic objective. It is usually referred to as aggregate effect of the budget result on economic activities. Fiscal policy can either be expansionary (easing) or contractionary (tightening). It is easing when government expenditure exceeds tax revenue, in which case, the government runs a budget deficit. Also, fiscal policy is tightening when tax revenue is more than government expenditure. This refers to budget surplus situation. When a government plans to spend more than it collects in taxes, it borrows to finance the deficit. The accrual of past borrowing is the government debt (Bhaduri, 2002).

The effect of expansionary fiscal policy on aggregate can be viewed from two channels in a closed economy. Firstly, the rise in public spending would exactly raise aggregate demand directly. Secondly, reduction in tax would affect consumers by increasing their disposable income which would consequently increase their aggregate demand. The investors, as well, would have a robust profit because of reduction in tax and consequent increase in demand. This could mean that government would sponsor the excess by borrowing via the sales of bonds. The action of borrowing through sale of bond would lead to rise in interest rate and consequently "crowd out" a number of personal investment i.e. reduce the portion of yield generated by private investment. The government could also borrow through obtaining loan from international community or print new notes. Each of these means has its peculiar economic implication to the system.

In an open economy, expansionary fiscal policy would reduce national savings through its impact on the exchange rate as well as trade balance. For example, government deficit

financing leads to increased domestic rates of interest which will in turn attract foreign capital and consequently cause local currency to appreciate. Increase in the value of local currency would result to cheaper imported goods in home country. However, the country's exports become dearer outside its shores, leading to a decrease in merchandise trade balance - negative net export.

Crowding out, according to Jhingan (2004), means decrease in private capital spending due to increase in public expenditure via deficit budget through a tax cut, increased money supply or issuance of public bond. Bhaduri (2002) defines it as the decrease in investment that is triggered when expansionary fiscal policy increases the rate of interest.

Capital mobility, which in this study is FDI, "is the flow of funding provided by an investor or a lender to establish or acquire a foreign company or to expand or finance an existing foreign company that the investor owns and controls" (Pugel, 2012:345).

The FDI is quite different from foreign portfolio investment which denotes all foreign securities investments which do not involve management control. FDI is a capital expenditure in a business by an investor from other country for which the foreign investor has power over the company bought. According to CBN (2017), FDI is a type of cross-border investment connected with a resident in one economy having command or a significant degree of impact on the management of a venture that is inhabitant in another economy. Businesses that make FDI are known as Multinational Corporations (MNCs) or Multinational Enterprises (MNEs).

2.2. Theoretical Review

Fiscal policy is based on the hypothesis of a British economist, John Maynard Keynes, whose followers are also referred to as the Keynesian economists. This hypothesis states that governments could stabilise the economy through adjusting tax revenue and government expenditure. According to this theory, increase in government spending or reduction in tax usually referred to as budget deficit, will stimulate aggregate demand especially during recession, while reduction in government expenditure and rise in tax usually called government surplus, will ensure adequate control on aggregate- demand and price stability during the boom period (Bhaduri, 2002).

There is variance of opinion between the Keynesians and Monetarists about budget deficit on the crowding out effect. The main difference between the two arises from the fact that the Keynesians emphasise on short run and partial effect, whereas the Monetarists emphasise on the long run and ultimate effect. The Keynesian crowding out effect states that, when the government resorts to deficit financing by issuing new bonds, spending increases, and national income rises. If the money supply is held constant, people will need more for business which will raise the rate of interest. This will reduce the involvement of private investors to invest as interest rates have gone up.

The Monetarists emphasise the ultimate effects of budget deficit by taking account of wealth effect. When the government expands its spending by selling bonds in the financial market, their buyers feel themselves wealthier than before, as a result, they tend to demand for money which increases their demand.

Moreover, the work of Fleming (1962) and Mundell (1963) formed the pioneer studies on the effectiveness of stabilization policy on capital mobility. The researchers explained that there is a constraint effect of fiscal policy based on the degree of capital mobility. More so, their study established that fiscal policy was negatively connected to the extent of perfect capital movement. Specifically, in a micro economy with floating exchange rate, an

expansionary fiscal policy results in an increase in the local interest rate. This will result in rise in capital inflow (FDI) which raises the exchange rate, thereby reducing export and increasing imports and hence reducing aggregate demand. Therefore, the potency of fiscal policy is reduced. However, if the system operates a fixed exchange rate, the amount of capital movement will enhance the effect of fiscal policy.

In addition, Han (2014) extended the assumption of Mundell-Fleming's model and discussed the effectiveness of fiscal policy in a big open economy in a separate capital movement scenario. The study concluded that, in a situation of complete capital mobility, fiscal policy is physically powerful in a flat exchange rate, but not at all in a flexible exchange rate. On the other hand, when an economy has a non-perfect capital mobility, fiscal policy is physically powerful both in fixed as well as flexible exchange rate. When it comes to capital immobility, fiscal policy is less effective in a fixed exchange rate although it is strong under floating exchange rate.

Yeung-Nan, (2015) established the theoretical proposition that fiscal policy can be used to stimulate domestic output by extending Romer's IS-MP model. He replaced the LM curve in the Mundell-Fleming model with monetary reaction function. He therefore claimed that fiscal policy is effective in altering output in a floating exchange rate with perfect capital mobility.

Another major theory that discusses the effect of fiscal policy is the Ricardian equivalence hypothesis. The theory recommends that when a government tries to resuscitate by escalating debt-financed government expenditure, aggregate demand remains unaffected. It explained that the consumer behaviour is the same, regardless of the means of financing the deficit either through taxes or debt. They clearly explained that consumers are futuristic and so consumption is not a function of current income alone (Bhaduri, 2002). They did not believe in crowding in or out of fiscal policy. Pierzioch (2004) argued that fiscal policy could be efficient in a standard new open macro-economy model (NOEM). He buttressed his argument by using algorithm method for the NOEM model. After calibration of the model, he concluded that more capital movement would diminish the efficacy of fiscal policy.

In theory, an important question is how much crowding out effect happens in an economy? Economists say it depends on the economic condition of the economy. Keynes (1936) is of the opinion that if the economy is in recession like that of the great depression, crowding out does occur less since banks have savings to lend but few investors to borrow. The degree of crowding out also depends on the quantity of private savings and inflows of foreign financial investment.

2.3. Empirical Review

Rose (1994) examined the adjustment that exists among exchange rate, monetary policies and capital movement usually referred to as unfeasible "holy trinity". Panel data set was used for twenty-two countries. Capital mobility variable was generated from different indicators using factor analysis. Conditional exchange rate volatility was used in capturing fixed exchange rate while flexible and rigid price monetary models was used to measure the difference in monetary policies. The study showed that the fundamental macroeconomic instability and the extent of capital mobility have impact on exchange rate precariousness. Nevertheless, they explained that the study further showed that the evidence is a function of the exact gauge of monetary fundamental as being weak.

Hsing, (2005) empirically tested the alternative macroeconomic model of Yeing-Nan (2015). He used the extended IS-MP replica to study the short-run production function in Germany. The work demonstrated that the balance gross domestic product in the country is directly connected to stock market realisation and real exchange rate appreciation, and conversely affected by the anticipated inflation rate, the public deficit/GDP ratio, and the U.S. federal funds rate.

Tytell and Wei (2005) studied the effect of dynamic policies on financial globalization using both monetary and fiscal policies. They estimated a simultaneous equation between inflation and budget deficit using transmission matrix approach. This was done to correct the endogeneity problem in the model. Their study concluded that financial globalization can stimulate countries to pursue lower inflation rates but could not reduce the budget deficit. As a result, the strength of the discipline effect varies across different public policy.

Iya et al. (2014) studied the effect of fiscal shortfall on the Nigerian economy from 1981 to 2009 using causality and multiple regression to analyse their data. Their finding showed that there existed one-direction causality between real GDP and exchange rate from the tool of causality. The multiple regression result indicated that exchange rate, interest rate and government fiscal deficit have direct impact on economic growth in Nigeria.

Navaratnam and Mayandy (2016) investigated the impact of fiscal deficit on economic growth in some selected South Asian countries. They employed annual data between 1980 and 2014 with cointegration and granger causality test as tools to examine the dynamic association within the variables. Findings from their study showed that fiscal shortfall has inverse effect on economic growth in South Asian, but Nepal has a direct impact. This could be a function of degree of development in the economy.

In Nigeria, Ajogbeje, Adeniyi and Egwikhide (2018), examined the impact of trilemma policy path on interest rate using a quarterly which spanned between 1971 and 2017 in Nigeria. The study employed both long and short run ARDL estimation technique. The outcome of their study showed that capital mobility has significant effect on interest rate while exchange rate and independent monetary policy do not affect interest rate independently; they jointly have significant impact on interest rate through their interaction with external reserves.

3. METHODOLOGY

Due to few papers on this topic in economic literature, very few methods have been used so far. Some used OLS; Cointegration method which perhaps only analyses the long run relationship; VAR and VECM which have issues with theory and equality of lag periods of explanatory variables which in real world situations, may not be obtainable. Others used SVAR which is mostly used for relationship with more than six variables; ARDL and its Error Correction. This study employed Cointegration and ECM because the techniques of analysis are backed with economic theory and take care of disaggregated impact/effect of both the short run and long run. Forecasted variance decomposition was also engaged to decompose the dependent variable.

The study started with a preliminary stationary test because of the fear of falling into spurious issues. Since Phillip Peron (PP) and Augmented-Dickey Fuller (ADF) test results are usually moving toward the same direction, only the ADF was employed to test for

unit root in the data. The stability of the ECM, which is paramount, was also engaged alongside the residual tests.

3.1. Model Specification

FDI was made a proxy of capital inflow into Nigeria, and stood in as the dependent variable, while budget deficit, foreign loan and domestic loan were proxy of fiscal effect and were made the explanatory variables. Hence, the study adapted the model of Nwaeze, Kalu and Tamuno (2017) as:

$$FDI = f(BD, FL, DL) \quad (1)$$

The equation 1 is presented in a mathematical model as

$$FDI = \delta_0 + \delta_1 BD + \delta_2 FL + \delta_3 DL \quad (2)$$

Since the model might have left some other variables which could affect the dependent variable (FDI) but not captured in the model, we represented these other variables as error term and converted equation 2 into an econometric model as:

$$FDI = \delta_0 + \delta_1 BD + \delta_2 FL + \delta_3 DL + u_t \quad (3)$$

Where,

FDI Foreign direct investment
BD Federal government budget deficit
FL Foreign loan obtained.
DL Domestic loan obtained
u_t Error term, which represents all other necessary variables not captured in the model.

The study could not log the variables because of the fear of loss of observations with negative signs and thus, reducing the potency and chance to employ cointegration and error correction techniques. Hence, capital flow into Nigeria was represented by foreign direct investment (FDI), the fiscal effects were represented by budget deficit (BD), foreign loan (FL) and domestic loan (DL) which represented the explanatory variables.

Our *a priori* expectation was that, when budget deficit increases, the government obtains loan from both international and local investors. The action, which will lead to rise in interest rate, will reduce the private investment because the cost of investment would go high. Thus, there exists an indirect impact.

3.2. Data Issue

Annual time series data covering the period from 1970 to 2011 were sourced from the CBN Statistical Bulletin 2017 series, which made us have 41 observations in all. The choice of our data set being annual was because the variables used were annual in nature in most economies. The choice of 2011 was because the federal government did not obtain foreign loan, according to CBN (2017), from 2012 to 2016. As such, there would be statistical issues if used like that and the reliability of our results would be at stake.

4. RESEARCH FINDINGS

4.1. Results of Unit Root Test

Table 1 presents the results of unit root test which employed ADF only. From the results, it shows that at level (0), all the variables display presence of trend and thus are non-stationary. At first difference (1), only FDI and BD are stationary while FL and DL are stationary at second difference (2), all at 1% level of significance.

Table 1 ADF Unit Root Test

Variable	At Level	Prob.	At 1st Diff	Prob.	At 2nd Diff	Prob.
FDI	-1.4853	0.5323	-8.7212***	0.0000	-	
BD	4.3700	1.0000	-5.7567***	0.0000	-	-
FL	4.9455	1.0000	0.2078	0.9697	-5.1808***	0.0001
DL	3.4950	1.0000	-0.4863	0.8836	-8.2705***	0.0000

***Indicates significance at 1% level

Source: Author's extract from E-views 9

Table 2 showcases results of the lag order criteria of the model. From the table, all five criteria select 5-lag as the best lag selection for our model. However, because of insufficient data to use this selected lag period, we make use of 2-lag periods as automatically selected by Johenson cointegration test.

4.2. Result of Lag Selection Order

Table 2 Lag Selection Order

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1348.192	NA	4.24e+28	77.26812	77.44587	77.32948
1	-1299.334	83.75735	6.53e+27	75.39049	76.27926	75.69729
2	-1263.347	53.46631	2.17e+27	74.24838	75.84817	74.80063
3	-1217.212	57.99838	4.29e+26	72.52638	74.83718	73.32406
4	-1188.431	29.60322	2.55e+26	71.79604	74.81786	72.83917
5	-1150.352	30.46267*	1.06e+26*	70.53442*	74.26725*	71.82299*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author's extract from E-views 9

4.3. Results of Cointegration Test

Tables 3 and 4 present the Johenson cointegration test. The Tables show the Trace and Maximum-Eigen statistics, both of which indicate 2 cointegrating equations at 5% level of significance as the Mackinnon-Haug-Michelis (1999) p-values indicate. By implication, it is above the minimum of at least one, meaning that there is existence of long run relationship in the model. Hence, the model has satisfied the precondition for employing the ECM.

Table 3 Cointegration: Rank Test (Trace)

Hypotheised No. of CE(s)	Eignvalue	Trace Stat	0.05 Critical Value	Prob.
None *	0.921346	130.3645	47.85613	0.0000
At most 1 *	0.454385	36.28446	29.79707	0.0078
At most 2	0.232021	13.86833	15.49471	0.0866
At most 3 *	0.104907	4.100606	3.841466	0.0429

**MacKinnon-Haug-Michelis (1999) p-values
Source: Author's extract from E-views 9

Table 4 Cointegration Rank Test (Max-Eigenvalue)

Hypotheised No. of CE(s)	Eignvalue	Max-Eigen Stat	0.05 Critical Value	Prob.
None *	0.921346	94.07999	27.58434	0.0000
At most 1 *	0.454385	22.41614	21.13162	0.0328
At most 2	0.232021	9.767721	14.26460	0.2276
At most 3 *	0.104907	4.100606	3.841466	0.0429

**MacKinnon-Haug-Michelis (1999) p-values
Source: Author's extract from E-views 9

4.4. Results of Short run Impact and ECM Coefficients

Table 5 showcases the findings of short run impact and ECM coefficient. The Table shows that, in the short run period, one and two-lag periods of FDI have negative impact on present FDI and the impacts are both significant as their standard errors (0.121 and 0.138) and t-statistics (-6.519 and -2.424) show. The BD in one and two-lag periods show a positive sign which are also significant, as the standard error shows and the t-statistics (6.39 and 6.16) shows that they are significant at 1% level. In essence, a 1 unit increase in BD, on the average, leads to 36 units (one-lag) and 14 units (two-lag) increase in FDI.

Table 5 Short run Impact and ECM Coefficients

Variable	Coefficient	Standard Error	t-Stat
D(DFDI(-1))	-0.789896	0.12118	-6.51854
D(DFDI(-2))	-0.334069	0.13782	-2.42392
D(DDBD(-1))	36441807	5698750	6.39470
D(DDBD(-2))	13571038	2203958	6.15757
D(DDL(-1))	-2958273.	1739875	-1.70028
D(DDL(-2))	6875330.	2687115	2.55863
D(DFL(-1))	-22121653	1.6E+07	-1.37584
D(DFL(-2))	-9054654.	1.6 E+07	-0.56744
ECM(-1)	-0.532639	0.08002	-6.65608
R^2	0.892750		
R^2 Adjusted	0.857000		

Source: Author's extract from E-views 9

The FL (foreign loan) in both periods (one-lag and two-lag) shows a negative impact on FDI, meaning that, a 1 unit increase in FL, on the average, will lead to 22 units and 9 units

reduction in FDI in one-lag and two-lag periods respectively. However, the impacts in both periods are not significant, even at 10% levels as the t-statistics (-1.38 and 0.567) indicate.

Still on Table 5, DL, in one-lag period, shows a negative and significant impact at 10% level of significance, as the t-value (-1.70) indicates, meaning that, 1 unit increase in DL, on average, leads to 2.96 unit decrease in FDI. However, for two-lag period, there exists a positive and significant impact on FDI. The significance is at 5% level as the t-statistics (2.56) indicates. The coefficient of ECM (-0.533) shows the correct negative sign and an average speed of adjustment. In essence, about 53% is the adjustment path between the short and long run periods. The R^2 indicates that about 89% of the variation in FDI is explained by the explanatory variables in the model which is quite high. The R^2 adjusted, - which serves as a penalty for adding more explanatory variables, shows about 86%, very close to the R^2, meaning that, there is no redundancy in the explanatory variables.

4.5. Results of Long Run Coefficient

Table 6 Long Run Coefficient

Variable	Coefficient	Standard Error	t-Stat
DFDI(-1)	1.000000		
DDBD(-1)	90321707	5245823	17.2178
DDL(-1)	-34525662	3193914	-10.8098
DFL(-1)	-65648099	2.7E+07	-2.40330

Source:Author's extract from E-views 9

Table 6 presents the results of long run coefficients of the model. On the Table, BD has positive and significant effect on the FDI. A unit increase in BD, on average, leads to 90 units increase in FDI and it is quite significant at 1% level as the t-statistics (17.22) indicates. The FL and DL both have negative impact on FDI in the long run. Therefore, a unit increase in FL and DL, on the average, will lead to 66 and 35 units reduction in FDI and these impacts are significant at 5% and 1% levels, as their t-statistics (-2.4 and -10.8) indicate.

Figure 1 presents the stability check result using inverse roots of autoregressive characteristic polynomial. From the result, since the condition for Stability of our ECM result is that the dots should converge within the circle and none of the dots should be outside, then we conclude that our data, model and variables are stable as evident in figure 1.

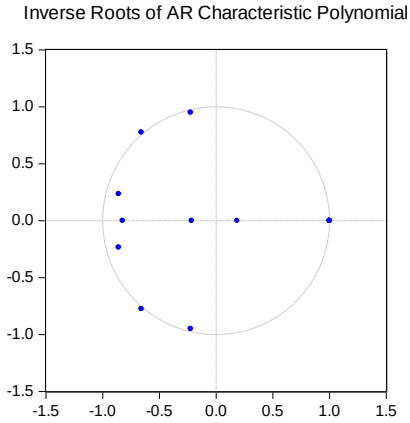

Fig. 1 Stability Check
Source: Author's extract from E-views 9

4.6. Results of Forecasted Variance Decomposition

Table 7 showcases the results of forecasted variance decomposition of FDI within 10 periods (years). From the table, in period 1, all the variances in FDI are explained by its own innovative shocks only. At period 2, only about 56% is explained by itself while 24%,

19% and 1% are explained by BD, DL and FL respectively. The percentage variance of BD continues to increase up to the 10th period (24-30%), meaning that, BD has a very powerful innovation in explaining changes in FDI. The impact of the innovations of DL and FL are also incremental but end on the 8th period before declining. The percentage of FL in forecasting FDI, all through, is not more than 3% while the BD and DL have two-digit cause of variation.

Table 7 Forecasted Variance Decomposition

Variance Decomposition of FDI Periods	S.E.	DFDI	DDBD	DDL	DFL
1	6.08E+08	100.0000	0.000000	0.000000	0.000000
2	8.31E+08	55.71319	23.86799	19.40722	1.011596
3	8.94E+08	50.17710	26.86050	22.06134	0.901062
4	9.80E+08	55.93368	22.42845	18.64530	2.992562
5	1.11E+09	54.30098	18.53903	24.82771	2.332284
6	1.22E+09	44.77193	29.04619	24.17136	2.010526
7	1.36E+09	49.53903	24.13955	24.26994	2.051479
8	1.37E+09	48.31264	24.90136	24.56313	2.222862
9	1.59E+09	48.26415	28.79505	21.28363	1.657159
10	1.61E+09	47.15410	30.32132	20.70525	1.819338

Source: Author's extract from E-views 9

4.7. Results of Diagnostic Check

Lastly, Table 8 presents results of the diagnostic check on the error term in our model. All three tests used to check the assumptions of our error terms- normal distribution; no serial correlation; and no conditional heteroscedasticity- show acceptance of the null hypotheses. Jarque-Bera statistics (0.3536) shows that we accept the null hypothesis that the distributions are normal, as evident from the probability (0.8379). The Langrage Multiplier (21.4405) shows that, we accept the H_0, that there is no serial correlation as indicated in the probability (0.1622). Then the White (Chi-sq) test (202.178) means we accept that there is no conditional heteroscedasticity as shown in its probability (0.1233). Hence our analysis is reliable, stable and inferences could be drawn from its results.

Table 8 Diagnostic Check

Test	Null Hypothesis (H_0)	t-Statistic	Prob.
Jarque-Bera (JB)	There is a normal distribution	0.3536	0.8379
Langrage Multiplier (LM)	No serial correlation	21.4405	0.1622
White (CH-sq)	No conditional heteroscedasticity	202.1784	0.1233

Source: Author's extract from E-views 9

4.8. Discussion of Result Findings and Implication of Findings

The first objective of this study was to investigate whether budget deficit crowds out capital inflow using FDI as proxy. The ECM analysis showed that in both the short and long run, BD (budget deficit) does not crowd out but rather crowd in FDI as BD had a positive and significant impact on FDI. This is in line with the studies of Hussain and Haque (2016 and 2017) and in contrast with the work of Navaratnam and Mayandy (2016).

The second objective was to examine the impact of fiscal borrowing on cash inflow into Nigeria. Our findings revealed that, in the short run, domestic borrowing (DL) averagely had positive and significant impact on FDI, since when the government borrows through selling of bonds within the country, it makes domestic investors have fewer funds to invest and thus, foreign investors would be encouraged to pump in more funds into the economy in the short run. However, in the long run, the impact of DL has negative and significant impact on FDI. This means that, in the long run, the government domestic borrowing will crowd out FDI in Nigeria.

Lastly, our objective was to determine the impact of foreign borrowing (FL) on FDI in Nigeria. Our results showed that, in both short run funds and long run period, foreign borrowings have negative and significant impact on foreign direct investment, and hence, foreign borrowing of the Nigerian government crowds out foreign direct investment (FDI). The speed of adjustment back to equilibrium, as indicated by the ECM analysis, showed that the explanatory variables have an average capacity to adjust FDI significantly.

The result of variance decomposition indicated that domestic borrowing had more powers in predicting changes in FDI than foreign borrowing, and that could be the main reason why Nigerian government has stopped borrowing from foreign source since 2012. It is also evident that budget deficit had more predictive capacity to explain volatility in FDI.

The main implication of our finding is that incurring deficit in Nigeria will crowd out foreign direct investment in both the short run and long run periods. In the short run, government borrowing from foreign source improves foreign direct investment but discourages it in the long run. Borrowing from domestic source through bonds has negative impact on foreign direct investment in both short and long run periods.

5. Conclusion and Recommendations

The study investigated the effect of fiscal policy in crowding out capital inflows in Nigeria using annual data between 1970 and 2011 by making use of foreign direct investment (FDI) as proxy to capital inflows into Nigeria, budget deficit (BD), foreign borrowing (FL) and domestic borrowing (DL) as proxies to fiscal policy. FDI was made the dependent variable, and BD, FL and DL, the explanatory variables. The study first removed trends in the time series data used, with the aid of ADF only, then employed Johenson cointegration and ECM technique to analyse the data and supported it with forecasted variance decomposition tool. Afterwards, stability and diagnostic test were carried out to ascertain the credibility and reliability of the data and model employed.

Our finding showed that in both the short and long run, BD (budget deficit) does not crowd out but rather crowd in FDI as BD had a positive and significant impact on FDI. Our result revealed that, in the short run, domestic borrowing (DL) averagely had positive and significant impact on FDI. However, in the long run, the impact of DL has negative and significant impact on FDI. Moreover, our results showed that, in both short run funds and long run period, foreign borrowings have negative and significant impact on foreign direct investment, and hence, foreign borrowing of the Nigerian government crowds out foreign direct investment (FDI). The speed of adjustment back to equilibrium as indicated by the ECM analysis showed that the explanatory variables have an average capacity to adjust FDI significantly.

Finally, domestic borrowing had more powers in predicting changes in FDI than foreign borrowing and that could be the main reason why Nigerian government has stopped borrowing from foreign source since 2012. It is also evident that budget deficit had more predictive capacity to explain volatility in FDI.

The study therefore, recommends that, the government of Nigeria could try to be aware of the implication of its fiscal policy in running a budget deficit and making proper decision in sourcing for funds to finance the deficit. Foreign borrowing is less expensive in financing budget deficit as it will not crowd out private investment *per se*, so the government could give preference to this source. More so, the government should try to minimise or even do without the deficit because of the implications inherent in it.

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EFEKAT ISTISKIVANJA FISKALNE POLITIKE NA KAPITALNE PRILIVE U NIGERIJI

Rad je istraživao efekte fiskalne politike na istiskivanje kapitalnih priliva u Nigeriji koristeći godišnje podatke između 1970. i 2011. upotrebom direktnih stranih investicija (SDI) kao pokazatelja priliva kapitala koji predstavljaju zavisnu varijablu, dok su budžetski deficit (BD), strana zaduživanja (SZ) i domaća zaduživanja (DZ) kao pokazatelji fiskalne politike postavljeni kao objašnjavajuće promenljive. Korišćena je kointegracija i ECM tehnika. Naši nalazi su pokazali da i kratkoročno i dugoročno BD ne istiskuje već čini deo SDI. Kratkoročno, DZ imaju snačajan pozitivni uticaj na SDI. Međutim, dugoročno, DZ ima značajan negativni uticaj na SDI. Osim toga,i kratkoročno i dugoročno, SZ ima značajnno negativni uticaj na SDI, prema tome, SZ istiskuje SDI. Brzina prilagođavanja vraćanju ravnoteži pokazala je da objašnjavajuće varijabile imaju sposobnost da značajno prilagode SDI. Istraživanje preporučuje da vlada može da pokuša da bude svesna implikacija na svoju fiskalnu politiku u vođenju budžetskog deficita i donošenju pravih odluka pri traženju fondova za finansiranje deficita. Strano zaduživanje je manje skupo u finansiranju budžetskog deficit, te ako vlada mora da pozajmljuje, trebalo bi da daje prednost ovom izvoru. Generalno, vlada bi trebalo da smanji deficit zbog implikacija koje su mu inherentne.

Ključne reči: *SDI, budžetski deficit, inostrani zajmovi, domaći zajmovi*

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Original Scientific Paper

BOARD STRUCTURE AND BANK PERFORMANCE: EVIDENCE FROM SERBIAN BANKING SECTOR

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Abstract. *Traditional perspective relying on agency theory is based on the assumption that the board structure, as an internal corporate governance mechanism, determines board effectiveness and, therefore, financial performance. Board size, board composition and leadership structure are distinguished as relevant variables of the board structure. Since the results of previous empirical studies are often contradictory, examining the correlation between board structural characteristics and corporate performance is a relevant research question, particularly in banking sector. In order to improve effectiveness of internal corporate governance mechanism, and consequently bank performance, the main research objective is to identify the impact of the board size and the board composition on bank performance in the Republic of Serbia using the CAMELS model. We analyze this relation using Ordinary Least Squares regression analysis on balanced panel data-set of 54 observations. The paper contributes to recent research efforts by making conclusions on the effects of board structure on bank performance, in order to define recommendations for improving performance in banking sector.*

Key words: *board of directors, board structure, performances, CAMELS, banking sector, Republic of Serbia*

JEL Classification: G21, L21, O16

INTRODUCTION

Starting from the distinction between financial and non-financial sector (De Haan & Vlahu, 2016), banks as financial institutions have a unique role in financial mediation and take an important position within the payment system (Flannery, 1998). Insufficient transparency, information asymmetry, complexity of bank business (Levine, 2004), high

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debt ratio, as well as the problems of liquidity and solvency indicate the wide range of problems which banks have been facing, and which consequently reflects on the growth and development of economy (Macey & O'Hara, 2003). In accordance with the above stated, the good practice of corporate governance and effective corporate control mechanisms represent necessary assumptions for the improvement of bank performances, by which negative effects of financial crisis and turbulent economic ambient can be mitigated (Beltratti & Stulz, 2012; Erkens et al., 2012; Jackowicz & Kowalewski, 2012). Thus, the development of good practice of corporate governance represents one of the key challenges for the creator of economic policy since the choice of corporate governance model depends on economic, social, technologic and political factors (Orazalin et al., 2016).

In accordance with the above mentioned, in transition economies, the selection of appropriate corporate governance model, as well as the effectiveness of corporate control mechanisms represent an important research field. The board of directors (i.e. board) as internal mechanism of corporate control has a significant role, due to which the research of board effectiveness is of special importance for the improvement of bank performance. According to the traditional research perspective, board size, board composition and board leadership structure represent relevant structural characteristics. Since structural characteristics determine board effectiveness, and consequently bank performances as well, the examination of relationship among these variables is a relevant research issue. However, the results of empirical studies are often contradictory, due to which general conclusions on the influence of board structural characteristics on bank performances cannot be derived.

In the previous empirical studies, two research directions can be singled out. The first research direction confirms negative influence (e.g. Staikouras et al., 2007; Pathan, 2009; Stančić et al., 2014), while the second research direction confirms positive influence of board structure on bank performances (e.g. Aebi et al., 2012; Adams & Mehran, 2012; Minton et al., 2011), which implies the need for further research in this field. Since in the Republic of Serbia the empirical studies in the field of corporate governance, i.e. corporate control mechanisms are rare and sporadic, the need for the research of the influence of board structure on bank performance is even greater.

In order to overcome this research gap, the pilot research based on the sample which included 18 of total of 27 banks was conducted as a starting basis for future research. The contribution of the conducted research is reflected in making conclusion that can be guidelines for the development of good practice of corporate governance in banking sector, particularly in the process of nomination and selection of board members.

1. LITERATURE REVIEW

1.1. Board structure in banking sector

The roles of the board of directors can be observed through the perspective of different theories of corporate governance (e.g. agency theory, stakeholder theory, stewardship theory, resource dependence theory). According to the agency theory as the representative of conflict theories (Babić et al., 2011), the separation of ownership from control leads to the conflict of interest between the owners as principals and managers as agents. Starting from the identified agency problem (Kostyuk, 2011), and for the purpose of mitigation of the principal–agent conflict and the prevention of managerial opportunism, Fama and Jensen (1983) emphasize that monitoring and control of managerial decisions are a basic

role of the board of directors. Moreover, the board of directors has the responsibility to make decisions that refer to the choice and the substitution of managers, formulation of compensation package, as well as the control of management team (Jadah & Adzis, 2016). In line with the development of consensus theories (stakeholder theory, stewardship theory, resource dependence theory), the relevance of strategic board role (Babić et al., 2011) and directors' active participation in making strategic decisions is implied, highlighting the protection of interest, not only of shareholders, but also of other stakeholders. The board of directors has the responsibility that can be observed through the strategic decision making process and the initiation, evaluation and implementation of strategic decisions (Barroso-Castro, Perinan, & Dominguez, 2017). The strategic participation of the board members considers their role in strategy formulation and implementation process, and not only in evaluating and approving the strategy (Pugliese, Bezemer, Zattoni, Huse, Van den Bosch, & Volberda, 2009). According to the relevance of the control and strategic board role for improving performance, board effectiveness is an important area of research. Having in mind that board effectiveness represents the degree in which the activities encompassed by defined roles are successfully realized, it is possible to separate the two research perspectives: traditional and behavioral (Babić et al., 2012).

According to the traditional perspective, board size, board composition and the leadership structure analyzed through the duality in CEO position and chairperson are singled out as relevant variables of board structure (Jensen, 1993). Board size represents the total number of board members, who have the right to vote (Ongore et al., 2014). It is often stated that the optimal size of bank board of directors implies the appointment of between 16 and 18 members, while the percentage of independent board members is in the range of 70% and 85%, which is also larger than the average percentage of independent board members in non-financial corporations (60%–70%) (De Andres et al., 2012). Apart from board size, an important structural characteristic is board composition (Carteret al., 2003) which represents the relationship between the number of non-executive, independent directors and the total number of directors (Aebi et al., 2012; Erkens et al., 2012). In order to determine optimal number of independent directors, it is necessary to define primarily the criteria that determine members' independency. It is considered that a director, as a board member, is connected to a certain bank if he is: (1) a dominant owner; (2) a bank employee; (3) an employee in any company or company branch that is above certain bank on the ownership tree; (4) an employee in other company in which dominant shareholder has at least 10% of voice rights, regardless whether this company is on the same ownership tree; (5) a politician or employee in the government agency, when the dominant stakeholder is government; or (6) a company worker that is in the same country, where dominant stakeholder is from, when dominant stakeholder is a foreign citizen. On the other hand, directors that do not satisfy any of the mentioned criteria, are considered to be independent members (Stančić et al., 2014).

The leadership structure can be defined as the duality of CEO position and chairperson. The key dilemma is whether the positions should be unified or separated, or whether the CEO and chairperson's roles should be combined in one person or not (Babić et al., 2012). In fact, two opposite opinions can be singled out. Firstly, the separation of the positions of CEO and chairperson implies the reduction of agency expenses. On the other hand, the unification of the positions is described in terms of the power concentrated in one person's hands that allows CEO to control the information that is available to the other board members.

1.2. Bank performance

The measurement of financial performances of banks is of great significance for both internal and external users, among which are managers, depositors, creditors, investors, employees and regulators, since their expectations and interests are often different. The bank has to reach a short-term maximization of profit, which is often measured by the rate of return on equity (ROE), the rate of return on assets (ROA) or by the net interest margin (NIM). However, as in the case of non-financial corporations, the main objective is long-term profitability, which is usually measured by earnings per share (EPS) or by market price per share (MPS) (Belkhir, 2009; Orazalin et al., 2016).

Most of the studies carried out in emerging countries are focused on the monitoring of traditional accounting measures of bank performances, such as return on assets (ROA) and return on equity (ROE). Furthermore, in order to determine the relation between corporate governance and performances, Tobin's q and other market measures of bank performances are used as relevant indicators. Starting from the fact that the capital market in Serbia is insufficiently developed and non-efficient, as the information from the market is often unreliable, the problems with calculating mentioned indicators are the main reason for rare use of market performance indicators. Due to previous empirical results and limitations, it is necessary to include bank-specific performance indicators, such as the growth of assets, liquidity, and the quality of governance and capital adequacy (CAPAD).

Respecting the mentioned characteristics of banking sector, the internal methods of measuring performances are developed, such as the analysis of financial ratios, data envelopment analysis (DEA) and CAMELS model (Desta, 2016). CAMELS model, as one of the most famous models, is based on the evaluation of capital standards, quality of assets, management, earning capacity, liquidity and sensitivity to market risk of bank institutions. The acronym CAMELS is derived on the basis of the name of components that are used as specific financial indicators: capital adequacy, assets quality, management efficiency, earning capacity, liquidity and sensitivity to market risk (Dang, 2011; Desta, 2016; Vunjak et al., 2012). First of all, the implementation of this methodology considers the calculation of corresponding ratio indicators using the data published in the financial reports, such as balance sheet, income statement, and balance of cash flows. On the basis of conducted analysis, interested parties are expected to undertake necessary reactive and proactive measures towards providing bank prosperity as well as the efficiency of banking sector.

1.3. Board structure and bank performance

In numerous empirical studies, the correlation between board structural characteristics and bank performances is articulated in opposing ways, due to the fact that it is not possible to make a general conclusion on the intensity and direction of identified impact. In addition, the research results in transitional countries have shown bigger heterogeneity.

In the case of correlation between board size and bank performance, the results of empirical studies are contradictory. Certain researches show that the increase of the number of board members implies more effective board role, i.e. service and control role (Jadah & Adzis, 2016). Moreover, it is confirmed that larger number of board members can have positive influence on the performance of analyzed banks (Adams & Mehran, 2012; Aebi et al., 2012). However, a larger number of board members lead to the problems of coordination and communication within organization (Cerbioni & Parbonetti, 2007; Bushman et al., 2004).

Lipton and Lorsch (1992) indicate that the board with more than 10 members can face the problem in expressing opinion and attitudes; that is why the innovation capability is limited. In addition, the process of making decisions in case of large boards is often less efficient, which affects their ability of identifying and exploitation of new business opportunity (Bantel & Jackson, 1989). Consequently, larger number of board members is negatively related to corporate performance (Lipton & Lorsch, 1992; Jensen, 1993; Yermack, 1996; Eisenberg et al., 1998). According to the above mentioned, the following hypothesis is defined:

H1. The board size negatively affects bank performances.

The empirical research results related to the effects of board composition on bank performances are mixed. One group of empirical studies is based on the stewardship theory, according to which managers act in the interest of owners, due to which it is desirable for the boards to be composed of large number of internal, executive directors. Since board effectiveness is observed through the degree of fulfillment of strategic board role, dominant participation of internal, executive directors make available the large amount of relevant information, knowledge and skills necessary for making strategic decisions (Babić et al., 2011). Consequently, the assumptions about the number of independent members are different depending on the perceived board role. Although, starting from the opinion that independent directors perform effective and objective control of managers which contributes to the reduction of agency costs (Borokhovich et al., 1996; Singh & Davidson, 2003), positive influence of independent board composition on bank performances is supposed (Daily &Dalton, 1992; Shungu et al., 2014; Jadah & Adzis, 2016). According to the above mentioned, the following hypothesis is defined:

H2. The number of independent directors positively affects bank performances.

2. METHODOLOGY

2.1. Research model and variables

For the purpose of empirical testing of previous hypothesis, the research model has been developed (Figure 1) and both independent and dependent research variables have been defined.

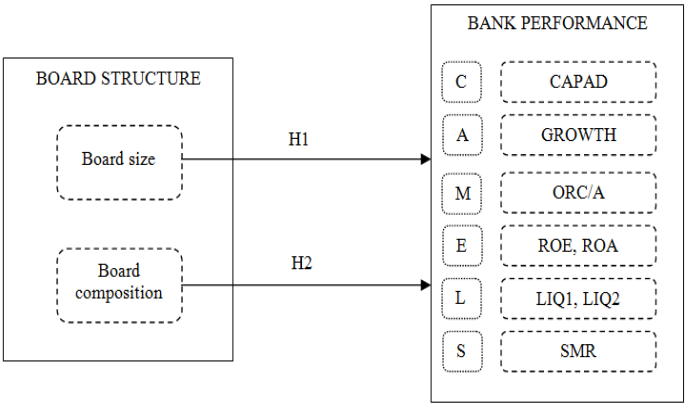

Fig. 1 Research model
Source: Authors

Starting from the presented research model, board size measured through the number of directors and board composition, observed through the number of independent directors as the key structural characteristics that determine board effectiveness, represent independent variables. According to the Law on Banks, the duality of CEO position and chairperson is not possible so the leadership structure is not incorporated in the research model (Table 1).

Table 1 Independent variables

Variables	Acronym	Operationalization
Board size	BDS	Total number of board members
Board composition	BDC	Number of independent directors divided by total number of directors

Source: Authors

In order to carry out the analysis of bank performances as dependent variables, the information from the bank financial reports has been collected. Pursuant to collected information the appropriate CAMELS indicators have been calculated. For each of the mentioned components of CAMELS models, at least one indicator has been calculated. The review of indicators, and their calculation is given in Table 2.

Table 2 Dependent variables

CAMELS label	Variables	Acronym	Calculation
Capital	Capital reserve ratio	CAPAD	Total capital divided by total assets
Asset	Annual asset growth ratio	GROWTH	(Total assets in year 2 – total assets in 1)/total asset in y1
Management	Operating expenses ratio	ORC/A	Operating expenses divided by total assets
Earning	Return on Equity	ROE	Earnings after tax divided by total equity of the bank
	Return on Assets	ROA	Earnings after tax divided by total assets of the bank
Liquidity	Total loans ratio	LIQ1	Total loans divided by total assets
	Loan to deposit ratio	LIQ2	Total loans divided by total deposits
Sensitivity to market risk	Market risk sensitivity coefficient	SMR	Securities divided by total assets

Source: Orazalin, N., Mahmood, M., & Jung Lee, K. (2016). Corporate governance, financial crises and bank performance: lessons from top Russian banks. Corporate Governance: The International Journal of Business in Society, 16(5), 798-814; Vunjak, N., Davidović, M., & Stefanović, M. (2012). Uticaj globalne finansijske krize na performanse bankarskog sektora Srbije. Teme, 36(3), 1279-1298.

2.2. Sample

Empirical research is carried out on the sample of 18 banks in the Republic of Serbia. The sample size is relevant, bearing in mind frequent change of the financial market structure which results in numerous mergers and acquisitions. Consequently, the number of banks that actively operate in the Republic of Serbia is constantly changing. Furthermore, it

is important to emphasize that the participation of foreign banks in this sector significantly increased in the previous period. Based on this view, monitoring board structure and measuring financial bank performance is limited, especially in case of collecting data for longer period of time.

Since the stated variables are observed in three-year time interval from 2015 to 2017, the total number of observations is 54, which represents good starting basis for implemented pilot testing. Pursuant to the provisions of the Law on Banks, banks are obliged to publish annual statements on business as well, apart from regular financial statements at quarterly and annual level. Thus, for the purpose of testing defined hypotheses, the data published in previously mentioned reports are used, while the data on board structure are collected on the basis of information that is collected at the web site of the National Bank of Serbia.

3. Results and Discussion

The research results are shown via descriptive statistics, correlation matrix and regression panel model. All the descriptive statistics are reported in Table 3. On the basis of these results, it can be concluded that the average board size of analyzed banks is approximately 6 members in the observed time period, while the percentage of independent board members is in the interval from 37,1% to 41,2%. As regards the bank performance indicators, the least average value refers to profitability indicators, i.e. in return rate on total assets. The heterogeneity of analyzed variables, identified on the basis of standard deviation, is the lowest in the case of board composition (0,077; 0,079; 0,091; respectively).

Table 3 Descriptive statistics (2015-2017)

	BDS	BDC	CAPAD	GROWTH	ORC/A	ROA	ROE	LIQ1	LIQ2	SMR
					Mean					
2015.	6,333	0,409	0,226	0,038	0,050	-0,015	0,025	0,617	0,880	0,156
2016.	6,222	0,412	0,248	0,066	0,050	-0,004	0,017	0,621	0,816	0,177
2017.	6,111	0,371	0,263	0,175	0,043	0,113	0,119	0,634	0,813	0,167
					Standard deviation					
2015.	1,328	0,077	0,149	0,105	0,021	0,067	0,158	0,154	0,311	0,122
2016.	1,555	0,079	0,121	0,097	0,025	0,053	0,178	0,153	0,221	0,140
2017.	1,451	0,091	0,119	0,354	0,019	0,097	0,202	0,136	0,267	0,121

Source: Authors

Based on the application of Pearson correlation coefficient, the correlation analysis has been carried out. According to the results shown in Table 6, it is possible to conclude that between certain variables the significant correlation has been identified. Significant values are between 0,259 and 0,423, which imply weak to moderate correlation intensity. The largest correlation intensity is established between board size and coefficient that measures the sensitivity to market risk, while other significant values of Pearson coefficient are negative.

Table 4 Correlation analysis: Pearson correlation coefficient

	1	2	3	4	5	6	7	8	9	10
1	1									
2	0,677**	1								
3	0,128	0,032	1							
4	-0,135	-0,155	0,029	1						
5	0,124	0,081	0,272*	-0,059	1					
6	-0,067	0,287*	-0,298*	0,001	-0,308*	1				
7	-0,269*	-0,149	-0,036	0,081	-0,254	0,319*	1			
8	-0,411**	-0,128	-0,395**	0,003	-0,029	0,246	0,406**	1		
9	-0,368**	0,023*	-0,434**	-0,109	-0,026	0,107	0,302*	0,876**	1	
10	0,423**	0,150	0,360**	0,025	-0,136	-0,074	-0,274*	-0,912**	-0,851**	1

Source: Authors

Note: 1- BDS, 2- BDC, 3- CAPAD, 4- GROWTH, 5- ORC/A, 6- ROA, 7- ROE, 8- LIQ1, 9- LIQ2, 10- SMR

For the purpose of testing defined hypotheses, the regression panel analysis has been carried out. In order to develop adequate regression panel model, as well as to determine whether individual effects in random effects model are fixed or stochastic, Hausman's specification test has been used. Since this value is above the level of 0,1, the conclusion is drawn that individual effects are stochastic, according to which the appropriate Random-effects model is created.

Table 5 Panel Regression Analysis (Cross-section random effects)

Variables	ROA	LIQ1	LIQ2	SMR
BDS	0.012275	-0.037299**	-0.100815***	-0.032872**
BDC	0.058034**	0.022156	0.105507**	-0.012109
R^2	0.117449	0.086598	0.154116	0.093348
Adjusted R^2	0.082839	0.050779	0.120944	0.057793
F-statistic	3.393500**	2.417618*	4.645977**	2.625443*

Agenda: *** p < 0.01; ** p < 0.05. * p < 0.1.

Source: Authors

According to the presented values of β coefficient, that reflects the direction and intensity of the impact of independent on dependent variable, it can be concluded that the analyzed structural board characteristics have the influence on certain bank performances.

Regarding the influence of board size on bank performances, negative effect on liquidity indicators has been found (LIQ1, LIQ2) and sensitivity to market risk (SMR). The obtained result is in accordance with the previous empirical studies that were carried out by Eisenberg, Sundgren and Wells (1998), Yermack (1996) and Staikouras et al. (2007). According to the presented results, the improvement of bank performances can be reached through defining standards that refer to decreasing board size. The conclusion can be drawn that the increase of board size leads to the decrease of board effectiveness and causes problems in communication and coordination which, consequently, limits bank ability to deal with market risks.

Although most of empirical studies do not confirm significant influence of independent board on bank performances, the results presented in this paper have implied the existence of positive influence of the number of independent board members. In particular, positive significant influence of mentioned structural board characteristic has been confirmed on the

return of assets (ROA), which is in accordance with the results of previous empirical studies, that were carried out by De Andres and Vallelado (2008) and Staikouras et al. (2007). Furthermore, similar result was also found in the case of liquidity analysis. Thus, board composition represents relevant question in the area of corporate governance in banking sector. In general, it can be highlighted that independent board members are more objective, especially when it comes to control board role.

4. Limitations and Directions for Future Research

Apart from the significant implications of our studies in terms of improving board effectiveness, the carried research has a few limitations. The first limitation refers to the sample size. The data used for the analysis have been obtained on the basis of information that banks publish in their business reports, as well as publically available financial statements at the website of the National Bank of Serbia. Initially, the sample covered 27 banks in total, according to the latest data available at the website of the National Bank of Serbia. However, in order to create research model, it was necessary to collect data on board structure and performances in time interval from 2015 to 2017. Due to the problem of non-transparency of data and noncompliance, as well as to the growing trend of mergers and acquisitions, the sample covered 18 banks that actively operate in the observed period.

The second potential limitation refers to the period from 2015 to 2017 comprising 54 bank-year observations. Period from 2015 to 2017 may be short, regarding the nature of the observed dependent and independent variables. However, longer period has caused the decrease of the number of banks included in the sample. Consequently, the number of observations in regression model would be decreased as well, due to limited data transparency on bank performance in the available reports.

The third limitation represents the choice of dependent variables, i.e. bank performance indicators. Although the wide specter of bank performance indicators has been incorporated, not all regression models are of adequate validity, due to which only the results that are statistically significant have been presented in the paper. However, from this point of view, the application of CAMELS model has certain advantages. Basic advantage is reflected in using specific bank performance indicators, as well as the fact that rare empirical research has been based on the mentioned model, due to which obtained results represent useful framework for future research.

Possible direction of future research refers to the increase of observation number. Larger number of observations refers to the inclusion of other banks within financial sector, as well as the expanding of time period within which the empirical research would be carried out. Since human and social capital of board members affects the board effectiveness, the comprehensive research of board effectiveness based on the analysis of behavioral characteristics of board members, as well as their competences should be conducted.

5. Conclusions

The improvement of the effectiveness of corporate governance mechanisms has an important role not only in financial, but also in the entire economic system of one country. In banking sector, regulatory framework and board of directors are stated as the

main mechanisms of corporate governance. An effective regulatory and institutional framework represents one of the key preconditions of economic growth and improvement of corporate governance mechanisms, especially when it comes to transitional economies. Furthermore, pursuant to the provisions of the Law on Banks, the board of directors is entitled responsibility for bank governance.

In order to provide an effective board, it is necessary to identify the factors that determine the board roles, and consequently bank performances, as well. In accordance with the mentioned, two hypotheses have been set out in the paper. The first hypothesis refers to the study of influence of board size on bank performances, measured through CAMELS model indicators. The reported results have shown that in the case of analyzed banks, board size has negative effect to bank performances, such as liquidity and sensitivity to market risk, whereby the mentioned structural characteristic has no significant influence on other observed bank performance indicators. The other hypothesis is set out in order to establish whether there is positive, statistically significant influence of the number of independent directors on the analyzed bank performances. Regarding to our findings, it is emphasized that independent board affects positively bank performances, such as profitability and liquidity, while in the case of other bank performance indicators this characteristic has no significant influence. Consequently, the hypotheses H1 and H2 are partially accepted.

Therefore, it is possible to conclude that board structure represents an important determinant of bank performances. However, in the cases when significant influence of this independent variable on the observed dependent ones is not identified, it is necessary to identify the factors which influence optimal capital adequacy, assets quality, as well as the improvement of management efficiency. This is why it is necessary to continue with the research in this area that should include behavioral characteristics of board members as well as the competences of board members.

The contribution of the carried research reflects in filling out the identified gap, in order to provide the insight into the factors that determine bank performances. Namely, limited empirical studies on the influence of structural characteristics of board on bank performances using CAMELS model. Since CAMELS model provides comprehensive insight into the bank performances, the improvement in relation to the previous research is precisely reflected in the manner of measuring bank performances. Furthermore, the obtained results can be used for the improvement of corporate governance practice within banking sector.

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STRUKTURA UPRAVNOG ODBORA I PERFORMANSE BANAKA: EVIDENCIJA IZ BANKARSKOG SEKTORA REPUBLIKE SRBIJE

Tradicionalna perspektiva, zasnovana na agencijskog teoriji, počiva na pretpostavci da struktura upravnog odbora, kao internog mehanizma korporativnog upravljanja, determiniše njegovu efektivnost, a posledično i finansijske performanse korporacija. Veličina upravnog odbora, kompozicija i liderska struktura se izdvajaju kao relevantne varijable strukture odbora. Budući da su rezultati prethodnih empirijskih studija neretko oprečni, utvrđivanje međuzavisnosti između strukturnih karakteristika i poslovnih performansi je relevantno istraživačko pitanje, posebno u slučaju bankarskog sektora. Kako bi se unapredila efektivnost internih mehanizama korporativnog upravljanja, a posledično, i performansi banaka, glavni cilj istraživanja je identifikacija uticaja veličine i kompozicije upravnog odbora na performanse banaka u Republici Srbiji, upotrebom CAMELS modela. Analizirali smo međuzavisnost koristeći regresioni balansirani panel model, baziran na metodu najmanjih kvadrata, pri čemu je ukupan broj opservacija 54. Doprinos rada se ogleda u izvođenju zaključaka o efektima strukture upravnog odbora na finansijske performanse, kao osnove za definisanje preporuka za unapređenje finansijskih performansi u bankarskom sektoru.

Ključne reči: *upravni odbor, struktura upravnog odbora, performanse, CAMELS, bankarski sektor, Republika Srbija*

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RELATION BETWEEN JOB SATISFACTION OF EMPLOYEES AND THEIR PERSONALITY DIMENSIONS ACCORDING TO THE 'BIG FIVE' THEORY

UDC 005.96

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Abstract. *Awareness regarding the increasing importance of human resources for achieving the organizational competitiveness on the market became an integral part of modern economy, where people, together with their knowledge and skills, represent strategic organizational resource. The aim of this research is to assess the influence of employees' personality dimensions, according to the 'Big Five' theory, and certain facets of job satisfaction as well as different facets of job satisfaction on the overall assessment of job satisfaction. The influence of respondents' socio-demographic characteristics on the individual facets of job satisfaction is also evaluated. The research results indicated that there is a significant difference in the assessment of individual facets of job satisfaction regarding the respondents' demographic characteristics. Also, statistically significant correlations are found between personality dimensions: 'Extraversion', 'Openness to new experiences', 'Conscientiousness', 'Agreeableness' and 'Neuroticism' and individual facets of job satisfaction. The research results will be beneficial for providing the appropriate guidelines for improvement of human resource management of large organizations, especially in the case of public-owned organizations within the countries facing significant restructuring changes, such as Serbia.*

Key words: *job satisfaction, personality dimensions, Big Five theory, transition*

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1. INTRODUCTION

In contemporary business environment, including the high level of global competitiveness, there is a need for seeking the adequate organizational responses and their reactions to constant ongoing changes (Jansen et al., 2006; Olsen & Sallis, 2006). Changes that take place at strategic level of organizations cannot be implemented without appropriate changes within the management of the human resources (Hult et al., 2004; Kwon Choi et al., 2013; Yidong & Xinxin, 2013).

As a response to inadequacy of bureaucracy, or more precisely to hierarchical organization of work in modern companies, caused by increased complexity of managerial processes, Tayloristic principles, based on the strict hierarchy, are increasingly complemented by *participative management* (Fassin et al., 2017). Changes in the environment are characterized by the appearance of multi-competition, new intra- and interorganizational forms, while advances in information and communication technology have been shown valuable for the implementation of new efficient organizing schemes for the advancement of human resources and effective positioning of competent employees (Petković & Lukić, 2014). Changes in attitudes of contemporary management are also manifested in providing greater importance to the employees' job satisfaction, which might further cause numerous positive repercussions for entire organization (Pacheco & Webber, 2016).

Job satisfaction is often the topic within the organizational psychology studies, since it is correlated with "the employees' motivation and job performances, reduced turnover and absenteeism, organizational citizenship behavior and organizational commitment" (Kayal & Das, 2016). Research regarding the employees' satisfaction issues is often related to various sociological and psychological constructs (Arthaud-Day et al., 2012; Lopez et al., 2009). One of important psychological theories, that was also researched in the context of the employees' job satisfaction, is labelled as the 'Big Five' theory, which is related to five dimensions of personality (Berglund et al., 2016; Hahn et al., 2016; Judge & Zapata, 2015).

Herein, the research was conducted within the large public-owned organization Electric Power Industry of Serbia (EPS), an organization that is expected to face restructuring period. The awareness regarding the inevitable incoming transformations is very pronounced among the employees and the research results are analyzed in the light of this fact. For majority of the employees, these transformations would cause changes in their job positions or even their dismissal, which could certainly influence the different facets of job satisfaction.

1.1. Job Satisfaction

Different authors are defining the term of job satisfaction in different ways. However, definitions of this term as provided by Locke (1976) and Vroom (1982) are the most frequently cited in the literature. Locke noted that job satisfaction is 'a positive emotional state that results from assessment of individual's job or experience at work'. On the other hand, Vroom, who equally used the terms 'job satisfaction' and 'job attitude', said that 'job satisfaction is affective orientation of individual towards his/her business tasks'.

Previous research indicated that job satisfaction could be considered as a key variable that might be reflected in the employees' behavior, which is one of the main reasons why job satisfaction is often researched as integral and important aspect of organizational behavior (Burke et al., 2005; Cronin et al., 2000). Besides, previous research also indicated that job satisfaction could be considered on the basis of different facets, including the

employees' satisfaction with pay, promotion, supervision, rewards, benefits, relations with co-workers, nature of the work and communication, as well as satisfaction with operating conditions (Hur et al., 2015; Pantouvakis & Bouranta, 2013, Weiss, 2002), which was also considered for the purposes of this research.

One of the prominent researchers of job satisfaction is Paul Spector (Spector, 1997). He pointed to several reasons for the importance of job satisfaction. The first reason is related to increased humanization of work, which implies that employees should be respected as individuals that are contributing to overall business success of the company, while, on the other hand, job satisfaction could also serve as an indicator of the employees' level of business efficiency. Furthermore, high level of job satisfaction, according to Spector (1997), could also be a sign of positive emotional attitude towards the job, which is important for achieving the high-quality job performances. Besides, organization should be aware of the importance of the employees' job satisfaction, due to the fact that it could have overall positive effects on the fulfillment of organizational goals, which could be manifested by positive behavior towards the achievement of these goals, or by negative behavior of the employees in the case of their dissatisfaction (Spector, 1997; 2000; Spector et al., 2000).

Expressed interest of researchers towards the concept of job satisfaction, as well as towards the identification of its antecedents and consequences, is evident in extensive literature related to job satisfaction (Furnham et al., 2002; Horppu et al., 2008; Kilili & Bozdağlar, 2013; Lee et al., 2013; Moliner et al., 2007; Noe et al., 2010; Pacheco & Webber, 2016).

Antecedents of job satisfaction (factors that cause job satisfaction) are, for example, interpersonal relations between the employees and their personality characteristics (Furnham et al., 2002), representation of participative management as an optimal balance in the degree of involvement of managers and their subordinates in the process of information and knowledge sharing, decision making and problem solving (Pacheco & Webber, 2016; Wright & Kim, 2004).

Consequences of job satisfaction are, for example, higher labor productivity, less absenteeism or less turnover of the employees' (Horppu et al., 2008; Kilili & Bozdağlar, 2013; Lee et al., 2013; Moliner et al., 2007; Noe et al., 2010).

1.1. Personality dimensions of the 'Big Five' theory and their implication within the business environment

There are numerous definitions of the term *personality* in the literature. Personality is defined as "*those characteristics that account for a person's consistent patterns of feeling, thinking, and behaving"* (Pervin & John 1997, p. 4) or as "*an individual's characteristic patterns of thought, emotion, and behaviour, together with the psychological mechanisms– hidden or not–behind those patterns"* (Funder, 2004, p. 5).

Therefore, personality is expressed in different ways, through specific behaviors, opinions and feelings, which make that person different from the other persons.

Employees are satisfied with their jobs, due to internal dispositions, including their personality, among other things (Judge et al., 2002). Personality could be considered as a predictor of career success (Ward, 2019), life satisfaction (Suldo et al., 2015) and job satisfaction (Templer, 2012). According to that, numerous researches indicated the correlation between the employees' personality and various forms of organizational

behavior. Relations between personality and business performances (Conte et al., 2017; Judge & Zapata, 2015) and team performances (Park et al., 2017; Soomro et al., 2016) are subjects for analyzing the problems of correlation between the employees' personality and organizational outcomes. The 'Big Five' theory of personality dimensions is one of the widely used theories when researching these relations. With minor variability, majority of the authors accepted the following five dimensions of personality: extraversion, neuroticism, agreeableness, conscientiousness and openness to new experiences (Atari et al., 2017; Sun et al., 2018).

Extrovert (high level of extraversion) is an expressive person that has many friends, socially oriented, feels good in a group environment and he/she is popular in it. Prevalence of empathy has a positive influence on the work setting, characterized by direct contact with customers and public. This is especially represented within the service sector, politics or profession of the PR managers. Such a person could also be a good supervisor, since he/she easily makes contact with people, and his/her relations with other employees are also characterized by informality that contributes to the establishment of mutual trust (Kaczmarek & Kaczmarek-Kurczak, 2017; Seibert & DeGeest, 2017).

In organizational terms, an individual with a high degree of agreeableness could be excellent team member, due to the fact that such a person usually brings harmony into the team, but also due to the fact that such a person is open for accepting the opinions of other team members, if he/she feels that their ideas could contribute to successful realization of the entire project (Judge et al., 2002; Judge & Zapata, 2015).

An individual with high level of conscientiousness is very organized and strict throughout the implementation of established procedures and rules. In business environment, such a person would be successful within the job positions that do not require greater degree of flexibility when choosing directions for accomplishment of business tasks, but consistency in following the established procedures (Anwar et al., 2018).

Furthermore, an individual with a high degree of openness to new experiences is original, creative and innovative, with the belief that changes would cause better situation in business environment. Such a person does not avoid complex situations and he/she tries to find a way out of them. All those job positions that require originality, creativity and global approach to solving the problems could be considered as appropriate for these individuals. On the other hand, an individual with low degree of openness to new experiences usually expresses unwillingness for using the non-traditional resources and he/she also expresses doubt regarding the choice of non-standard manners for solving the problems (Ivcevic & Brackett, 2015; Ngek, 2015).

An individual with a high degree of neuroticism tends to evaluate numerous situations in life in a negative way, so his/her job dissatisfaction is often a consequence of this personality dimension, rather than the real situation. It is also important to note that an individual with pronounced neuroticism is characterized by the lack of emotional stability and concern. Such a person hardly fits into a team, mostly due to his/her pessimism regarding the realization of organizational goals (Marchand & Vandenberghe, 2016; Vandenberghe et al., 2019).

1.2. Importance of personality dimensions for shaping the employees' job satisfaction

In recent years, there has been a significant increase in the number of researchers regarding the effects of dispositional factors on job satisfaction, with particular interest on affective disposition. The importance of individual factors for gaining the job satisfaction might be changed over time. However, some studies suggest that personality dimensions have certain stabilizing role in assessment of job satisfaction, which is the main reason of increased interest of researchers regarding the personality-related factors (Avery et al., 2015; Maggiori et al., 2016). Existence of different theories regarding the personality dimensions also influences different approaches to researching the job satisfaction. Hence, researchers usually choose the appropriate instruments for measuring personality dimensions, which are in accordance with the specific theory accepted as relevant by the researcher (Kampkötter, 2017; Maggiori et al., 2016). Herein, the research is based on the 'Big Five' theory of personality dimensions, due to considerable suitability of this theory in studies related to business environment.

Numerous authors found significant correlation of neuroticism with job satisfaction (Hackman & Oldham, 1974; Fiori et al., 2015; Judge et al., 2017). Perception and cognition have an important role in different theories related to job satisfaction, which are suggesting that an individual with high neuroticism perceives the environment as generally negative, which might cause negative job experience and low job satisfaction among these employees (Fiori et al., 2015; Judge et al., 2017).

Employees' job satisfaction surveys were also conducted over prolonged period, which revealed the stability of the employees' job satisfaction, despite the frequent changes in business conditions and business tasks. One of the possible explanations for this phenomenon is certain genetic conditionality of the employees' perception of job satisfaction (Li et al., 2016).

Arvey, Bouchard, Segal and Abraham (1989) indicated that determinants of job satisfaction could be genetically inherited. They came to these conclusions by examining the monozygotic twins (by using MSQ), which showed that 30% of the variance in job satisfaction was related to genetic components. This research was stimulated, in particular by the research conducted by Staw and Ross (1985), who pointed out that, over the five years of research in the same company, job satisfaction was very stable, regardless of the fact that pay and status of numerous employees were changed significantly during the researched period.

For example, it happens that people, who were often faced with different failures in any area of life, might generalize their dissatisfaction and transfer it to overall business environment, regardless of the real situation at work, which is confirmed on the basis of the study conducted by Zhao, Ghiselli, Law and Ma (2016) who focused their research on the intrinsic motivation and relations between job characteristics, job satisfaction, job stress and life satisfaction. Such people could feel the job dissatisfaction without the real grounds. They tend to experience the business tasks even harder than they actually are. On the other hand, personal satisfaction would lead to mature and tolerant way of behaving, which might result in mitigating the negative situations in business environment. Personality's compliance with specific job requirements allows the balance between the personality traits and job requirements to be consistent. Misbalance between personality and business tasks, together with dissatisfaction, caused by the other factors, might lead to different conflicts

between the people, absenteeism, fluctuation, passivation, alcoholism, injuries at work, frequent illnesses due to increased sensitivity and reduced resistance to stress (Fiori et al., 2015; Judge et al., 2017). Stress is particularly recognized as a serious problem for the functioning of individuals and organizations (Lukić & Lazarević, 2018).

Existence of harmony between the employees and demands of their job positions, enables better usage of their knowledge and abilities and yields the sense of achievement and greater personal satisfaction. On the other hand, organization also benefits in terms of gaining the productivity and achieving the good interpersonal relations (Kilili & Bozdağlar, 2013; Lee et al., 2013; Noe et al., 2010).

In one meta-analysis, Judge, Heller and Mount (2002) showed that emotional stability (expressing the indifference in conflict situations, providing the optimistic explanation for possible solution of the conflict, rapid consolidation after the conflict and rapid adjustment to new situation) correlates with job satisfaction. Loveland et al. (2015) confirmed that high levels of extraversion and emotional stability are significant predictors of job satisfaction. Agreeableness is also an important predictor of job satisfaction, according to Judge et al. (2017), since high score of this personality dimension implies motivation for achieving high degree of interpersonal closeness, which could further contribute to overall job satisfaction. Openness to new experiences is associated with creativity, especially with scientific and artistic creativity and readiness for accepting the divergent attitudes. Previous research also indicated that conscientiousness is positively correlated with job satisfaction, as it is associated with positive business performances. This should lead to significant promotion, rewards or benefits as important facets of job satisfaction. Finally, previous research also indicated that neuroticism would cause low levels of job satisfaction, although there are disagreements on this finding in the literature, which is understandable, since every study is conducted on specific sample and it could be significantly dependent on the type of specific business organization in which the research is conducted (Judge et al., 2017).

2. METHODOLOGY

2.1. Data collecting procedure

The survey research was conducted on the sample of the employees in the public company RB Kolubara, Elektroprivreda Srbije (EPS). This company was founded in 1992, deals with mining and distribution of coal and employs around 12,000 people. Its size and importance of the organization for the entire economy of Serbia were the main reasons for choosing this organization as the object of the research. At the beginning of the research, 250 questionnaires were distributed to the employees during 2018, with 222 of them completely answering the questions. Respondents provided their answers by using the standard method of pen and paper.

Subject of the research was focused on the relations between individual facets of job satisfaction and the employees' personality dimensions, according to the 'Big Five' theory. In addition, the impacts of the respondents' demographic variables on individual facets of job satisfaction were to be determined, within the organization that will experience significant changes in the transitional economy. The research results could find their practical implications in improving the employees' job satisfaction according to their personality traits in such important organization for Serbian economy with almost 12,000 of employees, which is reflecting the importance of conducting this research.

2.2. Hypotheses

Based on the literature review, as well as on the basis of aforementioned specifics of the business within the organization in which the research was conducted, three hypotheses of the research could be identified:

Hypothesis 1 (H1): There is a significant correlation between the employees' demographic characteristics (gender, age, education degree, working tenure, job position) and individual facets of job satisfaction.

Hypothesis 2 (H2): There is a significant correlation between assessment of overall job satisfaction (as dependent variable) and assessment of individual facets of job satisfaction (as independent variables)

Hypothesis 3 (H3): There is a significant relationship between the dimensions of personality and the facets of job satisfaction.

2.3. Instrument

The survey research was based on standardized questionnaires, which were affirmed in the literature as questionnaires that comprehensively analyze job satisfaction and personality dimensions within the 'Big Five' theory. Accordingly, the questionnaire could be divided into four parts. The first part of the questionnaire covered the questions related to the employees' demographic characteristics (gender, age, education level, working tenure and job position (subordinate or managerial)). The second part of the questionnaire contains 36 items for measuring nine dimensions of job satisfaction (pay, promotion, nature of the work, supervision, relations between co-workers, communication, benefits, operating conditions and rewards), on the basis of the Likert scale, from 1 (completely disagree) to 6 (completely agree), according to the Questionnaire formed by Paul Spector (Spector, 1997) and reused in further studies (Argyle, 2013; Frey & Stutzer, 2010).

The third part of the questionnaire refers to assessment of overall job satisfaction. Respondents expressed their satisfaction/dissatisfaction on the scale from 1 (completely dissatisfied) to 5 (completely satisfied). The fourth part of the questionnaire contained the items for measuring five dimensions of personality (extraversion, neuroticism, agreeableness, openness to new experiences, conscientiousness). These personality dimensions were measured on the basis of the scale established by Howard and Howard (2000). Collected data were statistically processed by using the SPSS (17.0), on the basis of descriptive statistics, as well as variance, correlation and multiple regression analysis.

3. RESULTS

3.1. Sample characteristics

Demographic characteristics of the employees were distributed among the respondents as follows: percentage of the male respondents (62%) was higher than percentage of the female respondents (38%). About 14% of the respondents are up to 30 years old, while 26% of the respondents are between 31 to 40 years old. There are 40% of the respondents in the category between 41 and 50 years, while 20% of the sample belongs to the age category between 51 and 65 years. According to the employees' education degree, minority of the respondents gained elementary education degree (3%), while majority of the

respondents gained high school education degree (47%). On the other hand, 16% of the respondents gained college (two-years) education degree, while 34% of them gained faculty (four-years) education degree. There were 18% of the respondents in the category that has up to five years of working tenure, 10% of those who have between 6 and 10 years of working tenure, while 6% of the respondents have between 11 and 15 years, 21% have between 16 and 20 years, 24% have between 21 and 25 years and 21% of the respondents have over 25 years of working tenure. Most of the respondents (83%) are employed within subordinate job positions, while 17% of them are employed within managerial positions.

Table 1 Descriptive statistics for personality dimensions, facets of job satisfaction and general job satisfaction assessment (N = 222)

Dimension	Minimum	Maximum	Mean Value	Standard deviation	Alpha coefficient
Neuroticism	1.0	7.0	4.25	1.30	0.72
Extraversion	1.4	7.0	5.72	1.22	0.78
Openness to new experiences	2.0	7.0	5.57	1.02	0.82
Agreeableness	1.8	8.0	5.81	1.15	0.75
Conscientiousness	1.0	7.2	6.22	0.90	0.81
Benefits	1.0	5.75	2.80	0.96	0.79
Communication	1.0	7.0	3.27	1.02	0.86
Supervision	1.5	6.0	4.26	0.98	0.82
Relations with co-workers	1.75	6.0	4.35	0.77	0.83
Operating conditions	1.0	5.5	3.46	0.80	0.80
Pay	1.0	5.25	2.65	0.93	0.84
Nature of the work	1.0	6.0	3.95	0.92	0.78
Rewards	1.0	5.5	2.80	0.94	0.81
Promotion	1.0	6.0	3.00	0.88	0.78
General job satisfaction	1.0	5.0	2.71	0.80	0.72

Influence of the employees' demographic characteristics (gender, age, education degree, working tenure and job satisfaction) on individual facets of job satisfaction was analyzed by ANOVA test. According to the respondents' job position, the research results pointed to significant difference of this demographic variable on the 'Nature of the work' facet of job satisfaction ($F = 8.00$; $p = .005$), as shown in Table 2. The research results did not point to significant differences in other facets of job satisfaction on the basis of the respondents' job position.

Table 2 'Nature of the work' facet of job satisfaction and the respondents' job position

Job position	Mean Value	Standard deviation	F	P
Subordinates	3.86	0.93	8.00	.005
Managers	4.32	0.77		

Also, the research results pointed to significant differences in the facets of job satisfaction 'Supervision' ($F = 3.88$; $p = .010$) and 'Benefits' ($F = 2.75$; $p = .043$), according to the respondents' age, which is shown in Table 3. On the other hand, the research results

did not point to significant differences in other facets of job satisfaction, on the basis of the respondents' age.

Table 3 'Supervision' and 'Benefits' facet of job satisfaction and the respondents' age

Age (years)	Supervision					
	Mean Value	Standard deviation	F	P	Significant Contrast	Significant Differences
Up to 30	4.70	0.80	3.88	.010	1-3	0.52
31-40	4.38	1.01			1-4	0.69
41-50	4.18	0.94			2-4	0.38
51-65	4.01	0.94				
	Benefits					
	Mean Value	Standard deviation	F	P	Significant Contrast	Significant Differences
Up to 30	2.91	1.07	2.75	.043	2-4	-0.53
31-40	2.62	0.95				
41-50	2.76	0.90			3-4	-0.38
51-65	3.15	0.96				

The research results did not point to significant differences in researched facets of job satisfaction on the basis of the respondents' educational degree and their working tenure. However, significant difference was found for 'Operating conditions' facet of job satisfaction, according to the respondents' gender ($F = 4.10$; $p = .044$), which is shown in Table 4, while significant differences were not found for other facets of job satisfaction.

Table 4 'Operating conditions' facet of job satisfaction and the respondents' gender

Gender	Mean Value	Standard deviation	F	P
Male	3.37	0.83	4.10	.044
Female	3.61	0.73		

Based on the research results, H1 is partially confirmed. There is a correlation between certain demographic variables and individual facets of job satisfaction, according to the research results. More precisely, according to the previously represented research results, there is a correlation between 'Supervision' and 'Benefits' facets of job satisfaction and the respondents' age. Besides that, significant correlation was recorded between 'Operating conditions' facet of job satisfaction and the respondents' gender, while the respondents' job position significantly correlates with 'Nature of the work' facet of job satisfaction.

Finally, multiple step-by-step regression analysis was conducted for identifying the impact of individual facets of job satisfaction factors (as independent variables) on the assessment of overall job satisfaction (as dependent variable). The research results pointed to the following regression rating equation = 0.147639 + 0.0846863 x 'Communication' facet of job satisfaction + 0.103804 x 'Supervision' facet of job satisfaction + 0.184344 x 'Pay' facet of job satisfaction + 0.363224 x 'Nature of the work' facet of job satisfaction + 0.118417 x 'Recognition' facet of job satisfaction +0.0843225 x 'Promotion' facet of job satisfaction

Significant relation between the variables at significance level of 99% was found. From the previously presented equation it follows that 'Nature of the work' and 'Pay' facets of job satisfaction have the greatest impact on the overall job satisfaction. Gained result could be explained by the type of the business tasks that are mostly performed within the researched company. Majority of the respondents are employed on the mining positions, in direct production process, where working conditions are difficult, so it is not surprising that 'Nature of the work' is an important facet in assessing the overall job satisfaction. Transition period in most of the countries within the Central and Eastern Europe is characterized by high degree of dismissal of workers, thus facing numerous existential problems. On the other hand, such potential problems are already recognized by policymakers, trade unions and employers within developed countries and they are keep in mind when planning the new reforms or changes within the workplace settings (Hess et al., 2016). In such situation, job security becomes one of the most important factors affecting their business performances. This, for example, results in the fact that answers to questions about the employees' 'Pay' facet of job satisfaction might be strongly influenced by the fact that numerous citizens have no pay at all, which is indicating that unemployment is one of the key macroeconomic problems facing the economy of the Republic of Serbia, as well as that minimizing the unemployment problem is one of the most important tasks of the modern era, since it has direct negative implications on the quality of life and the average living standard of the population (Gnjatović & Leković, 2019). It is, therefore, not surprising that employees labeled their 'Pay' facet as the second most important factor in assessing the overall job satisfaction.

Based on the research results, H2 is partially confirmed. There are significant correlations between assessment of the employees' general job satisfaction (as dependent variable) and their assessments of different facets of job satisfaction (as independent variables).

The research results also showed that significant linear dependence was found between the following pairs of personality dimensions and job satisfaction facets: 'Extraversion' and 'Supervision', 'Extraversion' and 'Relations with co-workers', 'Extraversion' and 'Nature of the work', 'Neuroticism' and 'Benefits', 'Neuroticism' and 'Pay', 'Openness to new experiences' and 'Benefits', 'Agreeableness' and 'Supervision', 'Agreeableness' 'Relations with co-workers', 'Conscientiousness' and 'Benefits', as shown in Table 5. In line with the research results, H3 is confirmed. There are significant relations between certain dimensions of personality and certain facets of job satisfaction. Table 5 shows only those facets of job satisfaction that showed significant correlations with individual dimensions of personality.

Table 5 Correlations between personality dimensions and job satisfaction facets (N = 222)

	Supervision	Relations with co-workers	Nature of he work	Benefits	Pay
Extraversion	0.1658*	0.1494*	0.1368*	-0.0862	-0.0931
Neuroticism	-0.0126	-0.0204	-0.0636	0.2305**	0.1563*
Openness to new experiences	0.0619	0.0767	-0.0181	-0.1563*	-0.1249
Agreeableness	0.1588*	0.1433*	0.0447	-0.0687	-0.0527
Conscientiousness	0.1000	0.0984	0.0468	-0.1371*	-0.1070

*Correlation is significant at the .05 level (2-tailed).
**Correlation is significant at the .01 level (2-tailed).

4. DISCUSSION

Based on the research results, the highest assessment by the employees (6.22) was recorded for personality dimension 'Conscientiousness', while the lowest assessment (4.25) was provided for personality dimension 'Neuroticism'. Such assessments might be result of subjective evaluation of the employees that high level of 'Conscientiousness' is appropriate characteristic that would be highly evaluated by the management throughout the future transformation process when reducing the number of employees. Also, high 'Neuroticism' is highly undesirable for teamwork within the organizations that are highly oriented to collaboration between the different workplaces, due to complexity of the business tasks. In the case of facets of job satisfaction, the highest rating (4.35) was recorded for 'Relations with co-workers' facet of job satisfaction, while the lowest grade was recorded for 'Pay' facet of job satisfaction (2.65). Earnings in this organization are relatively high comparing to other organizations outside the public sector. For example, monthly incomes within the sector that is mainly operating through the private organization in Serbia is tourism. The research results of the study conducted by Jovanović et al. (2019) indicated that majority of the respondents (even 45% of them) have monthly incomes between 15,001 and 30,000 RSD, that is under the average monthly incomes in Serbia which amounts to around 49,650 RSD according to data basis of Statistical Office of Republic of Serbia. On the other hand, also according to data basis of Statistical Office of Serbia, average monthly incomes in the field of mining and distribution of coal amounts to between 76.873 and 79.481 RSD, which is above the average earnings for Serbia. One of the possible explanations for such low 'Pay' facet of job satisfaction might be related to the respondents' assessment that even this relatively good personal income is still insufficient for the needs of the employees, especially for those with large number of unemployed household members. In addition, this result may be a consequence of a possible organizational practice on rewarding some employees not due their productivity but due to their political engagement or some other non-work-related circumstances, which is viewed as unjust by most of the employees.

The research results pointed to significant difference in the employees' assessment of 'Nature of the work' facet of job satisfaction, according to the respondents' job position, with higher values obtained for the managers in comparison to the subordinates. There are numerous factors that contribute to higher grades of this job satisfaction facet among the managers. Managing position provides higher personal incomes, high degree of autonomy in performing the business tasks, realization of self-actualization, which is highly evaluated in the Maslow's hierarchy of the needs, as well as their greater influence in a decision-making process. In the surveyed environment, managing position often provides greater impact in a wider community, which could also bring certain benefits to these supervisors outside the organization. The research result also indicated significant difference in the employees' assessment of 'Supervision' facet of job satisfaction, according to the respondents' age, between those who have up to 30 years and between 41 and 50 years, those who have up to 30 years and between 51 and 65 years, as well as between those who have between 31 and 40 years and between 51 and 65 years. It is noticeable that employees' assessment of 'Supervision' facet decreases with the increase of their age, which might be a consequence of the employees' expectation that their life and work experience should bring them greater respect from the supervisors, greater participation in decision-making process, greater independence in performing their business tasks. The research results also pointed to

significant difference in the employees' assessment of 'Benefits' facet of job satisfaction, according to the respondents' age, between the respondents of the age group 31-40 years and those 51-65 years, as well as between the respondents of the age 41-50 and those 51-65 years. In both relations higher age group also brings higher values for the "Benefits" facet. One of the possible explanations could be related to the fact that older employees were repeatedly rewarded throughout their working lives and that they do not have high expectations in the future. For example, existence of organizational resorts allowed the best employees to spend their summer and winter vacations at the expense of the organization, while they also gave financial rewards to successful innovators. Aware of the present capabilities of the organization, they look more realistically at the place of this facet of job satisfaction in assessment of overall job satisfaction, which resulted in lower criteria in its assessment. Younger employees, who are striving for affirmation and recognition, also have high expectations that remain often unfulfilled in the present conditions, leading to lower assessment of this facet of job satisfaction. The research results also indicated significant difference in the employees' assessment of 'Operating conditions' facet of job satisfaction, in accordance to the respondents' gender. According to these results, female employees are more satisfied with this facet of job satisfaction, in comparison with their male colleagues. One of the possible explanations might be related to characteristics of the researched organization, due to the fact that significant number of male employees are working in difficult business conditions that require intensive physical work engagement.

The gained results indicated significant correlations between personality dimensions and facets of job satisfaction. Positive correlation between personality dimension 'Extraversion' with facets of job satisfaction: 'Supervision', 'Relations with co-workers' and 'Nature of the work' are a consequence of the fact that extrovert persons are able to easily establish good relationships with people, including their supervisors and other employees. Their relations with people are based on trust in them, which is of great importance for teamwork and such attitude might contribute to creating the harmonious relations between the team members and selfless exchange of knowledge, which might be important during the structural changes within the organizational environment.

Positive correlations between 'Neuroticism' and facets of job satisfaction 'Benefits' and 'Pay', together with the absence of correlation between 'Neuroticism' with other facets of job satisfaction, are indicating that high degree of 'Neuroticism' does not express high degree of satisfaction with those aspects of the job that are largely influenced by interpersonal relationships among the employees. If such a person is not involved in a teamwork possible increase of his or her personal incomes or receiving some benefits will be a consequence of his/her individual activities and, therefore, such a person expresses greater degree of 'Pay' and 'Benefits' facets of job satisfaction.

Negative correlation coefficient established as a measure of the linear relations between 'Openness to new experiences' and 'Benefits' facet of job satisfaction could be explained as follows: an individual with high degree of 'Openness to new experiences' is creative, innovative and full of ideas that, if realized, might create an expectation for such a person to receive certain benefits. Therefore, his/her expectations of benefits are higher and his/her criteria for high score of this job satisfaction facet are very high. If these criteria are not fulfilled, it could result in relatively low score of satisfaction among the employee with pronounced personality dimension 'Openness to new experiences'. Person with high 'Agreeableness' and tolerance for other people, who is inclined to forgiveness, will not be

demanding in assessing the quality of their 'Supervision' and 'Relations with co-workers' facets of job satisfaction and such a person will have lower criteria that will cause high grades for these relations. Individual with expressed 'Conscientiousness', especially if he/she is employed within the job positions characterized by the need for precision, meeting the deadlines and systematic approach in conducting the business tasks, has high work performance, which then induces high expectations of possible benefits. Therefore, criteria of such a person for assessing the 'Benefits' facet of job satisfaction are high and, if they are not fulfilled, such a person will give lower rating of aforementioned facet of job satisfaction.

According to the research results, conducted in this and other countries, there is no doubt that certain dimensions of personality affect certain aspects of job satisfaction. One of such studies was conducted in a Romanian company, with intention of comparing the research results with those conducted in the Western companies (van den Berg, Pitariu, 2005). As Romania is a country in transition, as well as Serbia, results of that study might be of interest to our companies as well. Van den Berg and Pitariu (2005) conducted the study on the sample of 228 male and 62 female engineers, who were employed within the science centers and now hold executive positions within Romanian companies and this research was related to relations between personality dimensions and job satisfaction. They found that significant correlation between extraversion and job satisfaction has not been confirmed, but they also found that there is significant correlation between conscientiousness and job satisfaction. Their research results also pointed to the fact that neuroticism is negatively correlated with job satisfaction, while the openness to new experiences is positively correlated with job satisfaction (van den Berg, Pitariu, 2005). In general, the results obtained, except for the extroversion dimension, are in agreement with the results obtained in the research conducted in Western companies. The discrepancy can be explained, as the authors state, by the fact that Romania has been under authoritarian rule for a long time, which has also been reflected in relations within companies, with no significant participation of employees in management and no expression of emotions and willingness to cooperate with others. Openness, and especially intellectual curiosity, are good predictors of a willingness to change, which is very important in transition times.

5. CONCLUSION

The necessity of studying the problems of job satisfaction is especially pronounced in the time of rapid changes, which is one of the main consequences of modern development in technology, politics and economy. Nowadays, this issue is approached from the perspective of human resources development, or more precisely from the perspective of the human resource management, which will enable the employees to maximize their potentials and thus enable themselves and the organization to realize the set of individual and organizational goals. Harmony between these goals is one of important preconditions for successful implementation of changes and, therefore, one of the most important tasks of management in the organization is to recognize the employees' job satisfaction and to take adequate measures for its achievement. Results of this study provide some indication of job satisfaction within the researched organization. The low level of pay satisfaction expressed in this research might be a consequence of inadequate organizational rules on rewarding. Pay satisfaction might, therefore, be a consequence of comparing the personal income with

incomes of other employees in similar job position and information that they have higher personal incomes without a clear work-related reason for this situation. Creating the more appropriate rules on rewarding system or providing the more transparent approach in rewarding process would also contribute to development of innovative programs, which is significant in organizations such as the one in which the research was conducted.

Significant correlation coefficients, which measure the degree of linear dependence between personality dimensions and job satisfaction facets, indicated the expected correlations. Thus, positive correlation of extraversion and satisfaction with supervisors, other employees and the nature of the work is, among the other things, a consequence of extroverts' ability to easily establish good relations with people in general, including their supervisors and other employees. There was also a positive correlation between the personality dimension "neuroticism" and satisfaction with benefits and pay, as well as the absence of correlation between the personality dimension "neuroticism" and other facets of job satisfaction. Negative correlation coefficient was found in the relation between the personality dimension "openness to new experiences" and satisfaction with benefits. Positive correlation between the personality dimension "agreeableness" and satisfaction with supervisors, as well as with relations with co-workers was identified, while conscientiousness negatively correlated with the employee's satisfaction with benefits.

All these correlations are certainly influenced by the specificity of the workplace and therefore they should be considered by the management, in consultation with psychologists, when selecting the candidates and forming the business teams.

Limitations of the study: About 50% of the employees are field workers in the company, working on the coal mine, which were hard to reach for the purpose of the study and therefore possibly underrepresented in the sample.

Similar research in other sectors could significantly contribute to the efficiency in managing the organizational changes, improving the business performances and increasing the employee's organizational commitment, which would undoubtedly increase the overall efficiency of the economy.

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RELACIJE IZMEĐU ZADOVOLJSTVA POSLOM ZAPOSLENIH I NJIHOVIH DIMENZIJA LIČNOSTI PREMA TEORIJI VELIKIH PET

Svest o sve većem značaju ljudske strane organizacija za postizanje konkuretnosti na tržištu postala je sastavni deo savremene ekonomije, gde u tržišnoj utakmici ljudi sa svojim potencijalima predstavljaju strateške resurse kompanija. Predmet ovog istraživanja su relacije između dimenzija ličnosti prema modelu Velikih pet i pojedinih dimenzija zadovoljstva poslom uzimajući u obzir i socio-demografske karakteristike ispitanika. Dobijeni rezultati su značajni u cilju obezbeđivanja baze podataka koja bi omogućila unapređenje upravljanja ljudskim resursima u zemlji koja prolazi kroz process tranzicije, kakva je Srbija. Rezultati do kojih smo došli ukazali su da postoji statistički značajna razlika u oceni pojedinih faseta zadovoljstva poslom u odnosu na demografske varijable ispitanika. Utvrđene su i statistički značajne korelacije između dimenzija ličnosti prema teoriji Velikih pet: Ekstraverzija, Otvorenost, Sistematičnost, Prijatnost i Negativna afektivnost i pojedinih faseta zadovoljstva poslom. Preporuke menadžmentu ljudskih resursa koje su izvedene na osnovu istraživanja, mogu biti relevantne za slične velike organizacije u javnim preduzećima kojima predstoje značajne organizacione promene.

Ključne reči: *zadovoljstvo poslom, dimenzije ličnosti, teorija Velikih pet, tranzicija*

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Preliminary Communication

SHORT-TERM FORECASTING OF BELEXLINE AND BELEX15 MOVEMENTS

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Abstract. *At the onset of 2019, global economy has been facing a number of macroeconomic issues, which significantly multiplied in the course of the past ten-year period. Slow-moving rate of economic growth, increased fiscal deficits, enormous public and private debt – these are just some of the issues which led to the plunge of the leading stock market indices at the end of 2018. Bearing in mind that S&P 500, DJIA and NASDAQ Composite stopped the multiannual growth trend which started on March 22, 2009, new quakes on the global financial market may well be expected. Unlike developed global stock markets, which hugely recovered from the 2008 crash, the Belgrade Stock Exchange showed no significant growth trend in the observed period. In this respect, regardless of the detected declines of the world's best known stock market indices, it is not realistic to expect any significant change in the Belgrade Stock Exchange share market, which the conducted empirical research should confirm. The basic goal of the research is to establish the monthly tendencies of BELEXline and BELEX15 movements in the forthcoming one-year period. The basic hypothesis of the research is that there will be no significant changes in the movement of the values of selected stock market indicators in the Belgrade Stock Exchange share market during the one-year period to come.*

Key words: *Short-term forecasting, BELEXline, BELEX15, Winters' additive model, Winters' multiplicative method*.

JEL Classification: G17, G23, C22

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INTRODUCTION

Depending on the method of establishing future share price movements, stock market analysts may be divided into two groups: fundamental analysts and technical analysts. The fundamental analysis advocates consider solely the basic market factors, whereas the technical analysis advocates use a number of graphic methods. In order to establish future share values, "fundamentalists" analyze the factors arising from economic and political background (a company's earnings, dividends, interest rate, etc.). Unlike them, technical analysts base their forecasts solely on market data analysis, assuming that all economic, financial, political and psychological factors are instilled in the market price of shares. They maintain their attempt to establish future short-term changes of share prices based on the past quotation analysis (in the period of at least 6 months) (Rusu & Rusu, 2003).

Economic forecasting has been underestimated for a long time. However, this field has become very popular in recent years. New researchers, such as Lawrence Klein, Wassily Leontief, Franco Modigliani and James Tobin, became Nobel prize winners for economics for their achievements in the field of forecasting (Lovrić et al., 2013, p. 132). Some of the leading scientific journals in this field are *International Journal of Forecasting* (*International Institute of Forecasters*) and *Journal of Forecasting* (*Wiley*). ~~Also~~ Moreover, the forecasting research may be found in some well-known journals in the field of statistics, management science, econometrics and operational research (*Journal of Business and Economic Statistics*, *Management Science* and *Journal of Econometrics*) (Chatfield, 2001, p. 10).

In this paper, the short term forecasting of future movements of BELEXline and BELEX15 indexes of the Belgrade stock exchange will be carried out. Regarding research objectives, the paper is organized in the following manner: The first part of the paper will deal with the analysis of the forecasting methods used in the simillar researches. Winter's additive and Winter's multiplicative method will be used to perform the analysis and the forecasting of BELEXline and BELEX15 future values. In the second part, the model testing and the short term forecasting will be carried out, based on the model's goodness of fit with the historical values of stock indexes. In the final part of the paper, the discussion of the empirical results will be given along with the corresponding conclusions.

METHODOLOGY

The time series forecasting methods may be classified into qualitative and quantitative (Bovas & Ledolter, 2009, p. 2). The *qualitative methods* are applied in case time series data cannot be expressed quantitatively or are unavailable. These methods are based on the opinions of experts, which means the values of underlying economic phenomena are established based on an assessment of a group of economic experts. The *quantitative methods* may be used only if a piece of information about a phenomenon whose movement is subject to forecasting may be expressed numerically, i.e. quantified. In this regard, they are based on mathematical and statistical models. In order to apply the quantitative methods, one must use the data relative to the past time series values. The basic premise of the time series forecasting methods is that the series movement will be in the future as it was in the past. The quantitative methods include applicable methods of the statistical analysis of time series (project methods) and causal methods. The methods of the statistical analysis of time series forecast future movement of an economic

phenomenon solely on the basis of its values from the past, while the causal methods rest upon a premise that the phenomenon whose movement is subject to forecasting has a cause-and-effect relationship with another economic phenomenon or phenomena.

Generally speaking, the time series models may be used in case there is a small amount of information regarding the factors which affect the variable value, there is a huge amount of data or the analysis goal is to make a short-term forecast (Rusu & Rusu, 2003). In this respect, the time series analyses relative to the share prices and stock market index values from the past are suitable for use along with the technical analysis. Like the technical analysis, the time series analysis along with the past share price analysis uses different statistical methods to forecast their movement in the future. A majority of research of this kind applies the following methods: time series decomposition, Box-Jenkins (ARIMA) methodology, neural networks and Holt-Winters' exponential smoothing (Tseng et al., 2012). Nevertheless, in addition to this, the *Box-Jenkins (ARIMA) methodology* is predominantly used for short-term forecasting purposes (Rusu & Rusu, 2003). Some of the authors who explained the application of this methodology more closely by means of a stock market index example were Varghese et al. (2016). Tolosa et al. (2015) used the ARIMA methodology to analyze and forecast the Philippine Stock Exchange indices. Seeking to predict the future values of stock market indices they often use the *moving average methods* in their research. These methods were used by numerous researchers for the analysis and forecasting of daily values of the best-known stock market indicator, the Dow Jones Industrial Average (Brock et al., 1992; Sullivan et al., 1999; Siegel, 2008). The moving average methods take the latest dynamic series data into account. The effect of the latest observations wanes with the rise of the number of values (periods) used. If a dynamic series experiences random changes in longer time intervals, a larger amount of data is used, and if random changes occur frequently, i.e. in shorter time intervals, a considerably smaller amount of data is used (Rusu & Rusu, 2003). Although quite complex as well, the *neural networks model* is frequently used to analyze and forecast the stock market indicator values. Leigh et al. (2005) used this model to analyze the NYSE Composite Index and forecast its future movement. The neural networks model was also used by Yumlu et al. (2005) while testing the Istanbul Stock Exchange performance, whereas Mostafa (2010) used it to forecast the stock market movements in Kuwait. The *exponential smoothing methods* are also often used to make short-term forecasts of time series. This group of methods is suitable for short-term prediction, step by step. In addition to this, a smoothed value of time series represents a combination of exponentially weighted values, whose movement is represented up to a certain observed period, and specific observed smoothed values during such period. A smoothed time series indicates the basic tendency and principle present in the data. Simple exponential smoothing does not recognize the trend in time series, whereas the value forecast by means of the Holt-Winters' method includes both the exponentially smoothed component and trend component (Rusu & Rusu, 2003). Besides, time series often feature seasonal variations. In this context, the Holt-Winters' forecasting methods were developed and they include the seasonal component; there are additive and multiplicative methods (Kalekar, 2004). The goal of time series exponential smoothing is to eliminate the effects of random variations (fluctuations) and discover the basic characteristics of the phenomenon development. By applying the procedure of exponential smoothing to the available data, a smoothed series is obtained by means of suppressed random fluctuations. The resulting smoothed value series is a starting point used to forecast future values.

Two methods were selected from a vast group of exponential smoothing methods to analyze and forecast the future movement of BELEX15 and BELEXline indices: *Winters'* additive and *Winters'* multiplicative methods. The application of the above methods to the time series of these indices (separately) resulted in two models per each series. A better adjusted model was selected based on the forecast root-mean-square error as a criterion for the model evaluation. The better model is the one with less forecast error (root-mean-square error (RMSE) in this case). All calculations were made in *IBM SPSS* software.

Even though the first organized share trade at the Belgrade Stock Exchange began by the middle of 2001, the Stock Exchange made its first index, BELEXfm, on May 1st, 2004. It was the so-called *all-share* index, which means it comprised all shares included in the free stock market (fm - free market). The enormous rise of share prices and market activities in general in the period before the global financial crisis was improperly illustrated by the general market movement indicator. For this reason, on May 3rd, 2007 BELEXfm was replaced by BELEXline, which provided a much more precise representation of the general performance of the shares traded on the Stock Exchange. BELEXline represents all shares traded on a regular basis, i.e. actual market capitalization is indexed. On October 1st, 2015 the Belgrade Stock Exchange made its second index, BELEX15, which included only shares traded by continuous trading which met the criteria for inclusion into the index basket. The base values of both indices were 1,000 index points. The monthly value data of BELEX15 and BELEXline indices between October 2005 and February 2019 were taken from the Belgrade Stock Exchange website and shown in Figure 1 and Figure 2.

Based on the shown values of the main Belgrade Stock Exchange indices the impact of the 2008 global financial crisis is clearly observed. This shock is one of the most influential factors which may affect successful forecasting of the BELEX15 and BELEXline time series.

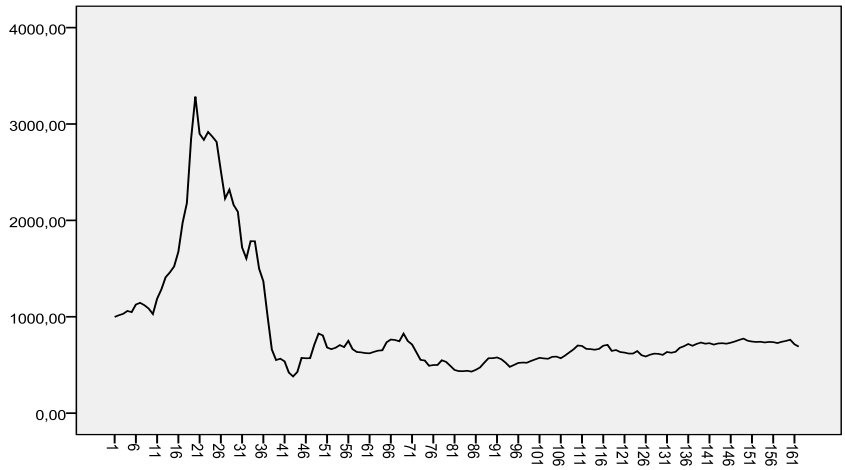

Fig. 1 Original values of BELEX15 index between October 2005 and February 2019
Source: Belgrade Stock Exchange

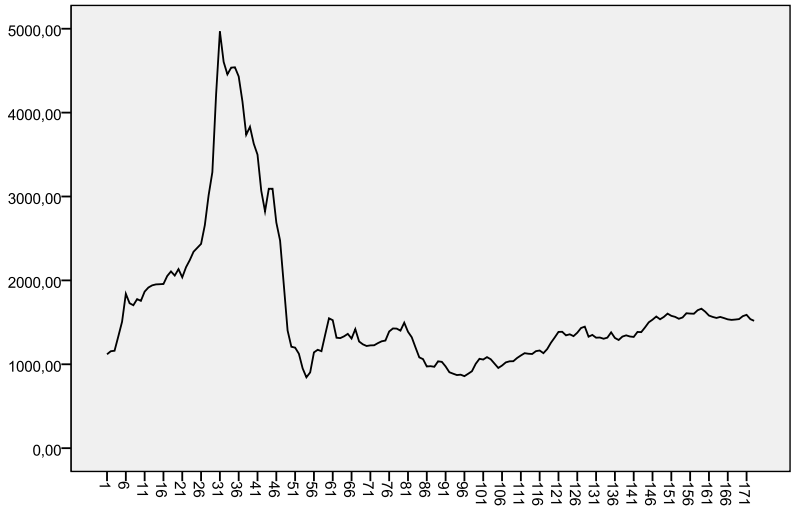

Fig. 2 Original values of BELEXline index between October 2005 and February 2019
Source: Belgrade Stock Exchange

RESULTS OF THE RESEARCH

Before making a short-term forecast of the future movement of BELEX15 and BELEXline indices of the Belgrade Stock Exchange, it is required to marginalize the impact of the shock incurred by the 2008 crash. In this regard, two time series will be represented in the period between January 2009 and February 2019, which will serve as a basis for the attempted short-term forecasting (Figure 3 and Figure 4).

Fig. 3 Original values of BELEX 15 index between January 2009 and February 2019
Source: Belgrade Stock Exchange

Application of the *Winters*' additive and multiplicative models to the BELEX15 time series will help establish the forecast error during the use of these models.

Table 1 BELEX15 index forecast error by the *Winters'* additive and multiplicative models

Type of model	Forecast error
Winters' additive model	37.543
Winters' multiplicative model	41.200

Source: Authors

Based on the shown data it may be concluded that a better adjusted model was obtained for the observed time series by applying the *Winters'* additive model.

Fig. 4 Original values of BELEXline index between January 2009 and February 2019
Source: Belgrade Stock Exchange

As in the previous case, the *Winters*' additive and multiplicative models were used on the observed time series to establish the forecast error.

Table 2 BELEXline index forecast error by the *Winters'* additive and multiplicative models

Type of model	Forecast error
Winters' additive model	60.232
Winters' multiplicative model	66.517

Source: Authors

It was observed that the Winters' additive method model was better adjusted to the BELEXline and BELEX15 time series. Accordingly, the *Winters*' additive model will be used for short-term forecasting of the movement of both indices between March 2019 and February 2020.

Figures 5 and 6 illustrate how the *Winters*' additive model matches the original values of BELEX15 and BELEXline indices and their forecast values for the one-year period.

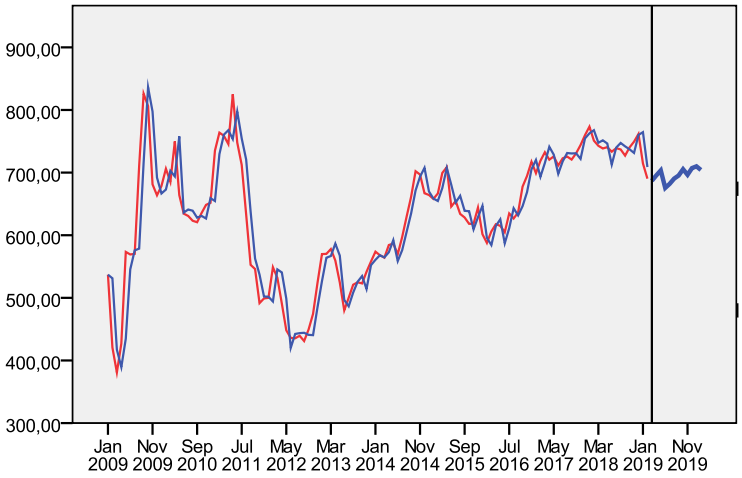

Fig. 5 Original (red line), adjusted (thin blue line) and forecast (thick blue line) values of BELEX 15 index
Source: Authors

Based on the completed forecast, a mild rise of the BELEX15 values may be expected in the observed period. Also, the forecast includes the values interval (top and bottom values of the interval) for each month subject to the forecast (Table 3).

Table 3 Forecast values of BELEX 15 index between March 2019 and February 2020

Month	Forecast value of BELEX 15: *Winters*' additive model		
	Bottom value of interval	Individual modeled values	Top value of interval
March 2019	612.56	686.90	761.24
April 2019	590.41	695.58	800.75
May 2019	574.62	703.47	832.33
June 2019	526.73	675.57	824.42
July 2019	515.61	682.09	848.57
August 2019	507.97	690.41	872.85
September 2019	498.18	695.32	892.45
October 2019	494.53	705.36	916.18
November 2019	472.81	696.51	920.21
December 2019	471.81	707.16	943.05
January 2020	462.45	709.96	957.47
February 2020	445.59	704.20	962.81

Source: Authors

Based on the data shown in Table 3 it is noted that the forecast values of BELEX15 index for the forthcoming year range between 675.57 and 709.96 index points. This index is expected to reach the lowest value in June 2019 and the highest value in January 2020.

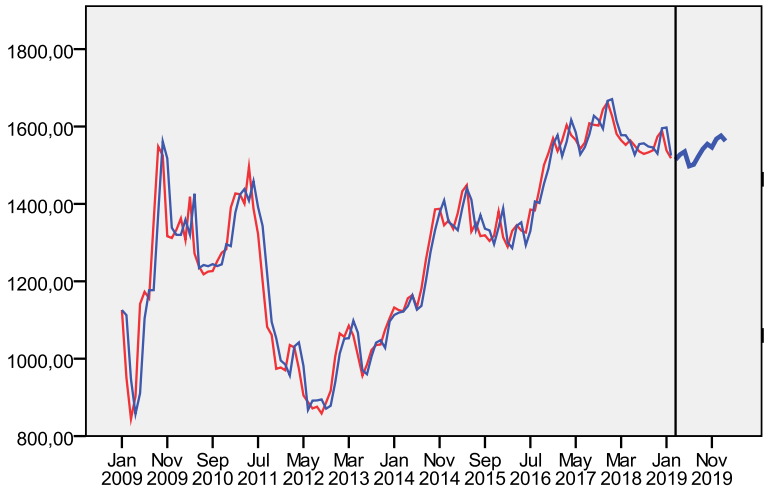

Fig. 6 Original (red line), adjusted (thin blue line) and forecast (thick blue line) values of BELEXline index
Source: Authors

In case of BELEXline index the forecast shows that a mild rise of BELEXline index may be expected in the observed period. Also, the forecast includes the values interval (top and bottom values of the interval) for each month subject to the forecast (Table 4).

Table 4 Forecast values of BELEXline index between March 2019 and February 2020

Month	Forecast value of BELEXline: *Winters*' additive model		
	Bottom value of interval	Individual modeled values	Top value of interval
March 2019	1395.24	1514.51	1633.77
April 2019	1358.91	1527.64	1696.37
May 2019	1328.42	1535.16	1741.90
June 2019	1258.90	1497.72	1736.54
July 2019	1234.66	1501.78	1768.89
August 2019	1229.97	1522.69	1815.42
September 2019	1225.51	1541.82	1858.12
October 2019	1216.31	1554.60	1892.88
November 2019	1187.27	1546.22	1905.17
December 2019	1189.43	1567.95	1946.47
January 2020	1178.86	1576.02	1973.18
February 2020	1147.78	1562.76	1977.75

Source: Authors

It can be noticed that the forecast values of BELEXline index for the forthcoming year range between 1497.72 and 1576.95 index points. As in the case of BELEX15 index, BELEXline index is expected to reach its lowest value in June 2019 and its highest value in January 2020.

DISCUSSION AND CONCLUSION

The conducted empirical research indicates that the share market in the Republic of Serbia will have no significant trends in 2019. Bearing in mind that the turnover of shares in the BELEX15 index basket makes more than 60% of the entire share turnover, it may be concluded that the Belgrade Stock Exchange will have a scarce share turnover between March 2019 and January 2020. The expected increase of the BELEX15 index values in this period shall amount to less than 20 index points. Forecasts made by the time series methods are based on the determination of principles in the previous phenomenon development and projection of its movement in the future. However, forecasting cannot precisely establish future movements, so the analysis and interpretation of the obtained results should be regarded as having potential errors. Uncertainty and potential errors are in proportion to the length of the forecast period, which suggests that the forecast should be directed towards a short time period. Also, in forecasting time series multiple methods should be used in order to compare the results and minimize potential errors. With this in mind, future research concerning the field of short-term forecasting of BELEX15 and BELEXline index values may apply other well-utilized methods for this type of research (e.g. the Box-Jenkins (ARIMA) methodology and neural networks model).

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KRATKOROČNO PREDVIĐANJE KRETANJA BELEXLINE I BELEX15 INDEKSA

Početkom 2019. godine globalna ekonomija je suočena sa brojnim makroekonomskim problemima koji su se znatno uvećali tokom prethodnog desetogodišnjeg perioda. Usporena stopa ekonomskog rasta, uvećani budžetski deficiti, veliki javni i privatni dug su samo neki od problema koji su krajem 2018. godine doveli do pada vodećih berzanskih indeksa. Imajući u vidu da su S&P 500, DJIA i NASDAQ kompozitni indeks prekinuli višegodišnji rastući trend započet 22. marta 2009. godine, mogu se očekivati novi potresi na globalnom finansijskom tržištu. Za razliku od razvijenih svetskih berzi koje su se u velikoj meri oporavile od kraha nastalog 2008. godine, Beogradska berza u posmatranom periodu nije zabeležila neki značajniji trend rasta. S tim u vezi, bez obzira na zabeležene padove najpoznatijih svetskih berzanskih indeksa, nije realno očekivati neku značajniju promenu na tržištu akcija Beogradske berze, što bi trebalo da potvrdi sprovedeno empirijsko istraživanje. Osnovni cilj istraživanja jeste utvrđivanje tendencije u kretanju BELEXline i BELEX15 indeksa za naredni jednogodišnji period, na mesečnom nivou. Osnovna hipoteza rada jeste da na tržištu akcija Beogradske berze u narednom jednogodišnjem periodu neće doći do značajnijih promena u kretanju vrednosti odabranih berzanskih pokazatelja.

Ključne reči: *Kratkoročno prognoziranje, BELEXline, BELEX15, Winters-ov aditivni metod, Winters-ov multiplikativni metod.*

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