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THE CONTRIBUTION OF DEVELOPMENT FACTORS TO ECONOMIC GROWTH ON VARIOUS GDP LEVELS – THE MIDDLE-INCOME TRAP

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Abstract

This paper analyses the intensity of the influence of foreign direct investments, exports of goods and services, and research and development expenditure on GDP growth of developed and developing countries. Panel regression analysis determined that the exports of goods and services make the largest contribution to growth on middle levels of income. In fact, the contribution the export of goods and services makes to growth on middle levels of income is two times larger than in countries with a high GDP. The most essential impact on countries with a high GDP level was made by research and development expenditure, which is 3.5 times larger than its impact on the developing Balkan countries. The phenomenon of the Middle-Income Trap can be explained by insufficient research and development expenditure. Foreign direct investments are not statistically significant for the GDP growth of observed countries, but they achieve far better results on low development levels. The empirical data, presented in figures, confirms the conclusions of the econometric analysis.

Key words: middle-income trap, the economic growth factors, exports of goods and services, foreign direct investments inflow, research and development expenditure

ДОПРИНОС ФАКТОРА РАЗВОЈА ПРИВРЕДНОМ РАСТУ НА РАЗЛИЧИТИМ НИВОИМА БДП-А – ЗАМКА СРЕДЊЕ РАЗВИЈЕНОСТИ

Апстракт

Овај рад анализира интензитет утицаја страних директних инвестиција, извоза роба и услуга, и издвајања за истраживање и развој на раст БДП-а високо и средње развијених земаља. Панел регресионом анализом је утврђено да извоз роба и услуга највећи допринос расту даје на средњим нивоима дохотка. Допри-

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нос извоза роба и услуга на средњим нивоима дохотка је два пута већи него код земаља са високим БДП-ом. На високом нивоу БДП-а најзначајнији утицај остварују издвајања за истраживање и развој, и тај утицај је 3,5 пута виши него код средње развијених земаља Балкана. Недовољним издвајањем за истраживање и развој се једним делом може објаснити феномен замке средње развијености. Стране директне инвестиције нису статистички значајне за раст БДП-а посматраних земаља, али далеко боље резултате дају на ниским нивоима развијености. Емпиријски подаци презентовани у графиконима потврђују закључке економетријске анализе.

Кључне речи: замка средње развијености, фактори привредног раста, извоз роба и услуга, прилив страних директних инвестиција, издвајања за истраживања и развој

INTRODUCTION

Growth rates are the result of synergetic effects, that is to say, the effects of a large number of economic growth factors. Their importance and impact change as time goes by, and as GDP changes. On lower GDP levels, when there are not enough investments or capital, foreign investments can be expected to have a deciding impact on development. They appear as an additional source of economic growth financing, they put the available resources into function, they activate the economy, and they increase employment and GDP. Later, they appear as development generators through exports, which increase growth rates and multiply the national income. Nevertheless, it is common for economies to fall into a middle-income trap, and become discouraged by its long duration, which leaves the impression that it is impossible to reach the high-developed economy circle. This article tries to discover the causes of entrenchment into middle GDP levels. At the same time, this article examines the measures which may stop that *circulus vitiosus*, or which may bring the country out of the vicious circle of mediocre economic performances.

The primary goal of this research is to measure the three-factor impact of foreign direct investments (FDI), exports of goods and services (XGS), and research and development expenditure (R&D) in the domain of economic growth on different GDP levels. Using Panel Regression analysis, the impact of these factors is measured within two GDP country groups, for the period between 2001 and 2019. The first group of observed countries (Group A) includes the USA, Canada, Great Britain, France, and China – countries from three different continents and absolute GDP value. The second group (Group B) includes the developing Balkan countries – Romania, Bulgaria, Serbia, Croatia, and North Macedonia.

The World Bank has accepted GDP per capita as a measurement of development level demarcation, which can completely distort the clear image of the Balkan countries. The illusion of growth can be created not only by a GDP increase but also by the decrease of the number of citi-

zens, which is the very case with Balkan countries due to immigration and depopulation. A decrease in the number of citizens can lead to conclusions about positive trends in the macroeconomic variables' movement, since GDP per capita grows at the unchanged GDP value. The impression of this macroeconomic performance's positive movement can appear even in the case of GDP falling when the decrease in the number of citizens is relatively larger. In line with this, and for the sake of comparison, the economic growth factors' influence will be measured as opposed to the movement of the absolute GDP value in the countries of Group B, as well as in the countries of Group A.

A certain amount of aloofness is involved in observing China. According to the World Bank classification, the boundary between the low-developed and developing countries is 1,000 USD GDP per capita, while the boundary between developing and developed countries is 12,000 USD GDP per capita. All the selected countries fulfil this condition of middle, that is to say, high development, except for China. Yet, China is close to this boundary by virtue of possessing a well-expressed growth trend in GDP, as well as in GDP per capita. That is why China is part of Group A – it is the second economy in the world, according to the GDP value measured by current prices.

The main research questions are the following: which factors have the strongest impact on GDP growth of countries in Group A, and which factors have the strongest impact on GDP growth of countries in Group B. The different contributions of select factors to the development of all the selected countries can, at some point, enlighten even the phenomenon of the 'middle-income trap'. In that way, this paper may contribute to widening the scope of research in this field, in terms of the number of factors impacting GDP growth, and in terms of the analysis of each factor's dominant impact on different GDP levels. The practical implications of this research are reflected in the suggestions to economic policy creators, stemming from the identification of the development factors on which development plans should be based according to different GDP levels.

LITERATURE OVERVIEW

For a long time, the relations between development factors and GDP had been examined by various econometric models, and individual and collective economic growth factors' impact on GDP had been measured. Giles and Williams (2000a; 2000b) analysed more than 150 papers, published between 1963 and 1999, which examine the relationship between exports and economic growth. They classified all the papers into three groups: the first group contains those works which rely on the application of range correlation coefficients among the countries; the second group applies cross-sectional regression analysis; and the third group con-

tains works which apply different techniques referring to the analysis of time series on individual countries. Two-thirds of the papers belong to the third group, while more than seventy of them were based on Granger causality and his various tests. After the year 2000, in their examination of this phenomenon, far more authors would use the Panel and Multiple Linear Regression Model, different variants of the VAR model (Vector Autoregression Model), and other econometric models which provide the measurement of the degree of individual development factors' impact on GDP.

Vohra (2001) examined the level of export change impact on the change in GDP value. The analysis was carried out on the example of developing Asian countries such as India, Pakistan, the Philippines, Malaysia, and Thailand, during the period between 1973 and 1993. The results of this empirical research indicate that exports have a positive and significant impact on economic growth, more particularly so in the middle-income group when a country has achieved some level of economic development (Vohra, 2001). A similar analysis was done by Balaguer (2002) who concludes that, among developing countries, those who are export-oriented are the ones with a larger growth rate. That is why, in the case of developing countries, export promotion shows a larger impact on GDP growth in comparison to both low-developed and high-developed countries.

Research results referring to those developing African countries whose GDP per capita is higher than 1,000 USD, which is the lower boundary of middle development according to the World Bank, were similar. Adeleye, Adeteye and Adewuyi (2015) graded Nigerian regression parameters in the period between 1988 and 2012. The conducted analysis showed a positive and statistically significant impact of total export on the economic growth of Nigeria. Other model parameters were not statistically significant. The one-way relation between exports and GDP was proven, in relation to Ghana, by Okyere and Jilu (2020) thanks to the causality test. The same results about the one-way relation of exports' impact on GDP were obtained by Awokuse (2003), Jordaan and Eita (2007), and Travkina (2015). Therefore, exports should be used as a generator of development in the long term (Marjanović and Marjanović, 2019).

The second development factor to be analysed represents foreign direct investments. They are a significant additional source of economic development financing under the insufficient domestic savings conditions (Mencinger, 2003). Under these conditions, foreign direct investments represent the base of accelerated economic development not only through capital inflow but also through technology transfer (Wang & Wong 2009). The positive effects of FDI on development are not the same for all countries (Stevanović, Marković and Lepojević, 2022). Analysing the economy of Pakistan in the period between 1991 and 2005 by applying

correlation analysis and the Multiple Regression Model, Ali and Hussain (2017) proved that there was a positive and statistically significant impact of foreign direct investments on GDP growth. Using regression analysis, the same conclusion was made by Har, Teo & Yee (2008), who examined FDI impact on Malaysian economic growth based on yearly data for the period between 1970 and 2005. Therefore, the foreign direct investments inflow has a positive impact on GDP growth.

Similar research was conducted by Bouchoucha and Ali (2019) on the economy of Tunisia during the period between 1980 and 2015. The authors applied the ARDL Model (Autoregressive Distributed Lag Model) to distinguish the differences between the short and the long run of foreign direct investments' impact on economic growth. The analysis' results showed a positive and statistically significant FDI impact on economic growth both in the short and the long run.

Stanić and Račić (2019) conducted empirical research in Bosnia and Herzegovina for the period between 2005 and 2018. The authors examined FDI impact on economic growth by applying the Multiple Linear Regression Model. In addition to FDI, the following variables were included in the model: imports, exports, growth rate, unemployment, and inflation. The analysis showed that foreign direct investments had a positive impact on BiH's economic growth. The same analysis showed that total imports had the largest impact on BiH's economic growth, while foreign direct investments and total exports took second place. The general conclusion, based on all the aforementioned and other empirical research, is that FDI does have a positive impact on GDP growth, exports, and foreign currency inflow, as well as on the decrease of unemployment, poverty, and inequality (Kastratović, 2016).

Besides export and FDI, the third factor to be included in panel regression analysis is research and development (R&D). The positive impact of this factor is becoming more and more obvious in practice, after the third technological revolution. Indeed, numerous studies prove this. In his analysis, Inekwe (2015) came to very interesting conclusions on R&D impact on GDP in the case of developing countries. A sample of 66 countries was selected, and the countries were classified into those with upper-middle-income and those with lower-middle-income. In the period between 2000 and 2009, the impact of R&D expenditure was statistically significant for the countries with upper-middle-income, while the same cannot be said for the countries with lower-middle-income.

Gumus and Celikay (2015) examined whether R&D impact on economic growth varies depending on the level of a country's economic development. The analysis was conducted on a sample of 52 countries for the period between 1996 and 2010 by applying the Dynamic Panel Data Model. The results obtained by the authors indicate that R&D has a positive and statistically significant impact on the economic growth of devel-

oped countries, both in the long and short run. Nevertheless, in the case of developing countries, there is a positive and statistically significant relation only in the long run. In the short run, R&D impact on the economic growth of the countries in this group is not statistically significant.

The discerned effect of R&D expenditure on economic growth, both in the long and the short run, intrigued even Nair, Pradhan and Arvin (2020), and inspired them to conduct the same study on OECD countries. The analysis was conducted via the VAR model (Panel Vector Autoregressive Model). The authors conclude that, in the long run, there is a positive relationship among R&D, ITC infrastructure, and economic growth, while in the short run, there is a complex relationship among the observed variables which cannot be explained straightforwardly.

The general conclusion drawn from the analysed literature is that there is a positive relationship between the selected development factors (exports, foreign direct investments inflow, and research and development expenditure) on the one side, and GDP on the other side. Nevertheless, the impact intensity of each selected factor varies and it depends on the observed period (a short or a long one), as well as on the achieved level of development. It has to be noticed that, along with GDP growth, the absolute value of R&D expenditure and the relative GDP participation likewise grow, which multiplies this factor's impact on economic development. This paper will try to find the answer to, or offer an explanation for, the middle-income trap by measuring this impact.

PANEL-DATA SAMPLE FORMING

The Panel-data sample is formed based on the annual variable values for the selected countries' group. The countries which are isolated from the target group, including countries with high GDP levels (Group A), are Canada, China, France, the USA, and the UK, while the country group with middle GDP level (Group B) includes Serbia, Croatia, North Macedonia, Bulgaria, and Romania. The collected data covers the time interval of 19 years, that is to say, the period between 2001 and 2019. This time frame is long enough for the relationship among independent and dependent variables to be discerned.

The issue to be examined in this analysis is the GDP movement's dependence on the goods and services export movement, FDI net inflow, and financial division for research and development. The data about the mentioned variables was collected from the World Development Indicators (WDI) section of the World Bank (2021) data basis. The mentioned variables, in WDI, can be found under the titles: "GDP (current US$) – gross domestic product (GDP)"; "Exports of goods and services (current US$)"; "Foreign direct investment, net inflow (BoP, current US$)"; and "Research and development expenditure (% of GDP)". Since there is no

data about R&D for 2019 in relation to any of the countries, the data is supplemented by OECD data (OECD, 2021), a base for Group A countries. In this way, time-series data and cross-section data are completed for this country group, and a balanced data panel is created at the same time.

The analysis of the countries which belong to Group B will be conducted on an unbalanced data panel. Within this panel frame, R&D data is missing for 2019 in relation to all the countries (Serbia, Croatia, North Macedonia, Bulgaria, and Romania). Also, FDI net inflow data for Serbia for the period between 2001 and 2006 is missing because of different calculation systems. The last data change implies the transformation of relative R&D data into absolute values. This transformation also refers to the panel data of high-level GDP countries. The Eviews software package was used for the application of panel regression model analysis.

When observing the absolute GDP values (Figure 1), it can be concluded that there are large value differences between the Group A and Group B countries. Among Group B countries, Romania has the largest GDP value, equalling 249.70[1] billion USD. This value is not even close to the GDP size of Canada, the country with the lowest GDP in Group A whose GDP amounts to 1,741.58 billion USD. The difference is even larger if the comparison is made between USA and China, the countries which have the highest GDP values among Group A countries.

The average GDP growth rate of Group A countries for the observed period amounts to 3.33%, while the average growth rate in Group B for the same period amounts to 4.12%. The higher average GDP growth rate of Group B is the result of the synergetic action of various factors. The most significant of these factors is the larger disengagement of production factors which will, in case they are put into the growth function, bring the economy into the developed group. Besides that, it is a fact that larger growth rates are achieved through a slight increase of absolute GDP value.

[1] All indicator values are either taken from the World Development Indicators section of the World Bank's database or they represent the result of the author's calculation based on data from the same database.

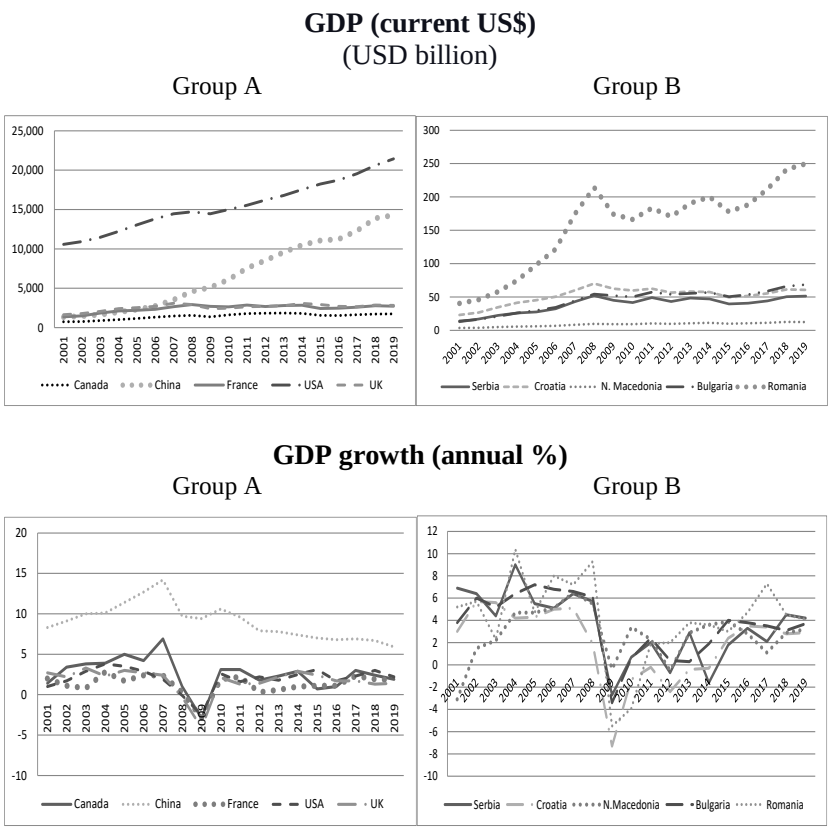

Figure 1. GDP current USD and growth rates of Group A and Group B countries, 2001-2019
Source: World Bank, World Development Indicators, 2021

In the observed period, China has the largest average growth rate among Group A countries, and it amounts to 9.03%. China achieved a growth rate of 14.2% in 2014, which is the largest growth rate among the observed countries. Other developed countries had far lower growth rates in the observed period – Canada's growth rate averaged at 2.57%, and the USA's averaged at 2.01%. Among Group B countries, Romania has the largest GDP growth rate, equalling 4.12%, followed by Bulgaria with 3.60%, and Serbia with 3.47%. The presented graphs (Figure 1) point to the fact that Group A countries have by far fewer oscillations in growth rates than Group B countries. Stable average growth rates in the long run are a feature of high development. High growth rates would lead to the economy overheating, which would have multiple consequences on economic courses. China is the exception because of the large capacity of the majority of its resources, especially the workforce, and because of its

decades-long entrenchment into low development. Therefore, it activates all the development engines which result in high growth rates.

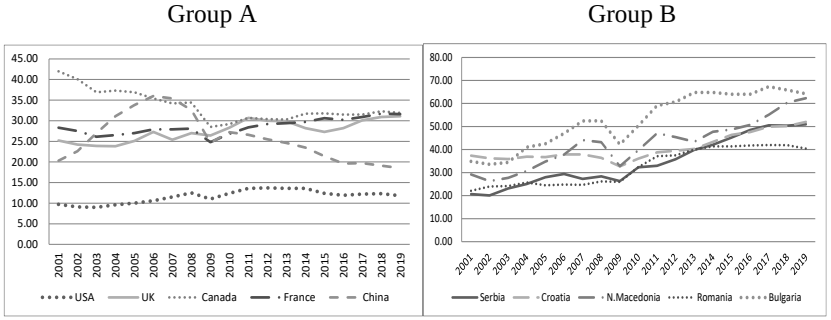

Figure 2. The share of goods and services' exports in the GDP regarding Group A and Group B countries, 2001-2019
Source: World Bank, World Development Indicators, 2021

Group B countries strive to continuously enlarge the exports' participation in GDP in order to reach higher economic growth rates. That is how Serbia increased the exports' participation in GDP from 20.70% (in 2001) to 51.00% (in 2019). The same is true of Romania, which increased the exports' GDP participation rate from 22.10% (in 2001) to 40.40% (in 2019). In the observed period, the analysed Group B countries doubled the exports' participation in GDP. The average exports' GDP participation rate for the observed period amounts to 40.63% in Group B, while the same rate amounts to 25.39% in Group A. The USA's exports' GDP participation amounts to 11.80%, and China's amounts to 18.50%, while Great Britain, Canada, and France had a value of around 31% in 2019 (Figure 2).

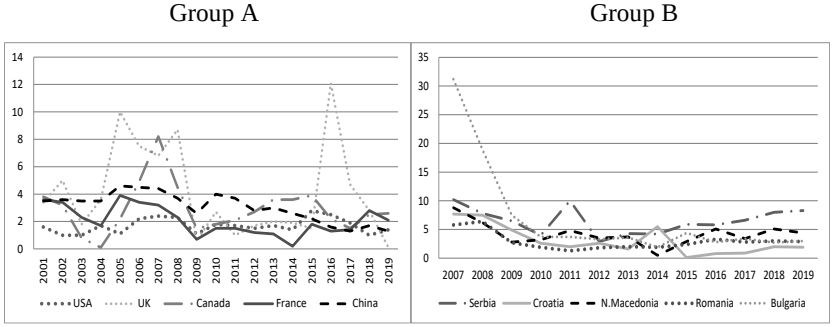

Figure 3. The share of foreign direct investments' inflow in GDP regarding Group A and Group B countries, 2001-2019
Source: World Bank, World Development Indicators, 2021

Foreign direct investments inflows mark a continuous decrease in GDP participation in all the observed countries from Group A and Group B (Figure 3). China decreased FDI participation in GDP from 3.5% (in 2001) to 1.3% (in 2019), while Britain decreased FDI participation from 3.4% (in 2001) to 0.1% (in 2019). Britain and Canada are the only countries that had large oscillations in FDI inflow in the observed period. The average FDI participation rate in GDP regarding Group A amounts to 2.77%. Group B countries mark an average FDI participation in GDP of 5.34% in the observed period. The largest FDI participation decrease in GDP is marked in the example of Bulgaria, from 31.2% in 2007 to 3% in 2019.

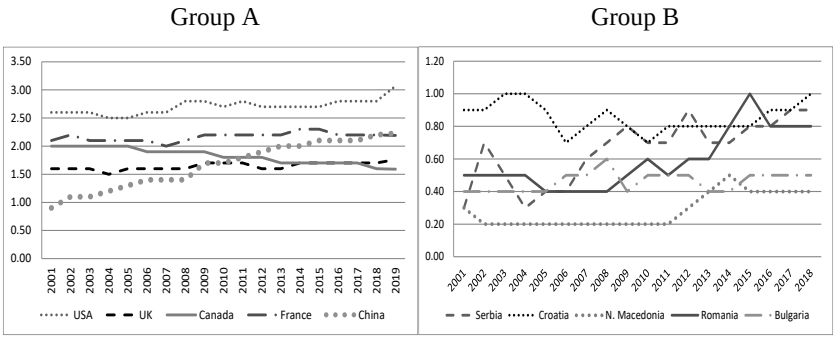

Figure 4. The share of R&D expenditure in GDP regarding Group A and Group B countries, 2001-2019
Source: World Bank, World Development Indicators, 2021

When the potentials of FDI inflows and of exports of goods and services are exhausted, research and development expenditure becomes the key generator of economic growth on higher GDP levels. High GDP level countries allocate far more funds for R&D compared to lower GDP countries, not only in absolute but also in relative indicators (Figure 4). The average R&D expenditure rate in the observed period for Group A countries amounts to 2.0%, while it amounts to 0.57% for Group B countries. The USA allocates the most funds for R&D – 3.07%. In the observed period, China continuously increased its expenditure for R&D. At the beginning of the observed period, in 2001, China allocated 0.90% of its GDP for R&D, and at the end of this period, in 2019, this expenditure reached the value of 2.23%. France has approximately the same R&D expenditure – 2.19% (in 2019). Group B countries' expenditures are far more frugal. Croatia had the highest R&D expenditure rate – 1% in 2019, followed by Serbia with an expenditure rate of 0.90%, Romania with 0.80%, Bulgaria with 0.50%, and North Macedonia with 0.40%. Therefore, relative R&D expenditures are directly proportional to the absolute GDP value.

RESEARCH METHODOLOGY

In this research, GDP value represents the function of goods and services exports' value, FDI net inflow, and R&D. The relation between the dependent and independent variables defined in this way can be mathematically illustrated as follows:

$$GDP = f(XGS, FDI, R\&D) \tag{1}$$

Here, GDP stands for gross domestic product; XGS stands for exports of goods and services; FDI stands for foreign direct investments inflow; and R&D stands for research and development expenditure.

The econometrical form of equation 1 can be written down as:

$$GDP_{it} = \beta_0 + \beta_1 InXGS_{it} + \beta_2 InFDI_{it} + \beta_3 InR\&D_{it} + \varepsilon_{it} \tag{2}$$

where β_0 stands for a constant; β_1, β_2, and β_3 stand for coefficients of independent variables; and ε_{it} stands for the error term. Other designations have the same meaning as in equation 1. Equation 2 was originally used in the analysis of the raw data. However, the obtained results were not sustainable. Thus, it was found that FDI has a negative effect on the GDP of the countries of group B. The existing problem was solved by logarithmising the data as Gujarati and Porter (2009) recommend. The logarithmic econometric equation has the following form:

$$InGDP_{it} = \beta_0 + \beta_1 InXGS_{it} + \beta_2 InFDI_{it} + \beta_3 InR\&D_{it} + \varepsilon_{it} \tag{3}$$

Equation 3 represents a basic panel regression equation which will be evaluated by the application of the Pooled OLS model, and the application of Fixed-Effect model and Random-Effect model.

RESULTS AND DISCUSSION

Research results will be shown first for Group A, and then for the countries from group B. Before the application of the Panel Regression model, it is necessary to examine the stationarity of the time series data in the panel.

The stationarity evaluation for the first country group (Group A) is done by the application of the unit root test. The unit root test was conducted by the use of: Levin, Lin, and Chu statistics; Breitung t-statistics; Im, Pesarran, and Shin W-statistics; and the ADF-Fisher Chi-square and PP-Fisher Chi-square method. The application of the aforementioned methods showed that the observed variables (GDP, XGS, FDI, and R&D) are not stationary on level, yet they reach stationarity on the first difference. Starting with these results, the logarithmised data was transformed on the first difference in the next step.

The evaluation of the regression equation was carried out by the application of the Pooled OLS model, Fixed Effect model, and Random Effect model. The selection of a model that illustrates the relationship between the dependent and independent variables best is done by the Chow test, Hausman test, and Lagrange Multiplier test (Zulfikar, 2018).

Table 1. Results of the Chow test, Hausman Test and Lagrange Multiplier Test for Group A countries

Chow Test			
Effects Test	Statistic	d. f.	Prob.
Cross- section F	1.917076	(4.82)	0.1153
Cross- Section Chi- square	8.045831	4	0.0899
Lagrange Multiplier Tests for Random Effects			
	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	0.293124	0.4567	0.749823
	(0.5882)	(0.4992)	(0.3865)
Hausman Test			
Test Summary	Shi-Sq. Statistic	Chi-Sq. d. f.	Prob.
Cross- section random	7.571602	3	0.0557

Source: Authors' calculations

The Chow test provides the basis for the selection between the Pooled OLS model and the Fixed Effect model. The null hypothesis of the Chow test implies that the Pooled OLS model represents the relationships among the observed variables better. As the value of Cross-Section Chi-square probability (0.0899), shown in Table 1, is bigger than 0.05, the null hypothesis can be accepted. The result of the Lagrange Multiplier Test shows that the null hypothesis is accepted. In other words, what is accepted is the Pooled OLS model, as opposed to the Random Effect model. Therefore, it can be concluded that the regressors are evaluated best by the application of the Pooled OLS model. The results of the applied Pooled OLS model will be presented next (Table 2).

The results of the Pooled OLS model for group A indicate that the observed independent variables (XGS, FDI, R&D) have a positive impact on the movement of GDP value. R&D, with a coefficient of 0.60, has the greatest impact. Therefore, a 1% growth of R&D leads to a 0.60% growth of GDP. R&D is followed by the impact of goods and services exports, with the coefficient of 0.26. Exports of goods and services and R&D have a statistically significant impact on GDP movement within group A countries. FDI net inflow is not statistically significant in the observed model. The regressor of FDI net inflow is 0.003 in total.

Table 2. Results of the Pooled OLS model of Group A

Dependent Variable:D(lnGDP)				
Method: Panel Least Squares				
Variable	Coefficient	Str. Error	t- Statistic	Prob.
C	0.003394	0.004133	0.821184	0.4138
D(lnXGS)	0.256344	0.043556	5.885378	0.0000
D(lnFDI)	0.003023	0.004158	0.726995	0.4692
D(lnR&D)	0.569029	0.048046	11.843500	0.0000
R- squared			0.858032	
Adjusted R- squared			0.853079	
F- statistic			173.256400	
Prob(F- statistic)			0.000000	

Source: Authors' calculations

The Adjusted R^2 shows us that the model can reliably explain the variations in GDP movement in relation to goods and services exports' movement, FDI net inflow, and R&D. The independent variables explain up to 85.31% of variations in GDP movement. The F-statistics probability value of 0.0000 (less than 0.5) only confirms the previous statement. Therefore, the regression equation which illustrates the relationship between the dependent and independent variables best can be represented in its econometric form:

$$InGDP_{it} = 0.003 + 0.26InXGS_{it} + 0.003InFDI_{it} + 0.60InR\&D_{it} \qquad (4)$$

After determining the econometric form of the regression equation, the model was tested for multicollinearity and heteroscedasticity. The multicollinearity problem is examined by the application of the variance inflation factor (VIF).

Table 3. The Variance Inflation Factor of Group A

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000017	1.531160	NA
XGS	0.001897	2.592271	2.001395
FDI	0.000017	1.098418	1.098338
R&D	0.002308	2.831277	1.869259

Source: Authors' calculations

Since the Centered VIF value is lower than 10 (Table 3) for all the independent variables, it can be concluded that the observed model does not have the expressed multicollinearity problem. The observed Centered VIF values of the observed independent variables amount to 2.00 in the case of exports of goods and services, 1.10 for FDI net inflow, and 1.87 for R&D.

The examination of the existence of heteroscedasticity is conducted by the application of the LR Test (the Likelihood Ratio Test). The obtained results are shown in the following table (Table 4).

Table 4. Panel Cross-section Heteroscedasticity LR Test of Group A countries

	Value	df	Probability
Likelihood ratio	8.412123	5	0.1349

Source: Authors' calculations

The null hypothesis of the LR test implies that the residuals in the evaluated model are homoscedastic. In other words, the model does not have a problem with heteroscedasticity. Since the p-values are 0.13 (larger than 0.05), it can be stated that the alternative is rejected, that is to say, the null hypothesis is accepted (Table 4). This is evidence that the model does not have a problem with heteroscedasticity.

The same procedure of regression coefficients analysis was implemented on the sample of Group B countries. The first step was, even in this case, the determination of the panel time dimension by the application of the unit root test. The implementation of the unit root test showed that gross domestic product, exports of goods and services, foreign direct investments inflow, and research and development expenditure reach stationarity on the first difference. The stationarity evaluation was performed by the same methods applied in Group A. Based on the obtained results, the first difference of the observed variables' logarithmised values was calculated. This difference served as the basis for the implementation of regression analysis.

The evaluation of Group B regressors was done by the application of the Pooled OLS model, Fixed Effect model, and Random Effect model. The selection of an adequate model was done based on the results of the Chow Test, the Hausman Test, and the Lagrange Multiplier Test.

Table 5. Results of the Chow test, Hausman Test and Lagrange Multiplier Test for Group B countries

Chow Test			
Effects Test	Statistic	d. f.	Prob.
Cross- section F	0.868431	(4.71)	0.4873
Cross- Section Chi- square	3.773552	4	0.4375
Lagrange Multiplier Tests for Random Effects			
	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	0.463651 (0.4959)	42.26809 0.0000	42.73175 0.0000
Hausman Test			
Test Summary	Shi-Sq. Statistic	Chi-Sq. d. f.	Prob.
Cross- section random	0.959678	3	0.8183

Source: Authors' calculations

The null hypothesis directs the Chow Test towards the selection of the OLS model, while the acceptance of the alternative hypothesis implies the selection of the Fixed Effect model. Since the probability value of Cross-Section Chi-square is 0.4375 (larger than 0.05 – Table 5), the null hypothesis is accepted. In other words, the OLS model is accepted. The selection between the Pooled OLS model and the Random Effect model was done based on the Lagrange Multiplier Test. The Cross-section probability value of 0.4959 leads to the rejection of the alternative hypothesis. Therefore, with the help of the LM test, the OLS model is accepted as a representational model for regression equation evaluation. The results of Group B pooled OLS models are shown in Table 6.

The evaluated Group B regressors are positive, which implies a positive relationship between the independent variables (XGS, FDI, and R&D) and GDP. Exports of goods and services, with a regressor of 0.56, have the largest impact on GDP value variation (Table 6). This further leads to the conclusion that the goods and services exports growth of 1% influences the growth of GDP by 0.56%. Research and development expenditure, with a coefficient of 0.17, has a significant impact on GDP. Foreign direct investments net inflow, with a coefficient of 0.01, is not a statistically significant factor in the explanation of GDP value movement.

Table 6. Results of the Pooled OLS model of Group B

Dependent Variable: D(lnGDP)				
Method: Panel Least Squares				
Variable	Coefficient	Str. Error	t- Statistic	Prob.
C	-0.003987	0.008556	-0.465983	0.6426
D(lnXGS)	0.556318	0.053977	10.30653	0.0000
D(lnFDI)	0.010368	0.009010	1.150690	0.2535
D(lnR&D)	0.166033	0.042386	3.917153	0.0002
R- squared			0.763863	
Adjusted R- squared			0.754418	
F- statistic			80.870870	
Prob(F- statistic)			0.000000	

Source: Authors' calculations

Based on the analysed independent variables, GDP variation movements of 75.44% can be predicted (Adjusted R- squared value 0.754418). F-statistics, with a value of 80.87, shows that the defined model is adequate for GDP movement prediction. This is also confirmed by the F-statistics probability value (0.0000), which is less than 0.05.

Based on the illustrated OLS model analysis, the econometric equation for Group B regression can be defined, and it defines the relationship among GDP, XGS, FDI, and R&D:

$$InGDP_{it} = -0.004 + 0.56InXGS_{it} + 0.01InFDI_{it} + 0.17InR\&D_{it} \quad (5)$$

After the determination of the Group B regression equation, multicollinearity and heteroscedasticity were examined. The presence of multicollinearity in the Group B regression model was determined by the application of the Variance Inflation Factor. The obtained results are shown in Table 7.

Table 7. The variance inflation factor of Group B

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000073	1.609750	NA
XGS	0.002914	2.198922	1.438847
FDI	0.000021	1.151717	1.149906
R&D	0.001797	1.648846	1.321705

Source: Authors' calculations

The implemented Group B variance evaluation implies the absence of multicollinearity problems. The Centered VIF value for all the observed variables is lower than 10 (Table 7), which is also a limiting value for multicollinearity presence evaluation. According to the results, The Centered VIF amount for exports of goods and services is 1.44, the amount for foreign direct investments net inflow is 1.15, and the amount for research and goods expenditure is 1.32.

The presence of heteroscedasticity is determined by the Likelihood Ratio Test.

Table 8. Panel Cross-section Heteroscedasticity LR Test of Group B countries

	Value	df	Probability
Likelihood ratio	4.790345	5	0.4420

Source: Authors' calculations

The null hypothesis of the LR Test implies that the residuals are homoscedastic, while the alternative implies that there is a problem with heteroscedasticity. Based on the Likelihood Ratio probability of 0.44 (Table 8), the null hypothesis can be accepted, and it can be concluded that the model does not have a problem with heteroscedasticity.

The economic growth of each country has its specificities, yet, generally speaking, the logic, goals, instruments, and development challenges are identical in most cases. In that vein, it is not rare for countries to fall into a 'middle-income trap'. Overcoming this problem can resem-

ble Sisyphus' labours. That is why the discovery of the causes for entrenchment into middle-income levels is of high priority for the creators of economic policy. The implemented regression analysis identifies these causes, and fulfils the necessary condition for overcoming the key obstacle on the way to reaching high GDP levels. Based on the values of the regressors of Group A and Group B, the basic development initiators can be identified, and the differences in the dominance of individual factors' influence on different GDP levels can be spotted.

Table 9. Regression coefficients of Group A and Group B countries

Development Factors	Group A	Group B	Statistical significance of regressors
XGS	0.26	0.56	Statistically significant
FDI	0.003	0.01	Not statistically significant
R&D	0.60	0.17	Statistically significant

Source: Authors' research

The analysis of regression coefficients (Table 9) allows for the conclusion that research and development expenditure represents the main initiator of economic development in high GDP level countries (Group A), while the exports of goods and services have a secondary significance. On the other hand, the main development support of middle-income countries (Group B) are the exports of goods and services. The exports' contribution to Group B's economic growth is two times larger than its contribution to the growth of Group A. Nevertheless, the R&D expenditure's contribution to development is 3.5 times lesser in Group B than in Group A. This imposes the conclusion that the main cause of entrenchment into middle-development is insufficient research and development expenditure.

The basic recommendation for the creators of middle GDP level countries' economic policies is to base their development strategies on the promotion and stimulus of export-oriented economy sectors. Yet, in this phase, they should also consider a gradual increase in R&D expenditure. Just as Gumus et al. (2015) emphasised, in countries with lower-middle income, R&D expenditure has a significant impact on economic development only in the long run. This is crucial, since it allows a country to overcome the 'middle-income trap'. China sets the example of a country whose increase in R&D expenditures began as it joined the group of developing countries. Therefore, in 2001, China had a GDP per capita value of 1,053 USD, while at the end of the observed period, its GDP per capita amounted to 10,216 USD. In the same period, China increased its R&D expenditure around 2.5 times.

CONCLUSION

The theoretical contribution of this paper lies in the fact that the results of Panel Regression analysis matched the exact data presented in Figures 2, 3, and 4 almost completely. The appointed model and the obtained regression equation explain the impact of the independent variables (FDI, EGS, R&D) on the dependent variable (GDP).

The practical dimension of this paper is reflected in the directions for developing countries, which point them towards increasing their research and development expenditure on time, so as to avoid the middle-income trap. More precisely, since the achievement of high development is a process, the creation and organisation of scientific institutions oriented towards education should likewise be recognised as a process. In this vein, it can be concluded that education and science are not an expense. On the contrary, they represent an investment into the most significant development factor. This conclusion is supported by theoretical research which states that, in relation to developing countries, research and development expenditure gives results only in the long run, and not in the short run. The efficient transfer of the results of scientific research into the economy also requires a higher level of organisation as regards these activities, and the whole of society.

The results of this Panel Regression analysis point to the conclusion that exports make the largest contribution to GDP growth on the middle development level, while research and development expenditure makes the largest contribution to GDP growth on the high development level. It is assumed that foreign investments have this function on the low level of income, when domestic savings are not enough to activate the economic cycle and put economic capacities into the growth function. They appear as a supplementary source of development financing. Therefore, there are two breakpoints on the development path, wherein one production factor loses its dominance and significance, and another takes over. The first breakpoint separates low-developed and developing countries, and the other separates developing and developed countries. The World Bank marked a GDP per capita level of 1,000 USD as the boundary between low and middle development. This round figure surely would not match the conclusions of this Panel Regression analysis, especially not for each country. The same refers to the boundary between middle and high development, defined as 12,000 USD of GDP per capita.

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ДОПРИНОС ФАКТОРА РАЗВОЈА ПРИВРЕДНОМ РАСТУ НА РАЗЛИЧИТИМ НИВОИМА ГДП-А – ЗАМКА СРЕДЊЕ РАЗВИЈЕНОСТИ

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Резиме

Овај рад анализира и квантитативно мери утицај страних директних инвестиција, извоза роба и услуга, и издвајања за истраживања и развој на раст бруто домаћег производа средње и високо развијених земаља. Значај анализираних фактора мења се у зависности од нивоа привредног развоја земље. На нижим нивоима развоја кључну улогу имају стране директне инвестиције. Њима се обезбеђује недостајући капитал којим се покреће привреда. Како би се прекинуо зачарани круг сиромаштва, земља мора да развија извозно орјентисане привредне секторе. Овим долази до средњег нивоа развијености. Опасност која прети на овом нивоу развијености јесте замка средње развијености.

Применом панел регресионог модела испитан је и квантитативно измерен утицај фактора развоја (страних директних инвестиција – FDI, извоза роба и услуга – XGS, и издвајања за истраживања и развој – R&D) на привредни раст земаља групе А (развијених земаља) и групе Б (средње развијених земаља). Групу А чине САД, Канада, Велика Британија, Француска и Кина, док групу Б чине Румунија, Бугарска, Србија, Хрватска и Северна Македонија. Спроведена анализа показала је да је доминантан фактор развоја код групе А издвајање за истра-

живање и развој, док је код групе Б доминантан фактор извоз роба и услуга. Издвајања за истраживања и развој имају три и по пута већи значај за привредни раст високо развијених земаља у односу на средње развијене земље. Са друге стране, извоз роба и услуга има два пута већи значај за привредни раст средње развијених земаља у односу на развијене земље.

Закључак који се може донети јесте да су издвајања за истраживање и развој кључ за решавање замке средње развијености. То даје смернице креаторима економске политике да на време крену са улагањима у науку и образовање. Поменути закључак подржавају и теоријска истраживања која кажу да код земаља у развоју издвајања за истраживања и развој дају резултате само у дужем периоду, али не и у кратком року. У кратком року је тешко изградити квалитетан образовни систем и ефикасне научне институције, што је предуслов ефикасног коришћења резултата истраживања у привредном развоју.