

# ECONOMIC DEVELOPMENT IN THE EASTERN EUROPE – DETERMINANTS AND DISCREPANCIES

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## Summary

*Even if the Eastern European countries share a common communist past, the efficiency of the transitions these economies have gone through is at least not similar. Former USSR satellites managed to build relatively functional market economies which in turn allowed these countries to join the European Union and deepen the integration within other cooperation structures of the Western World. Unlike the first group of countries, former Soviet Republics, covered by the Eastern Partnership initiative of the EU, have registered varying performances in building efficient market economies, the success of which could be debated. The present study is set to reinforce the debates related to the economic growth and convergence of the Eastern Europe, simultaneously, finding the main directions on which policy-makers and academics should concentrate to increase the effectiveness and favourable impact of the development policies and strategies. The methodology is based on comprehensive quantitative analysis of the data related to economic development of these nations the core of which is log-log ordinary least squares regressions. The results show that there are considerable differences in the income sensitiveness both among the countries and growth determinants, the Eastern EU member states tending to register higher levels in this regard.*

**Keywords:** Eastern Europe, development, discrepancies, productivity, European integration

**JEL:** F15, F43, O18, O33, Q01

**UDC:** 338.1(1-924.7/.9)

**Introduction.** Even if the Eastern European countries share a common communist past, the efficiency of the transitions these economies have gone through is at least not similar. Former USSR satellites i.e. Poland, the Czech Republic, Hungary, Romania and Bulgaria as well as the Baltic States, as an exception, managed to build relatively functional market economies which in turn allowed these countries to join the European Union and deepen the integration within other cooperation structures of the Western World. Unlike the first group of countries, former Soviet Republics i.e. Ukraine, the Republic of Moldova, Belarus, Georgia, Armenia and Azerbaijan, covered by the Eastern Partnership initiative of the EU, have registered varying performances in building efficient market economies, the success of which could be debated. Presently, there are important economic development differences between these countries, both in terms of income and

productivity. Thus, it can be remarked that, for instance, that in the Czech Republic the GDP per capita in 2017 reached 36 300 USD (adjusted to purchasing power parity) while in the Republic of Moldova it slightly passed over 5 600 USD. Looking at this gap in development in a region which share much similarity a subsequent question occurs, and namely, which are the essential causes for this divide? Many growth theories underline the importance of various factors in stimulating development including productivity, consumption, foreign direct investments, capital formation, trade, innovation competitiveness and remittances. Theoretically, each of these factors strengthens economic growth i.e. through boosting production capacities of nations or by strengthening the consumption potential. In this regard, the present study is expected to check for validity this affirmation considering the countries of the Eastern Europe. Moreover, in the case the relation is proved, it is supposed to measure the extent to which these factors enhance the economic growth in this region. Another important objective to be achieved by this research is to identify if there any differences in this extent considering the EU and non-EU member countries. Furthermore, it is supposed to underline the existing differences in the living standards across this region through analysing income, productivity and consumption the fundamental factors determining countries' economic bases. The methodology is based on comprehensive quantitative analysis of the data related to economic development of these nations the core of which is log-log ordinary least squares regressions. These will assure the possibility to identify the sensitiveness of income in the countries of the Eastern Europe considering economic growth determinants. The present study is set to reinforce the debates related to the economic growth and convergence of the Eastern European countries. Simultaneously, it is supposed to advise on the main directions on which policy-makers and academics should concentrate to increase the effectiveness and favourable impact of the developed policies and strategies. Last but not the least, this research is set to contribute with relevant development models charactering growth patterns in these states as well as the potential development dynamics for the following years. It is important to underline that the studied period covers 16 years starting with 2002 and finalising with 2017.

**Theoretical fundament of economic development.** One of the most essential contributions to framing development economics was made by Robert Solow and Trevor Swan who established the Solow-Swan model. Robert Solow was awarded the Nobel Prize for finding many implications and application of this model which determined the way economic growth and modern macroeconomics are approached (Acemoglu, 2009). This model underlines the necessity to stimulate capital accumulation to foster the long run economic growth of countries. It also underlines the strategic role of technological progress reflected through the prism of productivity growth implying also population expansion, its core being represented by the neoclassical production function which connects the model with microeconomics and wider datasets (Solow, 1957). Furthermore, the Solow-Swan model marks the idea that in the long run economies tend to reach steady equilibrium and only the technological breakthrough could ensure development. Shifts in the level of savings and population assure only levelling in the absolute value of real income per capita. Moreover, it presupposes that weak economies in the long run could catch up with

more developed due to a higher speed of poor countries' technology and capital absorption as compared to the speed of generation of innovation in the advanced economies (Romer, 2006). Certainly, this model is simple as it makes abstractions of various economic variables especially considering individual decision making, thus, it is only introduction to more complex models (Acemoglu, 2009 and Romer, 2011). Mankiw et al (1992) included to this model, besides capital accumulation, population growth and increases in productivity, the necessity to foster human capital. This inclusion helps in explaining the failure of international investments in stimulating growth in some poor countries. It underlines that weak economies are not able to fully benefit from capital output due to lower human capital able to increase the marginal product of it. At the same time, it should be underlined the idea that active participation of countries in international trade is also a determinant factor in strengthening their economic growth perspectives, the fact being widely supported by the empirical work of Krueger (1978, 2012) and Balassa (1985) as well as Feder (1982), authors underling the role of economic openness for fostering overall economic welfare, principles rooted in the neoclassical theory of economic growth. Simultaneously, it should be mentioned ideas of Krugman (1997) who is one of the most influential economists, adept of New Keynesian economics, converging new trade theory with new economic geography mentioning that regions which concentrate production named also agglomerations are characterised "as the outcome of the interaction of increasing returns, trade costs and factor price differences". In the case that trade is shaped by economies of scale the regions with intensive production are more profitable thus capable of attracting even more production, this fact being actual for countries, regions, or cities. At the same time, it should be underlined the contribution of Stiglitz (2002), another famous representative of New Keynesian economics, who highlighted the importance of efficient market mechanism to strengthen economic development especially of developing countries. In this case, governments can improve the economic growth by well-chosen interventions. Furthermore, governments could apply expansionary monetary and fiscal policies to raise the consumption capacities of population as potential solutions for redressing economies from recessions and depressions. Both Krugman and Stiglitz underline the importance of supporting purchasing power and demand of citizens and businesses to enhance economic growth. Another important source of economic development is FDI the effect of which is explained by International production theory, firms tend to move economic activities to the regions having specific attractiveness factors i.e. cheap labour, capital endowment or resources which are not available on the domestic market. FDI tends to foster economic development only in case it has favourable spill overs over local firms (Dunning, 1980 and Fayerweather, 1982). Accordingly, based on the reviewed works, it can be underlined that economic development is dependent on productivity growth, capital formation, innovative and technological capacities, economies' export capacities and FDI attractiveness as well as purchasing power of the citizens which, from the perspective of this research, is reflected through national expenditure and remittances.

Accordingly, these growth theories underline the importance of various factors in stimulating economic development including productivity, consumption, foreign direct investments, capital formation, trade, innovation competitiveness and

remittances. Theoretically, each of these factors strengthens growth i.e. through boosting production capacities of nations or by strengthening the consumption potential. In this regard, the present study is expected to check for validity this affirmation considering the countries of the Eastern Europe (hypothesis 1). Moreover, it is supposed to identify if any other of the selected indicators has a stronger impact on the economic growth as compared to productivity (hypothesis 2). Furthermore, it is expected to identify whether income discrepancies among the countries of the Eastern Europe have diminished over the period of 2002-2017 (hypothesis 3).

**Literature review.** In order to enhance the understanding of readers regarding the issues related to economic development in the Eastern European countries and its determinants a subset of relevant literature has been selected. Thus, according to Cuaresma et al (2014) economic growth in the Eastern European countries tend to be concentrated in the capital regions, these registering higher catching up pace with the West as compared to the rest of the territory. Important determinants in this regard are the raising income level of the population and human capital. Nevertheless, the positive effects of income growth are limited due to the development asymmetry between capital cities and regions. Moreover, Myant and Drahokoupil (2010) as well as Ghodsee (2011) underlined that the present economic weakness of the Eastern Europe comparing to the developed West should be linked to the economic crisis of communism of the late Cold War, when it was clear that there are irreversible systemic deficiencies. The efforts of Michael Gorbachev undertaken under the framework of glasnost and perestroika were late and unable to reignite development of the East which faced stagnation. The transition has been a period of great challenge for the Eastern Europe some of the states succeeding in overcoming it in a relatively short time, while other, mainly former USSR nations, failed in this path. Furthermore, Pavlínek (2015) mentioned that the effectiveness and speed of transition determined the capacities of the Eastern European countries in attracting FDI. In this regard, it can be marked the consistent difference between the former USSR member states and its satellites. The first group implemented more deficient market reforms, unlike the second, the fact reducing the nations' FDI attractiveness, which negatively affected their long run economic growth potential. Also, Liñán & Fernandez-Serrano (2014) highlighted that national cultures have determinative effect upon the economic performance of countries, the geographical elements having significant relevance in this regard. Overall, European nations share several common cultural features, thus, the authors mentioning that "autonomy and egalitarianism clearly predominate over embeddedness and hierarchy, while harmony tends to prevail over mastery". The Eastern Europe was influence primarily by communist ideology the fact which contributed to nations' low level of autonomy and egalitarianism. Entrepreneurship was long time oppressed in this region the fact creating a gap of business competitiveness. While, Popescu (2014) mentioned that the institutional strength is a decisive factor determining FDI attractiveness of countries. Accordingly, some of the Central and Eastern European nations succeeded in developing faster, while other stagnated or were lagging, for instance compared the evolution of the Czech Republic and Poland. It should be underlined that FDI is an important driver of economic growth since it allows to consolidate economic competitiveness through enhancing employment and capital basis. Finally, Åslund (2018) said that the performance of the

Central and Eastern European countries in terms of fiscal burden, tax system, labor markets, education, pensions, governance, and research and development has consistently improved in the post crisis years the fact which stimulated growth of GDP per capita. Quality of institutions is fundamental prerequisite of economic development, despite the fact that it has consistently increased in this region, it's effectiveness is not comparable to the Western European Union member countries.

Aldcroft (2016) stated that the differences between Europe's West and East are historically inherited which started to shrink in the interwar period when the Eastern nations faced a period of impressive economic growth. By the end of these years, some of the countries even overpassed the levels of the Western counterparts. Thus, according to Maddison Project Database (2018), the GDP per capita in Hungary was higher than in Italy and Austria by 1937 and in Poland larger than in Spain and Portugal. Communism has slowed the growth of the region, by 1970, the development of the West considerably enhancing while in the East economic stagnation becoming wide spread. Moreover, Topalli & Ivanaj (2016) determined that business sector in the Central and Eastern European countries is less competitive as compared to the West due to the lack of experience, it being established relatively recently and namely at the end of 1980s and beginning of 1990s. Moreover, entrepreneurial culture of this region has been negatively affected by communism which determined the erosion of population's economic values motivating much deficient adaptation to market system. Furthermore, Binelli et al (2015) underlined that transition period in the Central and Eastern Europe was particularly grievous in most of the former USSR states, where communism had undertaken the most radical forms. Thus, after the collapse of communism the satellites of USSR faced quicker adaptation period due to more efficient market reforms. At the same time, transition period in the ex-soviet space faced multiple challenges i.e. corruption, organized crime, institutional and legislative weaknesses which destroyed the economic potential of this region of Europe. Also, Roland (2018) mentioned that the end of the 20th century was marked by two major events, the collapse of communism in the Eastern Europe and the rapid orientation of China to market economy. The paths of transition these regions followed are distinct. If in China it is considered successful, in the Eastern Europe it was only partially favourable. The transition period in the former USSR satellites could be assessed as relatively propitious, while in the proper USSR it was destructive and incomplete facing consistent political difficulties. Simultaneously, Tertytchnaya et al (2018) pointed that deficient transition in the Eastern Europe, mainly, in the former USSR countries created immense economic instability the fact determining consistent destruction of the industrial potential which caused high unemployment. As a result, the population fled the states engaging in labour migration from the ex-Soviet peripheries to more attractive countries. Migration created significant inflows of remittances in the states of origin which in the short run fostered economic growth. However, in the long run, temporary emigration has become permanent negatively affecting development perspectives. At the same time, Danzer & Dietz (2014) remarked that emigration in Armenia, Belarus, Georgia, Moldova and Ukraine affected both qualified and non - qualified labour force which mainly head for the European Union and respectively the Russian Federation. In the vast majority, those following the EU's direction faced reduction of their professionalism as "many labour

migrants suffer from occupational downgrading or skill waste in this destination”, the fact which also determined the EU to fail in efficiently integrating these migrants’ economic potential.

Furthermore, Azam et al (2016) underlined that FDI has a more comprehensive and beneficial effect on the economic development of states as compared to the remittances’ inflow, this fact is especially actual in the Eastern Europe. FDI leads to the growth of production capacities of states, while remittances strengthen consumption capacities which in their vast part have only temporary effect of economic growth without structural impact. Moreover, in a certain extent remittances tend to compete FDI which reduces the capacities of countries enhancing technological and capital basis. Moreover, Epstein & Jacoby (2014) said that the Eastern European countries which integrated in the European Union in 2004 and 2007 have been able to considerably strengthen economic potential benefiting from the opportunities of the single market. In this context, the economic divide between the West and East started shrinking. However, the political and institutional developments remained slowly progressing due to the rigidity of the post-communist mentality. Nevertheless, it should be underlined that significant progress has been made including in these areas within the last decade. Furthermore, Bachtler et al (2014) highlighted that an important role in enhancing both economic and institutional as well as political performances in the Central and Eastern European countries has been played by Cohesion policy. As the author concludes “administrative capacity was developed faster and more substantially than commentators predicted”. At the same time, it should be underlined that “administrative capacity has been underestimated and insufficient attention has been given to the dynamics of capacity evolution and learning”. Finally, Jorgenson et al (2014) determined that it should be appreciated that despite of transition, the Central and Eastern European nations managed to redress the human well-being which has improved considerably accompanied by significant economic growth. Moreover, this growth could be generally assessed as sustainable since it has been relatively high in terms of environment efficiency, yet, there are possibilities to improve the results.

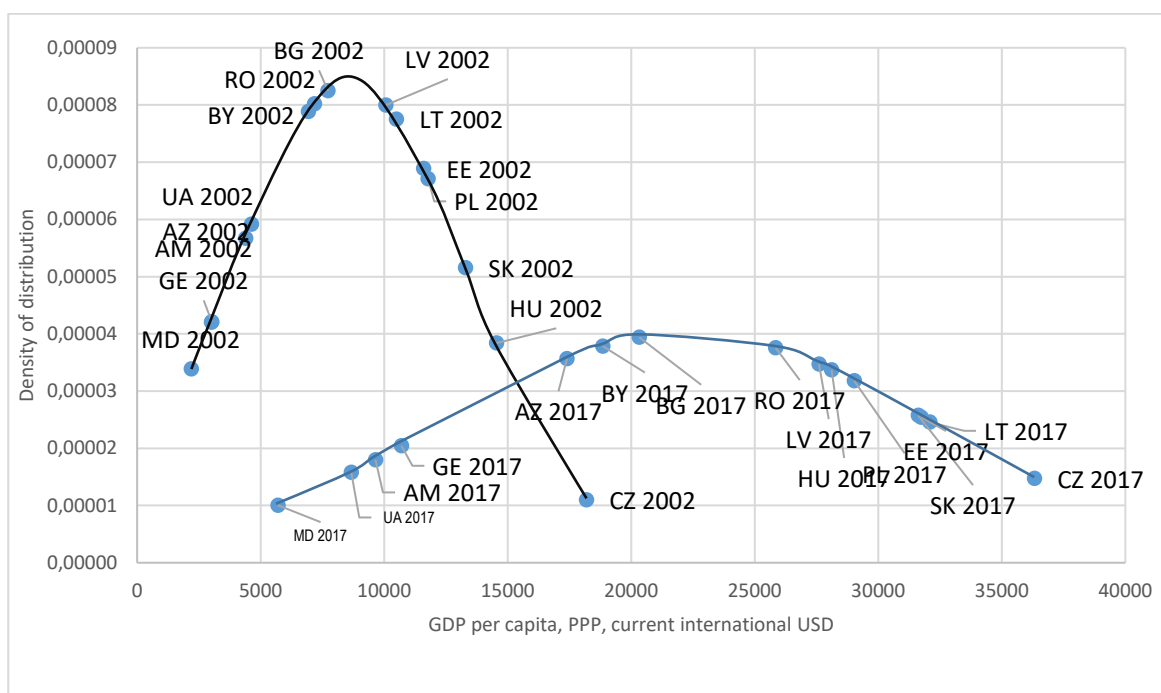
As a result, it can be underlined several important ideas related to the economic development of the Eastern European nations. First, there is an important development gap between the West and East which is a consequence of the stagnation of the communist system. Second, the transition period followed different paths in the former space of USSR and in its satellites, the last, due to the implementation of less radical communism, succeeded in adapting more efficiently to market and implement more transparent reforms. Third, the business sector, institutions and political effectiveness of the Eastern Europe is less competitive as compared to the West due to the lack of market experience following the transition from communism to capitalism. Fourth, in the former satellites of USSR the transition was successfully finalized making possible for countries to join Western institutes i.e. the single market or NATO. However, in the former territory of USSR, except the Baltic States, the transition was deficient causing the reduction of economic potential, emigration, destruction of industrial sector and consistent erosion of the institutions. In these areas little progress is being registered, the states struggling with structural challenges in terms of competences, corruption, reforms implementation, poverty and emigration.

This fact created important development discrepancies among the Eastern European countries, the divide growing with time, more efficient measures being imperative as to boost the economic development in these states.

**Methodology.** In order to achieve its objectives, the present research applies comprehensive statistical analysis methodology of the data related to the economic development dynamics in the Eastern Europe. Firstly, it is examined the estimates of distribution of countries based on the GDP per capita, PPP, current international USD, both in 2002 and 2017. This fact allows to identify which are the present income discrepancies among the countries and how they have changed since 2002. Also, there are pointed which are the most performant economies in this region and those lagging as well as it is underlined each state's registered growth. Further it is considered the distribution of countries according to log GDP per capita (PPP, current international USD) in 2002 and 2017 which is set to increase the relevance of the analysis through reflecting growth rates and the proportional change in terms of income among the researched states. Moreover, all analyzed indicators by the present study are expressed in logs to make possible to build more accurate OLS regressions between income and economic growth determinants. The distribution of countries according to log GDP per employed person (PPP, current international USD) in 2002 and 2017 is considered to outline the differences among the countries in terms of productivity, how the discrepancies have evolved during the period and which states register higher performances in this regard and which are lagging. The distribution of countries according to log gross national expenditure per capita (PPP, current international USD) in 2002 and 2017 is analyzed to identify whether there are any consistent differences between nations' income, productivity and expenditure and how these changes have evolved during the period. Further, several OLS regressions are developed between log GDP per capita and several determinants of economic growth including log GDP per employed person, log gross national expenditure per capita, log FDI stock per capita, log remittances per capita, log exports per capita, log high tech exports per capita, log gross capital formation per capita, confidence 95%. The coefficient of interest for the present analysis is  $\beta_1$  (CIV in tables) which describes, *ceteris paribus*, the extent growth determinants affect income and the economic development in the Eastern Europe (or the elasticity of GDP per capita considering the growth determinants selected).

**Results.** There are important development discrepancies among the countries of the Eastern Europe both in terms of GDP per capita and productivity. Presently, the wealthiest countries in this region are the Czech Republic having an income per capita of over than 36 000 USD, followed by Lithuania, 32 000 USD, Estonia, Slovakia, Poland and Hungary registering 31 700, 31 600, 29 000 and respectively 28 000 USD. At the same time, the poorest nations are the Republic of Moldova, Ukraine, Armenia and Georgia recording, by 2017, 5700, 8600, 9600, and respectively 10700 USD. Thus, it can be observed that the difference in income levels between the most and least prosperous states is more than 6 times. It is important to underline that this data is provided by the World Bank and expresses GDP per capita adjusted to purchasing power parity, current international USD. It was used GDP (PPP) to increase the relevance of cross countries comparisons and consider the differences in relative prices. Figure 1 shows that by 2002 the majority of the Eastern European countries had a GDP per capita lower than 12 000 USD, the median value being less than 8 000

USD. At the same time, it can be remarked that by 2017 the graph has shifted rightwards the fact underlining the raise in the income per capita in all the countries of this region, the value of the median increasing to 25 840 USD. Density estimate of the distribution within the researched period has considerably decreased the fact which highlights the idea that the development discrepancies among the states have enlarged. Moreover, if in 2002 the range of the data was 16 000 USD, then, in 2017 it has reached 30 600 USD, almost doubling in 16 years. The increase in the dispersion is also proven by the increase in the standard deviation from 4 755 to 9 943. As Acemoglu (2009) advises in a similar research *“part of the spreading out of the distribution is because of the increase in average incomes. It may therefore be more informative to look at the logarithm of income per capita”*. Therefore, further it will be analysed the natural logarithm (log) of indicators, in order to receive more accurate results.



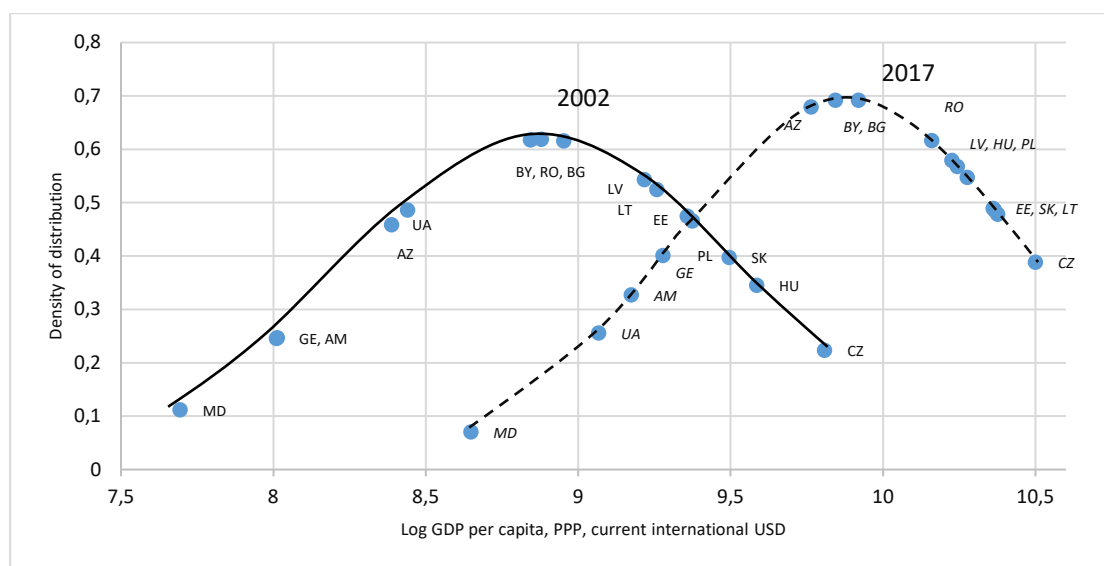
**Figure 1. Distribution of the Eastern European countries, GDP per capita, PPP, current international USD, in 2002 and 2017.**

*Source:* Designed by the author based on the data provided by the World Bank.

As it can be noticed in figure 2, the graph is also moving rightward the fact marking a similar pattern, nevertheless, the distribution is more constant. In this regard, it could be underlined that: despite the fact that the absolute value of the development discrepancies increased among the countries of the Eastern Europe, the proportional gap has slightly decreased. The range of date reduced from 2.11 in 2002 to 1.85 in 2017, while the standard deviation decreased from 0.64 to 0.58. Accordingly, it can be mentioned that the spread out in the log GDP per capita diminished at a low extent within the period of 2002-2017. Both figures i.e. 1 and 2 show that the level of income has increased in the Eastern European states,



nevertheless, this growth was mainly powered by the wealthier states which had a higher initial income. The weakest economies in the region remain underdeveloped, little progress being made in reducing the development discrepancies over the period as compared to the leading ones. Simultaneously, it can be observed that the evolution of log GDP per capita marks the relative division of states in layers. Accordingly, if in 2002 the density of distribution was rather uniform, than in 2017 it can be observed the group of leaders composed of the Czech Republic, closely followed by Lithuania, Slovakia and Estonia, as well as Poland, Hungary and Latvia, and at some extent, Romania. Emerging economic powers in the region are Bulgaria, Belarus and Azerbaijan, as well as Georgia, Armenia and Ukraine, while the Republic of Moldova is lagging, registering the most modest results among the states.

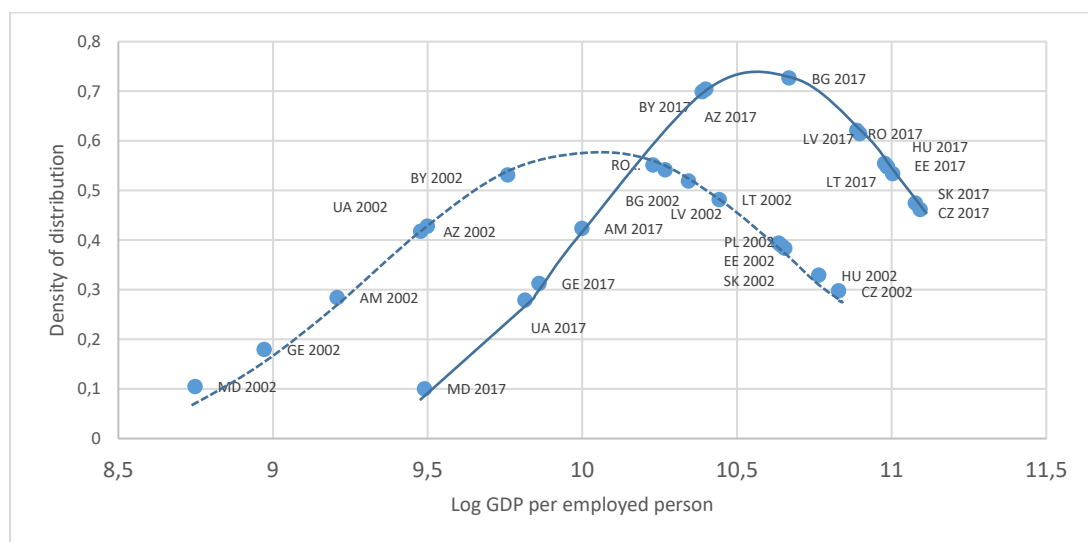


**Figure 2. The distribution of countries according to log GDP per capita (PPP, current international USD) in 2002 and 2017.**

*Source:* Designed by the author based on the data provided by the World Bank.

An important indicator determining the development potential of countries is productivity which plays strategical role in many growth theories (Acemoglu, 2009, Solow, 1957, Mankiw et al, 1992). The most relevant indicator in this regard is the GDP per employed person adjusted to purchasing power parity. It can be underlined that the proportional discrepancies in log productivity in the Eastern Europe have diminished at a greater extent as compared to sheer income per capita. Accordingly, the standard deviation decreased from 0.70 in 2002 to 0.54 in 2017, the median increasing from 10.27 to 10.89. Moreover, the range of data reduced from 2.08 to 1.60 within the same period of time. Nevertheless, by examining the information presented in figure 3, it can be observed that there still remain important differences in terms of productivity in the region of the Eastern Europe which tend to persist even if some progress has been made. The distribution of output per worker remain disperse, as in the case of income per capita. It can be noticed that leading economies in this region to form an agglomeration consisting of the Czech Republic, Slovakia, Estonia, Hungary, Lithuania, Romania and Latvia. Georgia, Ukraine and Moldova are

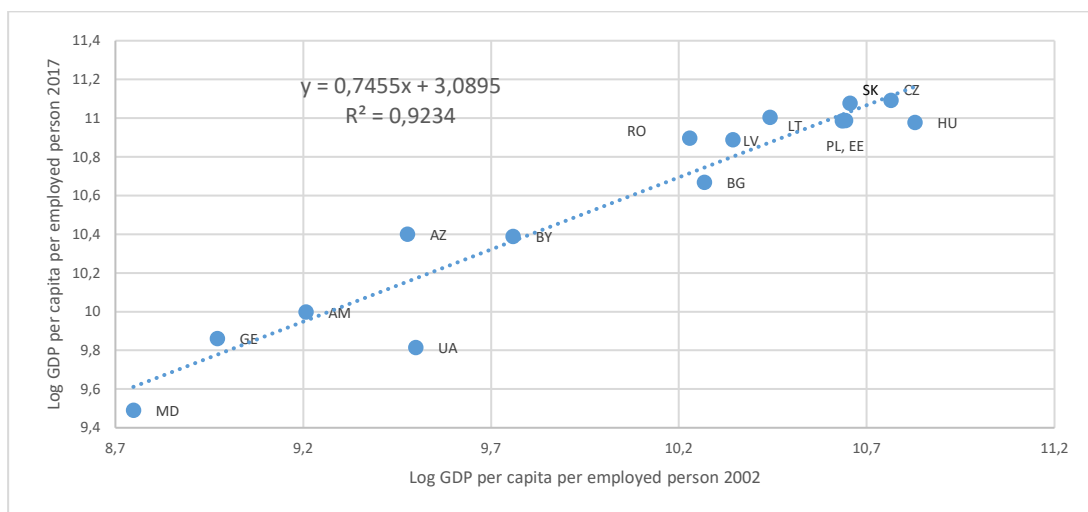
positioned on the opposite side, the lagging of the last increasing even with these countries. On overall, the figures 1-3 point two important findings i.e., first, there are consistent differences in economic development among the Eastern European nations and, second, small progress has been registered in reducing these gaps over the period of 2002-2017 both in terms of income per capita and productivity.



**Figure 3. The distribution of countries according to log GDP per employed person (PPP, current international USD) in 2002 and 2017.**

*Source:* Designed by the author based on the data provided by the World Bank.

By examining figure 4, it can be underlined the idea that some nations in the Eastern Europe have overpassed the regional trend of productivity growth within the period of 2002-2017 while other not. Thus, the leading countries in this regard are Romania, Azerbaijan, Lithuania, Latvia, Georgia, Slovakia and Armenia. The states which followed the same dynamics as the region as a whole include Belarus, Poland, Estonia and the Czech Republic. The lagers in terms of productivity growth are Moldova, Ukraine, Bulgaria, and Hungary. Another important observation to be made regards the stratification of countries in two distinctive groups, and namely, the Eastern European countries being members of the European Union and those which are not. The first group of countries make an agglomeration in the right part of the graph while the second group is spread on the left side, the fact underlining the idea that the first group has developed more similarly, a favourable effect of the EU over the region, while the remaining countries have grown much more dispersedly, their economies being much less connected to the single market.



**Figure 4. Log GDP per employed person in 2017 versus log GDP per employed person in 2002.**

*Source:* Designed by the author based on the data provided by the World Bank.

Table 1 reports ordinary least-squares regressions between Log GDP per capita (dependent variable,  $y$ ) and Log GDP per employed person (independent variable,  $x$ ). The linear regressions are explained by the following equation:

$$(1) \log(y_i) = \beta_0 + \beta_1 \log(x_p) + \varphi_1$$

where  $y_i$ -is GDP per capita,  $x_p$ - productivity,  $\beta_0$ - coefficient of intercept,  $\beta_1$ -coefficient of independent variable and  $\varphi$ - error term. The coefficient of interest for the present analysis is  $\beta_1$  (CIV in table) which describes, *ceteris paribus*, the effect of change in productivity on the economic development (or the elasticity of GDP per capita considering GDP per employed person). As it can be underlined in table 1, and more specifically in the first column, there is a high coefficient of determination  $R^2$  between the variables for all countries except Hungary (the fact which can be exemplified by the peculiar characteristics of this country's economy and the changes in terms of policy priorities). Therefore, it can be underlined that there is a strong correlation coefficient which is statistically significant between income and productivity in this region of Europe. The relevance of OLS regression is confirmed by favourable significance levels SF as well as P-values.  $\beta_1$  coefficients (CIV in the table 1) mark the idea that economic growth in the researched countries registers varying income sensitiveness on productivity. Accordingly, it can be observed that former Soviet states i.e. Moldova, Azerbaijan, Georgia, Armenia, Belarus and Ukraine, register the lowest sensitiveness, while the Eastern European Union countries record significantly higher levels. Thus, in Moldova 1% improvement in productivity stimulates GDP per capita growth with only 1.22% comparing to Estonia 3.08% or Poland, 2.81%.

**Table 1. OLS regression between Log GDP per capita and Log GDP per employed person, confidence 95%**

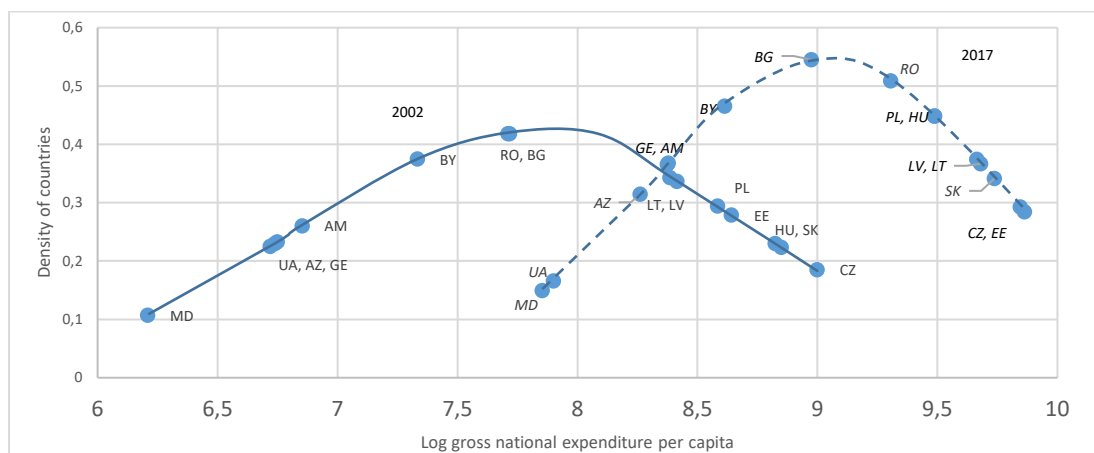
| *13 | R2   | SE   | SS   | RSS  | MS   | RMS  | F    | SF   | CI     | SEI  | TSI    | PVI  | CIV  | SEIV | TSIV | PVIV |
|-----|------|------|------|------|------|------|------|------|--------|------|--------|------|------|------|------|------|
| AM  | 0.96 | 0.07 | 1.72 | 0.06 | 1.72 | 0.00 | 371  | 0.00 | -5.58  | 0.74 | -7.50  | 0.00 | 1.47 | 0.08 | 19.3 | 0.00 |
| AZ  | 0.99 | 0.05 | 3.65 | 0.04 | 3.65 | 0.00 | 1283 | 0.00 | -4.44  | 0.39 | -11.51 | 0.00 | 1.36 | 0.04 | 35.8 | 0.00 |
| BY  | 0.99 | 0.03 | 1.73 | 0.01 | 1.73 | 0.00 | 2278 | 0.00 | -6.16  | 0.33 | -18.74 | 0.00 | 1.54 | 0.03 | 47.7 | 0.00 |
| BG  | 0.97 | 0.06 | 1.32 | 0.05 | 1.32 | 0.00 | 409  | 0.00 | -14.99 | 1.21 | -12.37 | 0.00 | 2.34 | 0.12 | 20.2 | 0.00 |
| CZ  | 0.90 | 0.07 | 0.58 | 0.06 | 0.58 | 0.00 | 126  | 0.00 | -13.55 | 2.11 | -6.41  | 0.00 | 2.16 | 0.19 | 11.2 | 0.00 |
| EE  | 0.93 | 0.08 | 1.32 | 0.09 | 1.32 | 0.01 | 194  | 0.00 | -23.48 | 2.40 | -9.78  | 0.00 | 3.08 | 0.22 | 13.9 | 0.00 |
| GE  | 0.99 | 0.03 | 2.34 | 0.01 | 2.34 | 0.00 | 2440 | 0.00 | -4.82  | 0.27 | -17.55 | 0.00 | 1.43 | 0.03 | 49.4 | 0.00 |
| HU  | 0.36 | 0.17 | 0.23 | 0.41 | 0.23 | 0.03 | 8    | 0.01 | -16.93 | 9.59 | -1.77  | 0.10 | 2.45 | 0.88 | 2.8  | 0.01 |
| LV  | 0.97 | 0.06 | 1.35 | 0.04 | 1.35 | 0.00 | 424  | 0.00 | -11.44 | 1.03 | -11.09 | 0.00 | 1.99 | 0.10 | 20.6 | 0.00 |
| LT  | 0.96 | 0.07 | 1.72 | 0.07 | 1.72 | 0.01 | 342  | 0.00 | -11.19 | 1.14 | -9.81  | 0.00 | 1.95 | 0.11 | 18.5 | 0.00 |
| MD  | 0.98 | 0.04 | 1.23 | 0.03 | 1.23 | 0.00 | 648  | 0.00 | -2.95  | 0.44 | -6.71  | 0.00 | 1.22 | 0.05 | 25.5 | 0.00 |
| PL  | 0.97 | 0.05 | 1.35 | 0.04 | 1.35 | 0.00 | 531  | 0.00 | -20.58 | 1.32 | -15.57 | 0.00 | 2.81 | 0.12 | 23.0 | 0.00 |
| RO  | 0.96 | 0.08 | 2.30 | 0.09 | 2.30 | 0.01 | 365  | 0.00 | -12.92 | 1.18 | -10.96 | 0.00 | 2.13 | 0.11 | 19.1 | 0.00 |
| SK  | 0.99 | 0.03 | 1.22 | 0.01 | 1.22 | 0.00 | 1865 | 0.00 | -12.07 | 0.51 | -23.60 | 0.00 | 2.02 | 0.05 | 43.2 | 0.00 |
| UA  | 0.88 | 0.07 | 0.48 | 0.07 | 0.48 | 0.00 | 102  | 0.00 | -7.50  | 1.62 | -4.62  | 0.00 | 1.68 | 0.17 | 10.1 | 0.00 |

*Source:* Calculated by the author.

Gross national expenditure is a relevant indicator depicting the living standards of the population since it reflects the ability of citizens, business and government to buy goods and services. Krugman (1997) and Stiglitz (2002) underline the importance of boosting consumption capacities of households, business sector, and government to enhance economic growth, ideas widely promoted by the representatives of Neo-Keynesian economics. By comparing the information displayed in figure 2 and 5, it can be observed that both consumption and income per capita have grown in the Eastern European countries, the graphs shifting rightwards. Unlike the discrepancies in terms of log income, log consumption differences in the Eastern Europe slightly reduced at a greater extent. Accordingly, the standard deviation of log income decreased with 0.07 units within the researched period, while those in terms of log consumption reduced with 0.22 units, at the same time, the range of data minimised with 0.26 and respectively, 0.78. Moreover, the median value in the case of log income enlarged with only 1.2, while in that of consumption with 1.59. Nevertheless, it could be mentioned that both the divergences in terms of GDP and consumption per capita are more or less similar in the linear association being determined by almost the same values of the respective equations (see figures 4 and 6).

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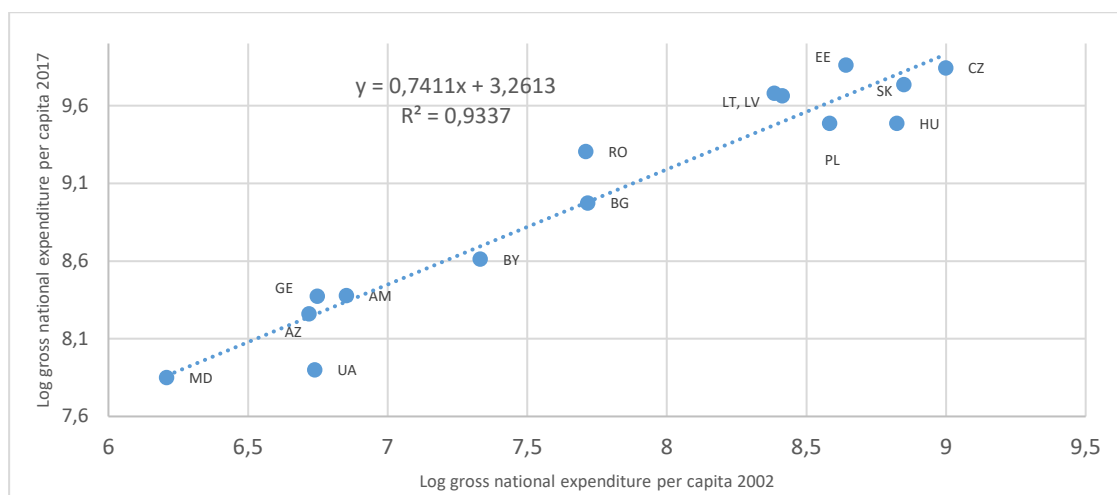
\*Please note for all tables: R<sup>2</sup>- coefficient of determination; SE- Standard Error; SS- Sum of Squares; RSS- Residual Sum of Squares; MS- Mean Squares; RMS- Residual Mean Squares; F- F test coefficient; SF- Significance F; CI- Coefficient of intercept; SEI- Standard Error of intercept; TSI- t stat of intercept; PVI- P-value of intercept; CIV- Coefficient of independent variable; SEIV- Standard error of independent variable; TSIV- t stat of independent variable; PVIV- P-value of independent variable;



**Figure 5. The distribution of countries according to log gross national expenditure per capita (PPP, current international USD) in 2002 and 2017.**

*Source:* Designed by the author based on the data provided by the World Bank.

Taking into account the information presented in figure 6, it can be highlighted that several countries exceeded the regional trend in terms of consumption per capita within the period of 2002-2017, the highest growth being registered in Romania, Lithuania, Latvia, Estonia and Georgia. It is also relevant to mention that dynamics of consumption in Ukraine, Poland and Hungary recorded values below the expected trend in the region.



**Figure 6. Log gross national expenditure per capita in 2017 versus log gross national expenditure per capita in 2002.**

*Source:* Designed by the author based on the data provided by the World Bank.

Based on the information provided in table 2, it can be concluded that there is a strong and statistically significant linear association between income and expenditure in the countries of the Eastern Europe. For the vast majority of states, the values of the determination coefficient  $R^2$  are very high the fact which confirms the observation

made in the previous sentence. At the same time, it should be remarked that the value of  $R^2$  for Hungary is higher than in table 1, yet, lower as compared to the rest of states, the situation which proves the specific character of economic growth in this country which is driven by peculiar determinants. Since the linear relation is strong and relevant (SF is low), it can be concluded that the linear relation between Log GDP per capita and Log gross national expenditure per capita is determined by the following equation:

$$(2) \log(y_i) = \beta_{0c} + \beta_{1c} \log(x_c) + q_2$$

where  $y_i$ -is GDP per capita,  $x_c$ - consumption,  $\beta_{0c}$ - coefficient of intercept,  $\beta_{1c}$ - coefficient of independent variable and  $q_2$ - error term. The coefficient of interest is  $\beta_{1c}$  (CIV in table 2) which describes, ceteris paribus, the effect of change in consumption on the economic development (or the elasticity of GDP per capita considering Gross national expenditure per capita). The sensitiveness of income of countries depending on consumption is much more reduced as in the case of productivity, yet also high. Accordingly, the highest sensitiveness is registered in Slovakia where for each 1% change in expenditures per capita, the income per capita will adjust with 0.88%, followed by Estonia, Poland, 0.8%, as well as Lithuania and Romania, 0.79% and respectively 0.74%. On the opposite side there are situated Ukraine, 0.36%, Moldova, 0.49%, and Armenia, 0.59%. Thus, an increase with 1% of expenditure in Slovakia will stimulate the growth of GDP per capita with 0.88% while in Ukraine with only 0.36%.

**Table 2. OLS regression between Log GDP per capita and Log gross national expenditure per capita, confidence 95%**

| *  | R2   | SE   | SS   | RSS  | MS   | RMS  | F   | SF   | CI   | SEI  | TSI   | PVI  | CIV  | SEIV | TSIV  | PVIV |
|----|------|------|------|------|------|------|-----|------|------|------|-------|------|------|------|-------|------|
| AM | 0.90 | 0.12 | 1.60 | 0.19 | 1.60 | 0.01 | 121 | 0.00 | 4.03 | 0.43 | 9.36  | 0.00 | 0.59 | 0.05 | 10.98 | 0.00 |
| AZ | 0.92 | 0.14 | 3.41 | 0.29 | 3.41 | 0.02 | 167 | 0.00 | 3.57 | 0.45 | 7.92  | 0.00 | 0.73 | 0.06 | 12.93 | 0.00 |
| BY | 0.88 | 0.12 | 1.53 | 0.22 | 1.53 | 0.02 | 99  | 0.00 | 4.26 | 0.53 | 8.05  | 0.00 | 0.62 | 0.06 | 9.94  | 0.00 |
| BG | 0.82 | 0.13 | 1.12 | 0.25 | 1.12 | 0.02 | 62  | 0.00 | 3.60 | 0.75 | 4.79  | 0.00 | 0.68 | 0.09 | 7.87  | 0.00 |
| CZ | 0.68 | 0.12 | 0.44 | 0.21 | 0.44 | 0.01 | 29  | 0.00 | 4.34 | 1.08 | 4.02  | 0.00 | 0.61 | 0.11 | 5.43  | 0.00 |
| EE | 0.88 | 0.11 | 1.25 | 0.17 | 1.25 | 0.01 | 105 | 0.00 | 2.35 | 0.74 | 3.16  | 0.01 | 0.80 | 0.08 | 10.25 | 0.00 |
| GE | 0.90 | 0.13 | 2.12 | 0.23 | 2.12 | 0.02 | 130 | 0.00 | 3.54 | 0.46 | 7.74  | 0.00 | 0.66 | 0.06 | 11.41 | 0.00 |
| HU | 0.40 | 0.17 | 0.25 | 0.38 | 0.25 | 0.03 | 9   | 0.01 | 3.75 | 2.05 | 1.83  | 0.09 | 0.66 | 0.22 | 3.02  | 0.01 |
| LV | 0.78 | 0.15 | 1.08 | 0.31 | 1.08 | 0.02 | 49  | 0.00 | 3.57 | 0.89 | 4.02  | 0.00 | 0.66 | 0.09 | 7.00  | 0.00 |
| LT | 0.83 | 0.15 | 1.49 | 0.30 | 1.49 | 0.02 | 71  | 0.00 | 2.54 | 0.88 | 2.90  | 0.01 | 0.79 | 0.09 | 8.40  | 0.00 |
| MD | 0.85 | 0.12 | 1.07 | 0.20 | 1.07 | 0.01 | 76  | 0.00 | 4.62 | 0.41 | 11.17 | 0.00 | 0.49 | 0.06 | 8.74  | 0.00 |
| PL | 0.74 | 0.16 | 1.03 | 0.36 | 1.03 | 0.03 | 40  | 0.00 | 2.48 | 1.18 | 2.11  | 0.05 | 0.80 | 0.13 | 6.29  | 0.00 |
| RO | 0.84 | 0.17 | 2.00 | 0.39 | 2.00 | 0.03 | 73  | 0.00 | 3.08 | 0.77 | 4.01  | 0.00 | 0.74 | 0.09 | 8.53  | 0.00 |
| SK | 0.77 | 0.14 | 0.94 | 0.28 | 0.94 | 0.02 | 46  | 0.00 | 1.61 | 1.24 | 1.31  | 0.21 | 0.88 | 0.13 | 6.80  | 0.00 |
| UA | 0.85 | 0.08 | 0.47 | 0.08 | 0.47 | 0.01 | 77  | 0.00 | 6.10 | 0.32 | 19.10 | 0.00 | 0.36 | 0.04 | 8.78  | 0.00 |

Source: Calculated by the author.

Information presented in table 3 confirms the fact that FDI is a determinant of economic development in the researched countries. It can be remarked that the registered  $R^2$  for all of the states is very high, excluding Azerbaijan (an economy

which is heavily dependent on natural resources exports unlike the other nations). At the same time, it can be mentioned that Hungary records a coefficient of determination much higher as compared to the previous cases, the fact highlighting the strategic role of FDI in the fostering its economic development, the situation which is also characteristic for all other states. Low level of SF marks that the linear association is statistically significant, thus, FDI influencing the economic development of the region as a whole. Since the correlation is strong and statistically significant, it can be concluded that the linear relation between Log GDP per capita and Log FDI stock per capita is determined by the following equation:

$$(3) \quad \log(y_i) = \beta_{0\text{FDI}} + \beta_{1\text{FDI}} \log(x_{\text{FDI}}) + q_3$$

where  $y_i$ -is GDP per capita,  $x_{\text{FDI}}$ - foreign direct investments,  $\beta_{0\text{FDI}}$ - coefficient of intercept,  $\beta_{1\text{FDI}}$ - coefficient of independent variable and  $q_3$ - error term. The coefficient of interest is  $\beta_{1\text{FDI}}$  (CIV in table 3) which describes, ceteris paribus, the effect of change in the stock FDI per capita on the economic development (or the elasticity of GDP per capita considering FDI stock per capita). The highest sensitiveness of income on FDI stock is characteristic for Estonia and Lithuania, 0.63, followed by Slovakia, Poland, and Hungary, 0.59, 0.56 and respectively 0.53. On the opposite side there are Ukraine, Bulgaria and Belarus, 0.22, 0.33 and respectively 0.35. This fact underlines the idea that a 1 % growth in FDI stock per capita in Estonia, for instance, will increase GDP per capita with 0.63%, while in Ukraine the same 1% growth will only foster income per capita with 0.22%.

**Table 3. OLS regression between Log GDP per capita and Log FDI stock per capita, confidence 95%**

| *  | R2   | SE   | SS   | RSS  | MS   | RMS  | F   | SF   | CI   | SEI  | TSI   | PVI  | CIV  | SEIV | TSIV  | PVIV |
|----|------|------|------|------|------|------|-----|------|------|------|-------|------|------|------|-------|------|
| AM | 0.89 | 0.12 | 1.59 | 0.19 | 1.59 | 0.01 | 118 | 0.00 | 5.70 | 0.28 | 20.19 | 0.00 | 0.44 | 0.04 | 10.84 | 0.00 |
| AZ | 0.29 | 0.43 | 1.08 | 2.61 | 1.08 | 0.19 | 6   | 0.03 | 5.83 | 1.48 | 3.94  | 0.00 | 0.50 | 0.21 | 2.41  | 0.03 |
| BY | 0.95 | 0.08 | 1.66 | 0.09 | 1.66 | 0.01 | 264 | 0.00 | 7.20 | 0.14 | 49.94 | 0.00 | 0.35 | 0.02 | 16.24 | 0.00 |
| BG | 0.86 | 0.12 | 1.18 | 0.19 | 1.18 | 0.01 | 85  | 0.00 | 6.79 | 0.30 | 22.93 | 0.00 | 0.33 | 0.04 | 9.24  | 0.00 |
| CZ | 0.85 | 0.08 | 0.55 | 0.10 | 0.55 | 0.01 | 76  | 0.00 | 6.01 | 0.48 | 12.53 | 0.00 | 0.46 | 0.05 | 8.74  | 0.00 |
| EE | 0.92 | 0.09 | 1.29 | 0.12 | 1.29 | 0.01 | 152 | 0.00 | 4.15 | 0.47 | 8.79  | 0.00 | 0.63 | 0.05 | 12.33 | 0.00 |
| GE | 0.98 | 0.06 | 2.30 | 0.05 | 2.30 | 0.00 | 644 | 0.00 | 5.75 | 0.12 | 48.28 | 0.00 | 0.41 | 0.02 | 25.38 | 0.00 |
| HU | 0.64 | 0.13 | 0.41 | 0.23 | 0.41 | 0.02 | 25  | 0.00 | 5.21 | 0.95 | 5.49  | 0.00 | 0.53 | 0.11 | 5.00  | 0.00 |
| LV | 0.94 | 0.08 | 1.31 | 0.08 | 1.31 | 0.01 | 217 | 0.00 | 6.05 | 0.25 | 23.75 | 0.00 | 0.45 | 0.03 | 14.73 | 0.00 |
| LT | 0.88 | 0.12 | 1.58 | 0.21 | 1.58 | 0.01 | 107 | 0.00 | 4.70 | 0.50 | 9.34  | 0.00 | 0.63 | 0.06 | 10.36 | 0.00 |
| MD | 0.85 | 0.12 | 1.07 | 0.20 | 1.07 | 0.01 | 76  | 0.00 | 5.63 | 0.30 | 18.85 | 0.00 | 0.42 | 0.05 | 8.74  | 0.00 |
| PL | 0.85 | 0.12 | 1.18 | 0.21 | 1.18 | 0.01 | 80  | 0.00 | 5.24 | 0.52 | 10.11 | 0.00 | 0.56 | 0.06 | 8.93  | 0.00 |
| RO | 0.89 | 0.14 | 2.13 | 0.26 | 2.13 | 0.02 | 115 | 0.00 | 5.84 | 0.35 | 16.51 | 0.00 | 0.49 | 0.05 | 10.71 | 0.00 |
| SK | 0.74 | 0.15 | 0.91 | 0.32 | 0.91 | 0.02 | 40  | 0.00 | 4.76 | 0.84 | 5.67  | 0.00 | 0.59 | 0.09 | 6.29  | 0.00 |
| UA | 0.93 | 0.05 | 0.51 | 0.04 | 0.51 | 0.00 | 179 | 0.00 | 7.44 | 0.11 | 67.19 | 0.00 | 0.22 | 0.02 | 13.37 | 0.00 |

*Source:* Calculated by the author.

Table 4 provides information regarding the linear association between income and remittances. The economic and social impasse in the Eastern Europe determined massive emigration of these countries' populations towards wealthier regions of the continent i.e. Western European and the Russian Federation. This situation created important inflows of financial resources sent back in the home countries by migrants. The remittances boosted the purchasing power capacities of households, thus, raising the demand for products and services which strengthened domestic economic development. As it can be observed in table 4, the vast majority of countries register high levels of the determination coefficient  $R^2$ , except for Bulgaria and Poland, the average value of the coefficient for the remaining states being 0.80. Low levels of SF underline the idea that there is a strong and statistically significant relation between remittances and income per capita in the Eastern Europe which is exemplified by the following equation:

$$(4) \log(y_i) = \beta_{0r} + \beta_{1r} \log(x_r) + q_4$$

where  $y_i$ -is GDP per capita,  $x_r$ - remittances per capita,  $\beta_{0r}$ - coefficient of intercept,  $\beta_{1r}$ - coefficient of independent variable and  $q_4$ - error term. The coefficient of interest is  $\beta_{1r}$  (CIV in table 4) which describes, ceteris paribus, the effect of change in the per capita remittances on the economic development (or the elasticity of GDP per capita considering received per capita remittances). The highest sensitiveness is registered in Bulgaria where for each 1% change in the level of received per capita remittances there is a 0.95% change in the respective level of GDP, this state is followed by Estonia, 0.80% and Lithuania, 0.57%. On the opposite site there are situated Latvia, Ukraine and Hungary with 0.28%, 0.28% and respectively 0.19%.

**Table 4. OLS regression between Log GDP per capita and Log remittances per capita, confidence 95%**

| *  | R2   | SE   | SS   | RSS  | MS   | RMS  | F   | SF   | CI   | SEI  | TSI   | PVI  | CIV  | SEIV | TSIV  | PVIV |
|----|------|------|------|------|------|------|-----|------|------|------|-------|------|------|------|-------|------|
| AM | 0.80 | 0.16 | 1.43 | 0.35 | 1.43 | 0.03 | 56  | 0.00 | 5.82 | 0.39 | 14.88 | 0.00 | 0.48 | 0.06 | 7.51  | 0.00 |
| AZ | 0.80 | 0.23 | 2.94 | 0.75 | 2.94 | 0.05 | 55  | 0.00 | 6.96 | 0.33 | 20.98 | 0.00 | 0.53 | 0.07 | 7.39  | 0.00 |
| BY | 0.95 | 0.08 | 1.65 | 0.09 | 1.65 | 0.01 | 251 | 0.00 | 8.00 | 0.10 | 81.11 | 0.00 | 0.39 | 0.02 | 15.83 | 0.00 |
| BG | 0.24 | 0.27 | 0.33 | 1.04 | 0.33 | 0.07 | 4   | 0.05 | 4.43 | 2.41 | 1.84  | 0.09 | 0.95 | 0.45 | 2.11  | 0.05 |
| CZ | 0.74 | 0.11 | 0.48 | 0.17 | 0.48 | 0.01 | 40  | 0.00 | 8.49 | 0.27 | 31.31 | 0.00 | 0.34 | 0.05 | 6.33  | 0.00 |
| EE | 0.93 | 0.08 | 1.31 | 0.10 | 1.31 | 0.01 | 184 | 0.00 | 5.49 | 0.33 | 16.60 | 0.00 | 0.80 | 0.06 | 13.57 | 0.00 |
| GE | 0.94 | 0.10 | 2.20 | 0.15 | 2.20 | 0.01 | 203 | 0.00 | 6.13 | 0.19 | 33.08 | 0.00 | 0.49 | 0.03 | 14.25 | 0.00 |
| HU | 0.75 | 0.11 | 0.47 | 0.16 | 0.47 | 0.01 | 42  | 0.00 | 8.93 | 0.16 | 56.32 | 0.00 | 0.19 | 0.03 | 6.47  | 0.00 |
| LV | 0.78 | 0.15 | 1.08 | 0.31 | 1.08 | 0.02 | 49  | 0.00 | 8.17 | 0.24 | 34.60 | 0.00 | 0.28 | 0.04 | 7.00  | 0.00 |
| LT | 0.76 | 0.17 | 1.36 | 0.43 | 1.36 | 0.03 | 45  | 0.00 | 6.50 | 0.51 | 12.70 | 0.00 | 0.57 | 0.09 | 6.67  | 0.00 |
| MD | 0.72 | 0.16 | 0.91 | 0.35 | 0.91 | 0.03 | 36  | 0.00 | 5.70 | 0.42 | 13.53 | 0.00 | 0.44 | 0.07 | 6.01  | 0.00 |
| PL | 0.32 | 0.26 | 0.44 | 0.94 | 0.44 | 0.07 | 7   | 0.02 | 8.10 | 0.69 | 11.71 | 0.00 | 0.35 | 0.13 | 2.57  | 0.02 |
| RO | 0.61 | 0.26 | 1.45 | 0.94 | 1.45 | 0.07 | 22  | 0.00 | 8.16 | 0.32 | 25.54 | 0.00 | 0.35 | 0.08 | 4.64  | 0.00 |
| SK | 0.81 | 0.13 | 0.99 | 0.24 | 0.99 | 0.02 | 59  | 0.00 | 7.88 | 0.28 | 28.07 | 0.00 | 0.39 | 0.05 | 7.65  | 0.00 |
| UA | 0.93 | 0.05 | 0.51 | 0.04 | 0.51 | 0.00 | 176 | 0.00 | 7.67 | 0.09 | 81.18 | 0.00 | 0.27 | 0.02 | 13.26 | 0.00 |

Source: Calculated by the author.



Knowing the previous results of the undertaken regression analyses, it has become interesting which is the effect of export on income of the region. Based on the information provided in table 5, it can be remarked that the registered determination coefficient is high for all of the countries and the SF is low. In this regard, it can be underlined that the correlation is statistically significant and reflects the impact of exports on economic growth in the countries of the Eastern Europe which can be exemplified by the following log-log model:

$$(5) \log(y_i) = \beta_{0e} + \beta_{1e} \log(x_e) + q_5$$

where  $y_i$ -is GDP per capita,  $x_e$ - exports per capita,  $\beta_{0e}$ - coefficient of intercept,  $\beta_{1e}$ - coefficient of independent variable and  $q_5$ - error term. The coefficient of interest is  $\beta_{1e}$  (CIV in table 5) which describes, ceteris paribus, the effect of change in the per capita exports on the economic development (or the elasticity of GDP per capita considering per capita exports). The highest sensitiveness of income per capita considering exports is remarked for Romania, Armenia and Moldova, 0.67, 0.65 and respectively 0.61. At the same time, the lowest levels are registered in the Czech Republic, Ukraine and Slovakia, 0.42, 0.43 and respectively, 0.45. In this case, an increase in terms of per capita exports of 1% in Moldova, for example, will boost nation's per capita income with 0.67%, while in Ukraine with 0.43%.

**Table 5. OLS regression between Log GDP per capita and Log exports per capita, confidence 95%**

| *  | R2   | SE   | SS   | RSS  | MS   | RMS  | F   | SF   | CI   | SEI  | TSI   | PVI  | CIV  | SEIV | TSIV  | PVIV |
|----|------|------|------|------|------|------|-----|------|------|------|-------|------|------|------|-------|------|
| AM | 0.94 | 0.08 | 1.68 | 0.10 | 1.68 | 0.01 | 239 | 0.00 | 4.51 | 0.27 | 16.39 | 0.00 | 0.65 | 0.04 | 15.47 | 0.00 |
| AZ | 0.86 | 0.19 | 3.18 | 0.51 | 3.18 | 0.04 | 88  | 0.00 | 5.35 | 0.43 | 12.35 | 0.00 | 0.54 | 0.06 | 9.36  | 0.00 |
| BY | 0.90 | 0.11 | 1.57 | 0.18 | 1.57 | 0.01 | 122 | 0.00 | 4.74 | 0.43 | 10.92 | 0.00 | 0.60 | 0.05 | 11.03 | 0.00 |
| BG | 0.93 | 0.08 | 1.27 | 0.10 | 1.27 | 0.01 | 186 | 0.00 | 5.01 | 0.33 | 15.13 | 0.00 | 0.56 | 0.04 | 13.62 | 0.00 |
| CZ | 0.86 | 0.08 | 0.55 | 0.09 | 0.55 | 0.01 | 83  | 0.00 | 6.34 | 0.43 | 14.89 | 0.00 | 0.42 | 0.05 | 9.09  | 0.00 |
| EE | 0.93 | 0.08 | 1.32 | 0.09 | 1.32 | 0.01 | 201 | 0.00 | 4.53 | 0.39 | 11.76 | 0.00 | 0.59 | 0.04 | 14.16 | 0.00 |
| GE | 0.98 | 0.06 | 2.30 | 0.05 | 2.30 | 0.00 | 624 | 0.00 | 5.00 | 0.15 | 33.22 | 0.00 | 0.56 | 0.02 | 24.98 | 0.00 |
| HU | 0.79 | 0.10 | 0.50 | 0.13 | 0.50 | 0.01 | 52  | 0.00 | 5.48 | 0.62 | 8.83  | 0.00 | 0.49 | 0.07 | 7.20  | 0.00 |
| LV | 0.94 | 0.08 | 1.31 | 0.09 | 1.31 | 0.01 | 208 | 0.00 | 5.86 | 0.27 | 21.37 | 0.00 | 0.46 | 0.03 | 14.41 | 0.00 |
| LT | 0.95 | 0.08 | 1.69 | 0.09 | 1.69 | 0.01 | 251 | 0.00 | 5.23 | 0.30 | 17.71 | 0.00 | 0.53 | 0.03 | 15.85 | 0.00 |
| MD | 0.92 | 0.08 | 1.16 | 0.10 | 1.16 | 0.01 | 162 | 0.00 | 4.48 | 0.30 | 15.14 | 0.00 | 0.61 | 0.05 | 12.72 | 0.00 |
| PL | 0.91 | 0.09 | 1.27 | 0.12 | 1.27 | 0.01 | 144 | 0.00 | 4.97 | 0.41 | 12.15 | 0.00 | 0.59 | 0.05 | 12.01 | 0.00 |
| RO | 0.98 | 0.06 | 2.33 | 0.06 | 2.33 | 0.00 | 563 | 0.00 | 4.44 | 0.22 | 20.30 | 0.00 | 0.67 | 0.03 | 23.74 | 0.00 |
| SK | 0.81 | 0.13 | 0.99 | 0.23 | 0.99 | 0.02 | 60  | 0.00 | 5.87 | 0.54 | 10.91 | 0.00 | 0.45 | 0.06 | 7.73  | 0.00 |
| UA | 0.83 | 0.08 | 0.46 | 0.09 | 0.46 | 0.01 | 68  | 0.00 | 5.90 | 0.36 | 16.17 | 0.00 | 0.43 | 0.05 | 8.26  | 0.00 |

Source: Calculated by the author.

One of the main indicators reflecting innovation capacities of countries and their technological competitiveness is high tech exports (reported to the total number of population). The Eastern Europe's innovation potential is somehow limited as

compared to the Western European countries, yet, it should not be underestimated its long run power in fostering economic growth and boosting living standards, especially in this deprived region. Based on the information provided in table 6, it can be concluded that, on overall, there is a strong interconnection between innovation and income of population in the majority of countries, except for Azerbaijan, Georgia, and Hungary, and at a lower extent, Estonia and Armenia. The significance coefficient SF in the vast majority of states is low, the situation which allows mentioning that there is a strong and statistically significant correlation between high tech exports and economic growth in this region. Thus, it can be underlined that the correlation is statistically significant and reflects the favourable impact of innovation and technological competitiveness on income which can be exemplified by the following equation:

$$(6) \quad \log(y_i) = \beta_{0te} + \beta_{1te} \log(x_{te}) + q_6$$

where  $y_i$ -is GDP per capita,  $x_{te}$ - high tech exports per capita,  $\beta_{0te}$ - coefficient of intercept,  $\beta_{1te}$ - coefficient of independent variable and  $q_6$ - error term. The coefficient of interest is  $\beta_{1te}$  (CIV in table 6) which describes, ceteris paribus, the effect of change in the per capita high tech exports on the economic development (or the elasticity of GDP per capita considering per capita high tech exports). The highest sensitiveness in this regard is registered in Belarus, 0.71%, which means that for each 1% increase in the per capita high tech exports, there will be a 0.71% growth in per capita GDP. This nation is followed by Moldova with a coefficient of 0.58, while on the opposite side there is situated Latvia, 0.3.

**Table 6. OLS regression between Log GDP per capita and Log high tech exports per capita, confidence 95%**

| *  | R2   | SE   | SS   | RSS  | MS   | RMS  | F   | SF   | CI   | SEI  | TSI    | PVI  | CIV   | SEIV | TSIV  | PVIV |
|----|------|------|------|------|------|------|-----|------|------|------|--------|------|-------|------|-------|------|
| AM | 0.57 | 0.23 | 1.01 | 0.77 | 1.01 | 0.06 | 18  | 0.00 | 8.39 | 0.10 | 81.87  | 0.00 | 0.49  | 0.11 | 4.27  | 0.00 |
| AZ | 0.07 | 0.50 | 0.25 | 3.44 | 0.25 | 0.25 | 1   | 0.33 | 9.33 | 0.13 | 71.22  | 0.00 | 0.17  | 0.17 | 1.01  | 0.33 |
| BY | 0.88 | 0.12 | 1.53 | 0.21 | 1.53 | 0.02 | 102 | 0.00 | 6.86 | 0.27 | 25.79  | 0.00 | 0.71  | 0.07 | 10.09 | 0.00 |
| BG | 0.97 | 0.06 | 1.32 | 0.05 | 1.32 | 0.00 | 398 | 0.00 | 7.64 | 0.10 | 80.12  | 0.00 | 0.42  | 0.02 | 19.94 | 0.00 |
| CZ | 0.88 | 0.07 | 0.57 | 0.08 | 0.57 | 0.01 | 103 | 0.00 | 7.20 | 0.30 | 24.31  | 0.00 | 0.41  | 0.04 | 10.13 | 0.00 |
| EE | 0.46 | 0.23 | 0.65 | 0.76 | 0.65 | 0.05 | 12  | 0.00 | 7.21 | 0.80 | 9.02   | 0.00 | 0.43  | 0.13 | 3.47  | 0.00 |
| GE | 0.24 | 0.36 | 0.56 | 1.79 | 0.56 | 0.13 | 4   | 0.06 | 9.34 | 0.30 | 31.14  | 0.00 | -0.31 | 0.15 | -2.09 | 0.06 |
| HU | 0.11 | 0.20 | 0.07 | 0.56 | 0.07 | 0.04 | 2   | 0.21 | 8.15 | 1.37 | 5.93   | 0.00 | 0.25  | 0.19 | 1.31  | 0.21 |
| LV | 0.97 | 0.05 | 1.35 | 0.04 | 1.35 | 0.00 | 474 | 0.00 | 8.26 | 0.07 | 114.51 | 0.00 | 0.30  | 0.01 | 21.77 | 0.00 |
| LT | 0.92 | 0.10 | 1.65 | 0.14 | 1.65 | 0.01 | 169 | 0.00 | 7.89 | 0.16 | 50.15  | 0.00 | 0.36  | 0.03 | 13.00 | 0.00 |
| MD | 0.65 | 0.18 | 0.82 | 0.45 | 0.82 | 0.03 | 26  | 0.00 | 7.55 | 0.14 | 53.85  | 0.00 | 0.58  | 0.11 | 5.06  | 0.00 |
| PL | 0.96 | 0.06 | 1.34 | 0.05 | 1.34 | 0.00 | 367 | 0.00 | 8.20 | 0.09 | 92.79  | 0.00 | 0.33  | 0.02 | 19.15 | 0.00 |
| RO | 0.90 | 0.13 | 2.15 | 0.24 | 2.15 | 0.02 | 125 | 0.00 | 7.56 | 0.19 | 40.33  | 0.00 | 0.45  | 0.04 | 11.16 | 0.00 |
| SK | 0.93 | 0.08 | 1.14 | 0.09 | 1.14 | 0.01 | 181 | 0.00 | 8.03 | 0.15 | 53.75  | 0.00 | 0.31  | 0.02 | 13.46 | 0.00 |
| UA | 0.69 | 0.11 | 0.38 | 0.17 | 0.38 | 0.01 | 31  | 0.00 | 7.51 | 0.25 | 29.59  | 0.00 | 0.41  | 0.07 | 5.55  | 0.00 |

Source: Calculated by the author.

Table 7 provides information regarding the linear correlation between Log GDP per capita and Log gross capital formation per capita. Capital is an important indicator reflecting the availability of assets in the economy capable of generating growth. By examining the first column, it can be observed that coefficient of determination is relatively high in the region, yet, on overall slightly lower as in the case of previous indicators. Nevertheless, it allows concluding that capital formation is strongly correlated with GDP per capita, the relation which is statistically significant taking into account SF coefficient and it is reflected by the following equation:

$$(7) \quad \log(y_i) = \beta_{0\text{cap}} + \beta_{1\text{cap}} \log(x_{\text{cap}}) + \varphi_7$$

where  $y_i$ -is GDP per capita,  $x_{\text{cap}}$ - high tech exports per capita,  $\beta_{0\text{cap}}$ - coefficient of intercept,  $\beta_{1\text{cap}}$ - coefficient of independent variable and  $\varphi_7$ - error term. The coefficient of interest is  $\beta_{1\text{cap}}$  (CIV in table 7) which describes, ceteris paribus, the effect of change in the per capita capital formation on the economic development (or the elasticity of GDP per capita considering per capita capital formation). The highest sensitiveness is recorded in the case of Slovakia, 0.83, followed by Azerbaijan, 0.81 and Estonia, 0.69. At the same time, on the opposite side it is Ukraine, Moldova and Armenia, 0.30, 0.44 and respectively 0.45. Thus, if Slovakia registers a 1% growth in terms of capital per capita, it may expect the GDP to increase with 0.83%, while this raise in the case of Ukraine will be of only 0.3%.

**Table7. OLS regression between Log GDP per capita and Log gross capital formation per capita, confidence 95%**

| *  | R    | SE   | SS   | RSS  | MS   | RMS  | F  | SF   | CI   | SEI  | TSI   | PVI  | CIV  | SEIV | TSIV | PVIV |
|----|------|------|------|------|------|------|----|------|------|------|-------|------|------|------|------|------|
| AM | 0.63 | 0.22 | 1.13 | 0.66 | 1.13 | 0.05 | 24 | 0.00 | 5.86 | 0.59 | 9.90  | 0.00 | 0.44 | 0.09 | 4.90 | 0.00 |
| AZ | 0.80 | 0.23 | 2.93 | 0.76 | 2.93 | 0.05 | 54 | 0.00 | 3.83 | 0.75 | 5.08  | 0.00 | 0.81 | 0.11 | 7.37 | 0.00 |
| BY | 0.81 | 0.16 | 1.41 | 0.34 | 1.41 | 0.02 | 59 | 0.00 | 6.16 | 0.44 | 13.95 | 0.00 | 0.46 | 0.06 | 7.65 | 0.00 |
| BG | 0.59 | 0.20 | 0.81 | 0.56 | 0.81 | 0.04 | 20 | 0.00 | 5.96 | 0.79 | 7.53  | 0.00 | 0.49 | 0.11 | 4.51 | 0.00 |
| CZ | 0.59 | 0.14 | 0.38 | 0.27 | 0.38 | 0.02 | 20 | 0.00 | 5.37 | 1.08 | 4.95  | 0.00 | 0.57 | 0.13 | 4.45 | 0.00 |
| EE | 0.61 | 0.20 | 0.86 | 0.56 | 0.86 | 0.04 | 22 | 0.00 | 4.23 | 1.24 | 3.42  | 0.00 | 0.69 | 0.15 | 4.64 | 0.00 |
| GE | 0.87 | 0.15 | 2.04 | 0.31 | 2.04 | 0.02 | 91 | 0.00 | 4.65 | 0.43 | 10.77 | 0.00 | 0.63 | 0.07 | 9.53 | 0.00 |
| HU | 0.23 | 0.19 | 0.15 | 0.49 | 0.15 | 0.03 | 4  | 0.06 | 5.85 | 2.00 | 2.93  | 0.01 | 0.52 | 0.25 | 2.05 | 0.06 |
| LV | 0.41 | 0.24 | 0.57 | 0.82 | 0.57 | 0.06 | 10 | 0.01 | 6.09 | 1.18 | 5.14  | 0.00 | 0.46 | 0.15 | 3.13 | 0.01 |
| LT | 0.58 | 0.23 | 1.04 | 0.75 | 1.04 | 0.05 | 19 | 0.00 | 5.23 | 1.06 | 4.93  | 0.00 | 0.60 | 0.14 | 4.41 | 0.00 |
| MD | 0.73 | 0.16 | 0.91 | 0.35 | 0.91 | 0.02 | 37 | 0.00 | 5.66 | 0.42 | 13.38 | 0.00 | 0.45 | 0.07 | 6.08 | 0.00 |
| PL | 0.64 | 0.19 | 0.89 | 0.50 | 0.89 | 0.04 | 25 | 0.00 | 5.02 | 0.97 | 5.17  | 0.00 | 0.63 | 0.13 | 5.01 | 0.00 |
| RO | 0.79 | 0.19 | 1.89 | 0.49 | 1.89 | 0.04 | 54 | 0.00 | 4.98 | 0.63 | 7.86  | 0.00 | 0.62 | 0.08 | 7.33 | 0.00 |
| SK | 0.52 | 0.20 | 0.64 | 0.58 | 0.64 | 0.04 | 15 | 0.00 | 3.22 | 1.73 | 1.86  | 0.08 | 0.83 | 0.21 | 3.93 | 0.00 |
| UA | 0.63 | 0.12 | 0.35 | 0.20 | 0.35 | 0.01 | 24 | 0.00 | 7.04 | 0.38 | 18.34 | 0.00 | 0.30 | 0.06 | 4.86 | 0.00 |

Source: Calculated by the author.

**Conclusions.** The present study accepts hypothesis 1 mentioning that the selected growth determinants stimulate economic development in the countries of the Eastern Europe, these indicators include productivity, consumption expenditures,

foreign direct investments, capital formation, trade, innovation competitiveness and remittances. Thus, our theoretical assumptions are backed by relevant proves highlighting that each of these factors strengthens growth. At the same time, this research rejects hypothesis 2 aiming to find if any other of the selected indicators has a stronger impact on the economic growth as compared to productivity. It has by far the most significant effect on the economic development of the Eastern European countries. This determinant is followed by innovation competitiveness reflected through high technology exports. On the third place it is situated the formation of capital shortly followed by remittances, consumption expenditures, foreign direct investments and finally, exports. Simultaneously, this study rejects hypothesis 3 highlighting that income discrepancies among the countries of the Eastern Europe have diminished over the period of 2002-2017. It should be stated that in absolute values the discrepancies have considerably increased and the development differences between former USSR satellites and Republics accentuated over the researched period. The discrepancies slightly diminished in proportional values, yet, insignificantly. These differences are also valid in terms of productivity as well as consumption expenditures.

There can be remarked a clear differentiation between the Eastern European economies which integrated in the European Union and those which are part of the Eastern Partnership initiative. Growth determinants in the first group have a much consistent impact on the economic development, as compared to the second group, in the majority of cases  $\beta$  coefficients of the independent variables of the first states being much larger. Moreover, the growth in the Eastern European Union countries tended to be powered more by productivity increase as compared to the EaP states. These observations are also valid for high technology exports meaning stronger innovation competitiveness of the first and for consumption expenditures underlining that they had a higher impact on the domestic production in the Eastern EU nations as compared to the rest. The same fact is observable for the capital formation pointing the idea that it was more oriented towards improving productive capacities in the first group comparing to the second. Export and FDI's effects on regional growth was almost the same, yet, slightly higher in the East EU member states, meaning that these countries' performances in these areas was slightly larger. At the same time, it can be remarked that the impact of the remittances on the economic growth of the Eastern Europe is greater in the former Soviet Republics, presently, EaP countries. Accordingly, it can be highlighted that these states are more dependent on migrants' transfers which is a consistent factor fostering economic growth.

The impact of the growth determinants on the economic development is lowest in Ukraine, followed by Georgia, Moldova and Armenia. The sensitiveness of  $\beta$  coefficients in the case of these nations are smaller as compared, for instance, to Estonia, Poland, Bulgaria, Slovakia and Romania, as well as Hungary and Lithuania. This observation could be explained by lower economic dynamics of the EaP states and proportional growth both in terms of income and growth determinants. Another important observation which can be assess regards hindering factors in the former USSR Republics which hampers these nations in reaching greater impact of development determinants. In this regard, it could be inferred that corruption, weak

institutions and less efficient economic policies may serve as justification, ideas which can be developed in a potential research.

As a result, it can be remarked the increase of the development discrepancies between the Eastern European nations which integrated in the European Union and the EaP countries. This situation reduces the potential of the region as a whole to grow since this it could not reach the full potential through maximising the impact of the development determinants and by increasing the integration among the countries. Former USSR states tend to stagnate this fact raising the instability of the region and, therefore, increase the security risks of the community.

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