

## EXOGENOUS VS ENDOGENOUS GROWTH IN THE EU'S EAP AND CENTRAL ASIAN COUNTRIES

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### Abstract

*The main purpose of this paper is to determine and analyse the factors that affected economic growth in the EU's Eastern Partnership and Central Asian countries in the 2000-2015 period. Economic growth is one of the main targets of economic policy of any country and influenced by various determinants. Of particular interest is the endogenous and exogenous nature of these factors. Having classified these factors into exogenous and endogenous ones, we examined and determined the significance and robustness of various factors influencing the economic growth in these countries, like investment, human capital, research and development, economic policies and macroeconomic conditions, openness to trade, geography, political factors and others. Correlation and factor analysis showed significance and strong association of GDP per capita with physical, human capital, and R&D in EaP countries and with natural resources and active population share in Central Asian countries.*

**Keywords:** economic growth, exogenous growth, endogenous growth

**JEL classification:** O1, O3, O4, O47, O52, O53

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### 1. INTRODUCTION

Economic growth is an important factor determining the well-being of people and one of the main targets of economic policy of any country in the world. And Eastern Partnership countries and Central Asian countries are not exceptions. Countries of Eastern Europe and the region as a whole have always been an area of interest to world powers which did still not lost its relevance nowadays. In May 2009 during the EU Prague summit by the initiative of Poland and Sweden the Eastern Partnership was launched, as an offshoot of the European Neighbourhood Policy. The Eastern Partnership is a joint initiative of the EU and its Eastern European partners: Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine. It supposed to bring Eastern European partners closer to the EU, supporting and encouraging reforms in the EaP countries for the benefit of their citizens. The main goal of the Eastern Partnership is to create the necessary conditions to accelerate political

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association and further economic integration between the European Union and interested partner countries (European Council, 2009). One of its main objectives is formation of a “ring of friends” to the eastern and southern borders of the EU, i.e. Post-Soviet republics sharing European values and models of economic and political system (Vlah, 2015).

Central Asia is the core region of the Asian continent and stretches from the Caspian Sea in the west to China in the east and from Afghanistan in the south to Russia in the north. Central Asia has long been a strategic location not merely because of its proximity to several great powers on the Eurasian landmass, but also due to its central location with access to trade routes to and from all the regional powers. The Central Asia region comprises the countries of Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan and Uzbekistan. It is a diverse region with a mix of upper middle and lower middle income countries with major strategic importance due to their geographic location and natural resource endowments.

These countries were part of Soviet Union and shared the same history for many years, and with independence and the transition of these countries towards a market economy all these countries took their own path of development. These countries have had to create their own economic and political system, legislation framework, financial and other institutions. Having initially the same conditions, in period of almost 25 years, they have succeeded differently, what was influenced by different factors of economic growth. Our task is to determine their exogenous and endogenous nature and check these factors for correlation with economic growth in target countries and assess their significance and robustness. Determination and classification of exogenous and endogenous growth factors will enable us to outline prospects for further development of studied countries.

## **2. DETERMINANTS OF ECONOMIC GROWTH AND THEIR EXOGENOUS AND ENDOGENOUS NATURE**

The economic growth of the country depends on many factors which can be classified differently according to various criteria, but of particular interest is the endogenous and exogenous nature of these factors. An exogenous variable is a factor that is outside of a given economic model. It often has an impact on the outcome of the model or how certain situations turn out, but it isn't usually determinative in its own right and the changes in the model don't usually impact it. These variables are sometimes referred to as independent variables as opposed to dependent or endogenous variables, which are usually explained by the mathematical relationships in the model. While endogenous variables can be manipulated, exogenous ones are generally uncontrollable.

Neoclassical or exogenous theory of growth starts from the neoclassical model of Solow (1956). The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. As a result, the model highlights the savings or investment ratio as important determinant of short-run economic growth. Technological progress, though important in the long-run, is regarded as exogenous to the economic system and therefore it is not adequately explored by this model. Turning to the issue of convergence divergence, the model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones.

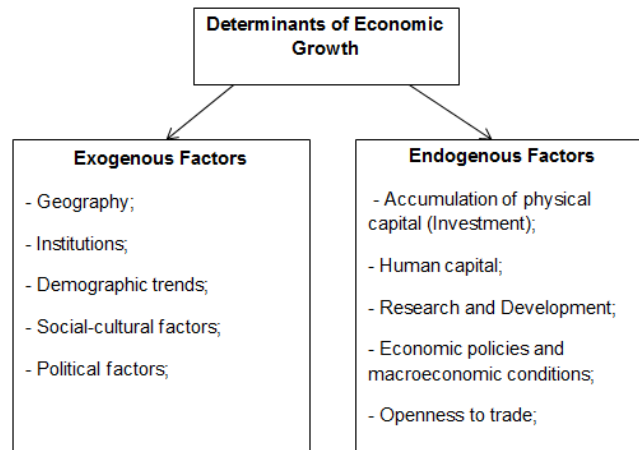
The main feature of Solow's Theory is that a variation in the endogenous variable, savings rate, affects the tilt of the growth trend in the short run but not in the long run because of the diminishing marginal productivity of capital. The new growth theory has

attempted to prevent diminishing marginal productivity or to slow its decline through introduction of accumulation of human capital, knowledge, acceleration of R&D, inventions and innovations, increasing the number of goods of new designs and their varieties with quality improvements and consideration of expansion of the size of markets.

Romer, whose articles (1986, 1990) initiated the introduction of Endogenous Growth Theory, propose that the introduction of new accumulation factors, such as knowledge, innovation, will induce self-maintained economic growth. Triggered by the seminal studies of Romer (1986) and Lucas (1988), work within this framework highlighted significant sources of growth: new knowledge (Romer, 1990, Grossman and Helpman, 1991), innovation (Aghion and Howitt, 1992). As a result, and in contrast to the neoclassic counterpart, policies are deemed to play a substantial role in advancing growth on a long run basis.

Barro and Sala-i-Martin (1995) state: “The determination of long-run growth within the model, rather than by some exogenously growing variables like unexplained technological progress, is the reason for the name ‘endogenous growth’.”

A cornerstone of endogenous growth is education, new knowledge, innovation, R&D. Great investment in education will result in a highly skilled workforce. This workforce will then move on into employment in research positions, developing a new and more efficient economy and creating sustained domestic growth.



*Source: author's representation*

**Figure no. 1 – Exogenous and Endogenous Determinants of Economic Growth**

The Endogenous Growth Theory is describing and helping understand the on-going change from resource-based economy to a knowledge based economy. Thus, Romer and Griliches (1993) state: “No amount of saving and investment, no policy of macroeconomic fine-tuning, no set of tax and spending incentives can generate sustainable economic growth unless it is accompanied by the countless large and small discoveries that are required to create more value from a fixed set of natural resources”.

The idea of promoting the next generation goes hand-in-hand with investment in technology and the “ideas” economy. Throughout history, economic growth has been driven by the development of new technologies. The industrial revolution in the new-developed world saw ground-breaking discoveries that led such countries to become economic powers.

**Table no. 1 – Argumentation Applied at Classification of Determinants of Economic Growth into Exogenous and Endogenous**

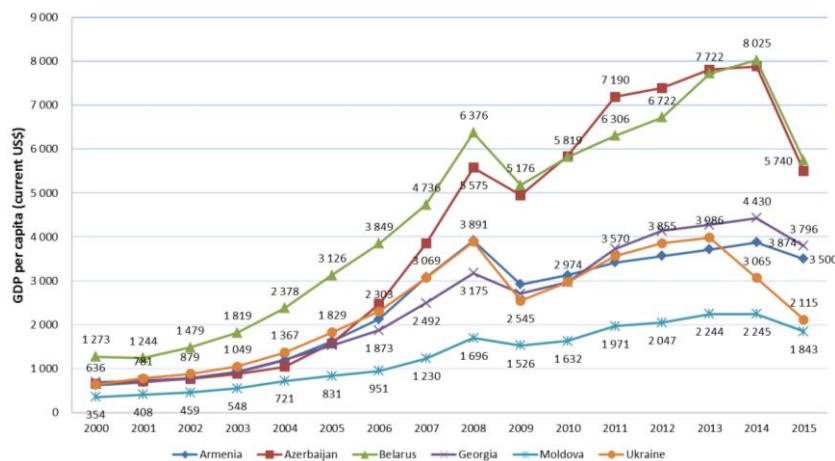
<b>Determinants of Economic growth</b>	<b>Argumentation</b>
<i>Exogenous determinants</i>	
<b>Geography</b>	Variables used as proxies for this determinant are natural resources, climate, topography, soil quality and disease ecology, distances from the equator, average temperatures and average rainfall, proportion of land within certain distance from the coast, natural resources, climate, and topography. All these variables are generally predetermined and cannot be manipulated (uncontrollable).
<b>Institutions</b>	Institutional factors include property rights, regulatory institutions, institutions for macroeconomic stabilization, institutions for social insurance and institutions of conflict management. For our research we have chosen 3 variables: Government effectiveness; Rule of Law; and Control of corruption. Well this factor can be as exogenous as endogenous, but in my opinion at least for short time periods in countries investigated these variables are not easily manipulated and in general uncontrollable, and distinguished by exogenous nature.
<b>Demographic Trends</b>	Variables like population growth, population density, migration and age distribution are usually used as proxies for Demographic trends. These variables are also generally predetermined and uncontrollable. As for population growth For example, in countries with a predominantly Muslim population traditionally have 2-3 children in the family, and in many countries with non-Muslim population though more advanced economies the figure is lower. It's more associated and predetermined with such a way of life and traditions, and generally uncontrollable which shows the exogenous nature of this factor.
<b>Social-Cultural Factors</b>	Social-cultural factors' variables like ethnic composition, diversity in language or in religion, beliefs, attitudes are also predetermined by history and population of countries investigated, and also cannot be manipulated, that's why we classified it as exogenous factor.
<b>Political Factors</b>	Proxies like political instability, political and civil freedom, democracy and political regimes are not easily manipulated and generally uncontrollable and depend on people coming to the power. Well this factor could be as exogenous as endogenous, but in my opinion at least for short time periods in countries investigated these variables predetermined by history, governance traditions and the way of life, and distinguished by exogenous nature.
<i>Endogenous factors</i>	
<b>Accumulation of Physical capital</b>	Savings and investments in capital are traditional variables used as proxies for Accumulation of physical capital determinant. Therefore, we have chosen Gross fixed capital formation (% of GDP) and FDI net inflows (% of GDP) as independent variables for our research. They can be manipulated and controlled in general and we can highlight its endogenous nature.
<b>Human Capital</b>	Human capital as well as R&D are the basis (cores) of Endogenous theory and the variables used as proxies naturally related to endogenous determinants of economic growth.
<b>R&amp;D</b>	
<b>Economic Policies and Macroeconomic Conditions</b>	Variables like inflation, budget deficits are used as proxies for Economic Policies and Macroeconomic Conditions and can be controlled and distinguished by endogenous nature.
<b>Openness to Trade</b>	Likewise, variables related to openness to trade (exports) can be easily controlled and manipulated and related to endogenous factors.

*Source: composed by author*

In the observed economic literature, the terms exogenous and endogenous are used mainly in relation to technological progress (or 'residual' in exogenous theory) i.e. knowledge, innovations, human capital, R&D. Determinants of economic growth usually classified as direct and indirect factors; economic and non-economic factors; intensive and extensive factors and etc. Nevertheless, we have expanded these terms applying on other determinants of growth. Thus, in Figure no. 1 we have classified the main determinants of economic growth by dividing them into exogenous and endogenous ones. Basically, many of these determinants here in some extent can belong to both groups of determinants. At division, we adhered to the principle that exogenous factors are generally predetermined, and while endogenous variables can be manipulated, exogenous ones are generally uncontrollable. Argumentation we applied to at division can be found in Table no. 1.

### 3. ECONOMIC GROWTH IN THE EU'S EAP AND CENTRAL ASIAN COUNTRIES

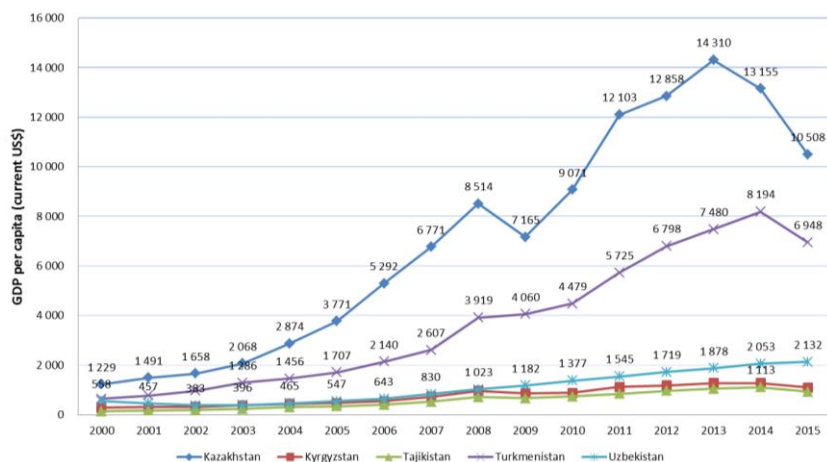
One of the main indicators of economic growth of the country is the nominal GDP and GDP per capita. When considering the GDP per capita dynamics (Figure no. 2) Azerbaijan and Belarus are better positioned, with a GDP per capita with about 5.7 thousand US\$. It's worth noting that in 2014 that indicator was much higher consisting 8 thousand US\$. This sharp decline associated with economic crisis in these countries, currency devaluations caused mainly by decline in oil (energy) prices in the world markets. Concerning the Belarus although it is not very dependent on oil prices but the overall crisis in Russia and Kazakhstan inevitably affected its economy too.



Source: World Bank database

Figure no. 2 – GDP Per Capita Dynamics in the EaP Countries in 2000-2015 (current US\$)

The second group of countries with a GDP per capita of 3.5 to 3.8 thousand US\$ includes Armenia and Georgia. Here too there has been some slowdown compared to the previous year. Ukraine, since 2013, consistently losing its position and GDP per capita sharply fell down to 2.1 thousand US\$ and got closer to the figure of Moldova which consisted 1.84 thousand US\$ as of January 1, 2016. In Ukraine this decline is associated with the mixture of factors from overall economic crisis, military conflict in the East, decline in oil (energy) prices and to the loss of economic ties with Russia.



Source: World Bank database

Figure no. 3 – GDP Per Capita Dynamics in the Central Asian Countries in 2000-2015 (current US\$)

Considering the GDP per capita dynamics in Central Asian countries (Figure no. 3), from the graph we can say that Kazakhstan and Turkmenistan are better positioned with more or less rapid growth and a GDP per capita 10.5 thousand US\$ and 7 thousand US\$ respectively. The growth in the rest of countries can be described as moderate or even slow. Moreover, since 2014 there is a slight decline in GDP per capita in all countries besides Uzbekistan (as of January 1, 2016 was of 2.1 thousand US\$. In Kyrgyzstan and Tajikistan this indicator consisted 1.1 and 0.9 thousand US\$ respectively.

In regards of determinants affecting economic growth, many of them are not backed up by precise definition and statistical data, and concepts like human capital, institutions, political factors, economic policies mentioned above are of amorphous nature and are not easily amenable to statistical handling. These are compound and complex variables and have to be approximated by proxies.

#### 4. RESEARCH METHODOLOGY AND DATA DESCRIPTION

In order to determine what are the factors of economic growth and what influence they have, we performed both a correlation and factor analysis of EU's EaP and Central Asian countries. For the Pearson Correlation, sets of data between 2000 and 2014 were analysed by using SPSS software. Furthermore, in order to describe variability among the observed correlated variables, we have separately conducted a factor analysis for EaP and Central Asian countries using the average data for the last 3 years of the research period (2012-2014), in order to control for the possible annual shocks. The results can be observed in Annex 1 and Annex 2 of the paper.

Table no. 2 displays the independent variables (sets of data) used during the 2000 - 2014 period (World Bank database).

Table no. 2 – Selected Independent Variables Related to Determinants of Economic Growth

Determinants of Economic growth	Indicators	Description and Representing Authors
<b>Accumulation of Physical Capital</b>	- FDI inflows; - GFCF;	- Foreign direct investment, net inflows (% of GDP); - Gross fixed capital formation (% of GDP); (Auerbach <i>et al.</i> , 1994; Azman-Saini <i>et al.</i> , 2010; Barro and Sala-i-Martin, 1995; Borensztein <i>et al.</i> , 1998; Hermes and Lensink, 2003; Kormendi and Meguire, 1985; Lensink and Morrissey, 2006; Levine and Renelt, 1992; Mankiw <i>et al.</i> , 1992; Podrecca and Carmeci, 2001; Sala-i-Martin, 1997)
<b>Human Capital</b>	- Tertiary education;  - Tertiary education total %;	- Enrolment in tertiary education per 100 thousand inhabitants; - Enrolment in tertiary education (% of total population of the 5-year age group following on from secondary school leaving); (Barro and Sala-i-Martin, 1995; Bassanini and Scarpetta, 2003; Benhabib and Spiegel, 1994; Hanushek and Kimko, 2000; Romer, 1990; Whalley and Zhao, 2013)
<b>R&amp;D</b>	- R&D expenditure; - High-tech exports;	- R&D expenditure (% of GDP); - High-technology exports (current US\$); (Aghion and Howitt, 1992; Cameron, 1998; Grossman and Helpman, 1991; Guloglu and Tekin, 2012; Nadiri, 1993; Romer, 1986, 1990, 1994)
<b>Economic Policies and Macroeconomic Conditions</b>	- Inflation;	- Inflation, GDP deflator (annual %); (Bassanini and Scarpetta, 2003; Bruno and Easterly, 1998; Checherita-Westphal and Rother, 2012; Edey, 1994; Fischer, 1993; Grier and Tullock, 1989)
<b>Openness to Trade</b>	- Exports;	- Exports (% of GDP); (Dollar, 1992; Petrakos and Arvanitidis, 2008; Rodriguez and Rodrik, 2000; Sachs <i>et al.</i> , 1995)
<b>Institutions</b>	- Govern. effectiveness; - Rule of law; - Control of corruption;	- Government effectiveness (estimate); - Rule of law (estimate); - Control of corruption (estimate); (Acemoglu <i>et al.</i> , 2002; de Vaal and Ebben, 2011; Easterly, 2001; Hall and Jones, 1999; Knack and Keefer, 1995; Mauro, 1995; Rodriguez and Rodrik, 2000; Rodrik <i>et al.</i> , 2004)
<b>Political Factors</b>	- Political stability and absence of violence/terrorism;	- Political stability and absence of violence/terrorism (estimate); (Alesina and Rodrik, 1994; Brunetti, 1997; Grier and Tullock, 1989; Jong-A-Pin, 2009; Kormendi and Meguire, 1985; Lensink <i>et al.</i> , 1999; Lipset, 1959)
<b>Geography</b>	- Natural resources rents;	- Total natural resources rents (% of GDP); (Bloom <i>et al.</i> , 1998; Henderson <i>et al.</i> , 2012; Masters and McMillan, 2001; Sachs and Warner, 1997)
<b>Demographic trends</b>	- Population growth; - Active population share;	- Population growth (%); - Population of age 15-64 (% of total) (Bloom and Finlay, 2009; Bloom and Williamson, 1998; Kelley and Schmidt, 1995)

Source: Selected by author from World Bank database

Savings and investment in capital plays a crucial role in accumulation of physical capital, therefore we have chosen Gross fixed capital formation (% of GDP) and FDI net inflows (% of GDP) as independent variables for our research.

In regards of Human capital, the majority of studies have measured the quality of human capital using proxies related to education. Given this, we have chosen two variables: Enrolment in tertiary education per 100 000 inhabitants and Enrolment in tertiary education (% of total population of the 5-year age group following on from secondary school leaving).

As we know, investment to R&D can be influenced by government intervention, both through direct provision and funding, and also through other indirect measures such as tax incentives and protection of intellectual property rights to encourage R&D (Cameron, 1998). Taking into account the studied countries we have chosen two variables representing R&D, in particular R&D expenditure (% of GDP) and High-technology exports (current US\$) as result of this activity.

In regards of Economic policies and macroeconomic conditions determinant, several macroeconomic factors with impact on growth have been identified in literature, but considerable attention has been placed on inflation, fiscal policy, monetary policy (budget deficits). Given that and availability of data we have chosen variable Inflation, GDP deflator (annual %).

Openness to trade. Taking into account that openness is usually measured by the ratio of exports to GDP, variable Exports (% of GDP) have been chosen for research.

In turn, Institutional factor is also considered as factor affecting economic growth. Rodrik (2000) highlighted five key institutions (property rights, regulatory institutions, institutions for macroeconomic stabilization, institutions for social insurance and institutions of conflict management), which not only exert direct influence on economic growth, but also affect other determinants. For our research, taking into account availability of data we have chosen 3 variables: Government effectiveness (estimate); Rule of Law (estimate); and Control of corruption (estimate).

As we mentioned above, many scientific works are devoted to the study of effects of political factors on economic growth. Brunetti (1997) distinguished five categories of relevant political variables: democracy, government stability, political violence, political volatility and subjective perception of politics. In turn, for our research we have chosen variable Political stability and absence of violence/terrorism (estimate) as most appropriate.

Researchers have used different variables as proxies for determinant Geography, like soil quality and disease ecology, distances from the equator, average temperatures and average rainfall and etc. Among other variables used are natural resources, climate, topography and 'landlockedness' have a direct impact on economic growth. Given the availability of data and possibility of applying in our research we have chosen Total natural resources rents (% of GDP) as most suitable.

As for Demographic trends, variables like population growth, population density, migration and age distribution, are believed to play the major role in economic growth. Thus, variables Population growth (%) and Population of age 15-64 (% of total) have been chosen for our research.

## 5. ANALYSIS OF RESULTS

### EU's EaP countries

According to the results obtained (Annex 1) we found significant and strong correlation of almost all variables except variables related to Economic policies and macroeconomic



conditions (Inflation), except Moldova which showed strong negative correlation. Openness to trade (Exports) showed strong positive correlation for Georgia and strong negative correlation for Moldova and Ukraine. Unexpectedly variables related to Accumulation of physical capital (FDI inflows; GFCF) showed moderate negative correlation for Azerbaijan, strong positive correlation for Belarus and no correlation for the rest countries.

However, some of the variables related to Human capital (Tertiary education total %) showed both strong positive correlation for Armenia, Azerbaijan, Belarus, Moldova and Ukraine, and negative for Georgia, which partially can be explained by small number of observations. Strong positive correlation can be observed with variables related to Demographic trends (Population growth; Active population share). Also, strong positive correlation of economic growth can be observed with variables related to Political Factors (Political stability and absence of violence/terrorism) and variables related to Institutions (Rule of law; Government effectiveness) which is in line with initial hypothesis and empirical results obtained in other studies. Variable "Control of corruption" showed strong positive correlation for Georgia and moderate correlation for Belarus.

Determinants related to Geography (Natural resources rents) have positive correlation for Armenia, Georgia and Ukraine and negative correlation for Belarus. Unexpectedly for Azerbaijan this variable does not correlate with economic growth which is strange taking into account that country is a relatively resource-based economy. Variables related to R&D (Hightech exports) showed strong positive correlation with economic growth. However, another variable (R&D expenditure) didn't show or even showed negative correlation with economic growth, which somehow contradicts with our hypothesis and theories. However, taking into account the insignificant amount of R&D expenditure in these countries that was predictable.

#### **Central Asian countries**

According to the results obtained ([Annex 2](#)) we found significant and mainly strong correlation with economic growth of many variables with exceptions for some countries. Variables related to Accumulation of physical capital (FDI inflows) showed strong positive correlation with economic growth only for Kyrgyzstan and moderate and variable "GFCF" showed strong correlation for all countries studied except Kazakhstan. However, all variables related to Human capital (Tertiary education; Tertiary education total %) showed strong positive correlation for all countries except Uzbekistan which surprisingly showed strong negative correlation on variable "Tertiary education; Tertiary education total %" and no correlation for Kazakhstan. Strong positive correlation can be observed with variables related to Demographic trends (Population growth; Active population share) in all Central Asian countries which is in line with initial hypothesis and empirical results obtained in other studies. Also, strong positive correlation of economic growth can be observed with variables related to Political Factors (Political stability and absence of violence/terrorism) for Tajikistan and Uzbekistan. Variable "Government effectiveness" related to Institutions also showed strong positive correlation for all Central Asian countries except Kyrgyzstan. Variables "Control of Corruption" and "Rule of law" showed strong positive correlation only for Kazakhstan and vice versa strong negative correlation for Uzbekistan on variable "Control of corruption".

Determinants related to Geography (Natural resources rents) have positive correlation with economic growth for Kyrgyzstan and Tajikistan, and negative correlation for

Turkmenistan and Uzbekistan and does not correlate for Kazakhstan which is strange taking into account that Kazakhstan and Turkmenistan are relatively resource-based economies.

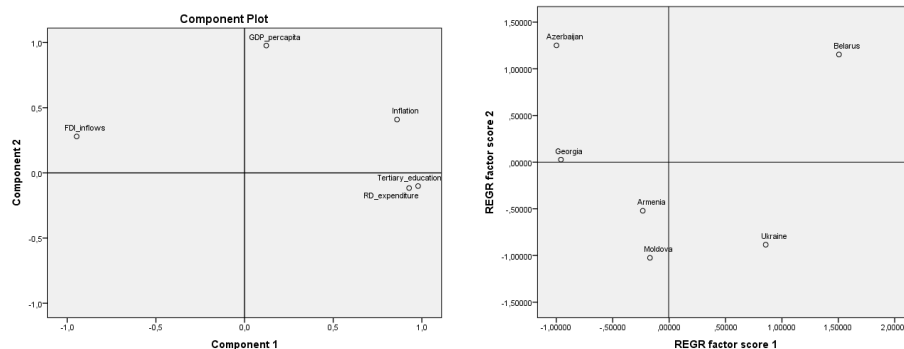
Variables related to R&D (High-tech exports) showed strong positive correlation with economic growth only for Kazakhstan.

However variable (R&D expenditure) didn't show a single direction or even didn't show any correlation with economic growth, which somehow contradicts with our hypothesis and theories. Thus, this variable showed strong negative correlation for Kazakhstan and strong positive for Tajikistan. However, taking into account the insignificant amount of R&D expenditure in these countries that was predictable.

“Inflation” related to Economic policies and macroeconomic conditions showed strong negative correlation for Tajikistan and Uzbekistan. Variable “Exports” related to Openness to trade also showed negative correlation for Kazakhstan and Tajikistan.

### Factor Analysis

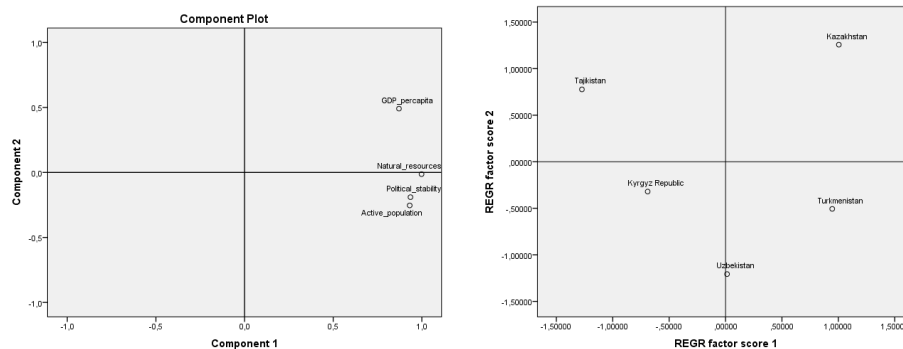
Applying the factor analysis to the Eastern partnership sample shows the following specification tests results proving the reliability of the analysis (Figure no. 4): Kaiser-Meyer-Olkin measure of sampling adequacy constituted 0.650 with significance of 0.068. The first two 2 components axis explain 93.874% of variance, confirming the importance of factors we have chosen. Thus, Georgia and Azerbaijan show higher FDI inflows as compared with Belarus and Ukraine. Also, Belarus faces the highest inflation, but benefits from the highest human capital and R&D. On the second axis, Belarus and Azerbaijan displays the highest values in term of GDP per capita, unlike Armenia, Moldova and Ukraine. At the same time according to the graphs GDP per capita growth in Azerbaijan was affected by FDI inflows and by Human capital and R&D variables in Belarus.



Source: author's representation

Figure no. 4 – Results of factor analysis (EaP countries)

In case of Central Asian countries, the following specification tests results prove the reliability of the analysis (Figure no. 5): Kaiser-Meyer-Olkin measure of sampling adequacy constituted 0.481 with significance of 0.044. In turn, percent of cumulative variance explained by first 2 components accounted to 95.983% confirming the importance of factors we have chosen. First component explains 87.4 % of variance with variables like Active population share, Political stability and Natural resources rents.



Source: author's calculations

**Figure no. 5 – Results of factor analysis (Central Asian countries)**

Thus, in terms of GDP per capita, Kazakhstan and Turkmenistan are better positioned than Uzbekistan, Kyrgyzstan and Tajikistan. In Kazakhstan and Turkmenistan GDP per capita is mainly related to higher Natural resources rents, Political stability and Active population share as compared to the other Central Asian countries.

## 6. CONCLUSIONS

Literature on economic growth showed that there are many factors affecting economic growth and having reviewed it we have determined the most important determinants affecting economic growth and have classified them by dividing into exogenous and endogenous ones. Thus, as exogenous ones we have chosen Geography, Institutions, Demographic trends, Social-cultural factors and Political factors. And as endogenous: Accumulation of physical capital, Human capital, Research and development, Economic policies and macroeconomic conditions, and Openness to trade. Basically, many of these determinants here in some extent can belong to both groups of determinants. As was mentioned before, at division, we adhered to the principle that exogenous factors are generally predetermined, and while endogenous variables can be manipulated, exogenous ones are generally uncontrollable. This classification in certain extent contributes to determination of internal and external economic growth reserves (factors) of country. At the same time, according to the author, economic growth based on endogenous factors is more sustainable and long-term.

Having selected independent variables (proxies) related to determinants of economic growth we checked them on correlation with economic growth (GDP per capita) and have come to the following results ([Annex 1](#) and [Annex 2](#)) and conclusions.

Regarding EU's EaP countries we found significant and strong correlation of almost all variables except endogenous variables related to Economic policies and macroeconomic conditions (except Moldova). Another endogenous variable Openness to trade (Exports) showed strong positive correlation for Georgia and strong negative correlation for Moldova and Ukraine. Unexpected insignificant correlations of endogenous Accumulation of physical capital determinants in most EU's EaP countries as well as other determinants deserve further research.

Strong positive correlation can be observed with exogenous variables related to Demographic trends. Also, strong positive correlation of economic growth can be observed with exogenous variables related to Political Factors and variables related to Institutions

which is in line with initial hypothesis and empirical results obtained in other studies. Exogenous variable “Control of corruption” showed strong positive correlation for Georgia and moderate correlation for Belarus.

Concerning the Central Asian countries, in general we found significant and strong correlation of many endogenous variables related to Human capital, Accumulation of physical capital (GFCF) and exogenous Demographic trends, Geography, Institutions (Government effectiveness), which is in line with initial hypothesis and empirical results obtained in other studies. Endogenous variable “FDI inflows” related to Accumulation of physical capital and exogenous variables “Rule of law” and “Control of corruption” related to Institutions in general didn’t show strong correlation which deserves further research.

Factor analysis results confirmed the importance of factors we have chosen which influenced the economic growth in EaP and Central Asian countries. Thus, in EaP countries the Physical capital, Human capital and R&D factors have supported GDP per capita growth, while in Central Asian countries natural resources, political stability and active population share contributed to GDP per capita growth.

Concluding the results obtained and taking into account the experience of developed countries and resource-based orientation of economies of many Post-Soviet countries, including some Central Asian countries, it is necessary to move from a resource-based economy to knowledge based economy with the strengthening of the role of endogenous determinants of economic growth like Human capital, R&D as well as others.

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## ANNEX 1

**Results of Analysis of Sets of Data (independent variables) Related to Endogenous and Exogenous Determinants of Economic Growth in EU's EaP Countries**

		Correlations						
			Armenia	Azerbaijan	Belarus	Georgia	Moldova	Ukraine
Determinants of growth	Variables / Indicators	Coefficients	GDP_per capita _currentUS\$	GDP_per capita _currentUS\$	GDP_per capita _currentUS\$	GDP_per capita _currentUS\$	GDP_per capita _currentUS\$	GDP_per capita _currentUS\$
Accumulation of Physical Capital	FDI inflows	Pearson Corr	,184	-,582	,640	,030	-,133	,319
		Sig. (2-tailed)	,513	,023	,010	,917	,636	,246
	N	15	15	15	15	15	15	
	GFCF	Pearson Corr	,439	-,580	,873	-,433	,497	-,023
Sig. (2-tailed)		,102	,023	,000	,107	,059	,936	
N	15	15	15	15	15	15		
Human Capital	Tertiary education	Pearson Corr	,748	-,911	,815	-,550	,577	,622
		Sig. (2-tailed)	,001	,001	,000	,034	,031	,013
	N	15	9	15	15	14	15	
	Tertiary education total %	Pearson Corr	,861	,606	,949	-,590	,873	,915
Sig. (2-tailed)		,000	,083	,000	,021	,000	,000	
N	15	9	15	15	14	15		
R&D	R&D expenditure	Pearson Corr	,135	-,670	,192	-,799	,253	-,819
		Sig. (2-tailed)	,646	,009	,510	,017	,453	,000
	N	14	14	14	8	11	14	
	Hightech exports	Pearson Corr	,580	,594	,920	-,490	,852	,857
Sig. (2-tailed)		,023	,020	,000	,064	,000	,000	
N	15	15	15	15	15	15		
Economic Policies and Macroeconomic Conditions	Inflation	Pearson Corr	,348	-,040	-,386	-,236	-,614	,063
		Sig. (2-tailed)	,203	,889	,155	,397	,015	,824
N	15	15	15	15	15	15		
Openness to Trade	Exports	Pearson Corr	-,423	,246	-,083	,802	-,777	-,835
		Sig. (2-tailed)	,116	,376	,769	,000	,001	,000
N	15	15	15	15	15	15		
Demographic trends	Population growth	Pearson Corr	,688	,620	,855	-,612	,869	,920
		Sig. (2-tailed)	,005	,014	,000	,015	,000	,000
	N	15	15	15	15	15	15	
	Active population share	Pearson Corr	,942	,955	,868	,941	,931	,905
Sig. (2-tailed)		,000	,000	,000	,000	,000	,000	
N	15	15	15	15	15	15		
Geography	Natural resources rents	Pearson Corr	,810	-,351	-,798	,715	-,215	,524
		Sig. (2-tailed)	,000	,200	,000	,003	,442	,045
N	15	15	15	15	15	15		
Institutions	Government effectiveness	Pearson Corr	,529	,618	,086	,966	,580	-,087
		Sig. (2-tailed)	,052	,018	,771	,000	,030	,766
	N	14	14	14	14	14	14	
	Rule of law	Pearson Corr	,262	,533	,774	,959	,742	,551
		Sig. (2-tailed)	,365	,050	,001	,000	,002	,041
	N	14	14	14	14	14	14	
Control of corruption	Pearson Corr	,447	,076	-,547	,913	,197	-,076	
	Sig. (2-tailed)	,109	,797	,043	,000	,500	,796	
N	14	14	14	14	14	14		
Political Factors	Political Stability and absence of violence/terrorism	Pearson Corr	,486	,815	-,365	,791	,538	,063
		Sig. (2-tailed)	,078	,000	,199	,001	,047	,831
N	14	14	14	14	14	14		

Notes:

	Strong correlation (r= 0,6-1)
	Moderate correlation (r= 0,4-0,6)
	Weak, no correlation and/or insignificant (r= 0-0,4)

## ANNEX 2

**Results of Analysis of Sets of Data (independent variables) Related to Endogenous and Exogenous Determinants of Economic Growth in Central Asian Countries**

Correlations							
			Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Determinants of growth	Variables / Indicators	Coefficients	GDP_per capita_c urrentUS\$	GDP_per capita_c urrentUS\$	GDP_per capita_c urrentUS\$	GDP_per capita_c urrentUS\$	GDP_per capita_c urrentUS\$
Accumulation of Physical Capital	FDI inflows	Pearson Corr Sig. (2-tailed) N	-.418 .121 15	.615 .015 15	-.270 .331 15	.320 .245 15	.344 .209 15
	GFCF	Pearson Corr Sig. (2-tailed) N	-.178 .526 15	.903 .000 15	.541 .046 14	.732 .004 13	.504 .055 15
Human Capital	Tertiary education	Pearson Corr Sig. (2-tailed) N	.429 .337 7	.796 .001 14	.804 .000 15	n/a	-.734 .007 12
	Tertiary education total %	Pearson Corr Sig. (2-tailed) N	.518 .234 7	.703 .005 14	.860 .000 15	n/a	-.824 .001 12
R&D	R&D expenditure	Pearson Corr Sig. (2-tailed) N	-.675 .008 14	-.299 .346 12	.620 .024 13	n/a	n/a
	Hightech exports	Pearson Corr Sig. (2-tailed) N	.984 .000 15	.215 .460 14	n/a	n/a	n/a
Economic Policies and Macroeconomic Conditions	Inflation	Pearson Corr Sig. (2-tailed) N	-.178 .527 15	.061 .830 15	-.669 .006 15	-.385 .156 15	-.667 .007 15
Openness to Trade	Exports	Pearson Corr Sig. (2-tailed) N	-.568 .027 15	.408 .131 15	-.797 .001 14	-.059 .849 13	-.446 .096 15
Demographic trends	Population growth	Pearson Corr Sig. (2-tailed) N	.736 .002 15	.731 .002 15	.835 .000 15	.860 .000 15	.573 .026 15
	Active population share	Pearson Corr Sig. (2-tailed) N	.627 .012 15	.859 .000 15	.942 .000 15	.916 .000 15	.874 .000 15
Geography	Natural resources rents	Pearson Corr Sig. (2-tailed) N	-.444 .098 15	.830 .000 15	.886 .000 15	-.851 .032 6	-.799 .001 14
Institutions	Government effectiveness	Pearson Corr Sig. (2-tailed) N	.719 .004 14	-.215 .460 14	.720 .004 14	.678 .008 14	.729 .003 14
	Rule of law	Pearson Corr Sig. (2-tailed) N	.899 .000 14	-.508 .064 14	.135 .646 14	.228 .432 14	.281 .330 14
	Control of corruption	Pearson Corr Sig. (2-tailed) N	.733 .003 14	-.518 .058 14	-.320 .264 14	-.223 .443 14	-.644 .013 14
Political Factors	Political Stability and absence of violence/terrorism	Pearson Corr Sig. (2-tailed) N	-.405 .151 14	.081 .783 14	.612 .020 14	.444 .112 14	.882 .000 14

Notes:

	Strong correlation (r= 0,6-1)
	Moderate correlation (r= 0,4-0,6)
	Weak, no correlation and/or insignificant (r= 0-0,4)