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The impact of monetary and non-monetary factors on GDP dynamics of the Visegrád Group countries

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ABSTRACT

The aim of the article is to identify the factors affecting economic growth of the Visegroup countries. Linear regression have been exploited to analyze the impact of both monetary and non-monetary factors on gross domestic product dynamics of Poland, Check Republic, Slovakia and Hungary. The study have revealed that both monetary and non-monetary factors have impact on GDP dynamics of the Visegrad Group countries, but household final consumption, exports of goods and services, inflation, high-technology exports and broad money growth show the highest correlation with GDP of the countries. All regression models consider GDP dynamics as dependent variable. Collinearity of certain predictor variables have not allowed using the most significant factors to develop linear regression models. As a result, independent variables sets are not those of the highest statistical significance. Therefore, regression model of Poland includes inflation, high-technology exports and real interest rate as predictor variables. Regression model of Check Republic shows the correlation between GDP dynamics as dependent variable and high technology exports, domestic credit provided by financial sector and broad money growth as independent ones. The following independent variables are used to develop the regression line of Slovakia: domestic credit provided by financial sector and broad money growth. Linear regression model of Hungary includes inflation and foreign direct investment as predictors. The study have confirmed the strong positive effect making by foreign direct investment on economic growth of the post-communist countries. The research results also contribute to the thesis about low inflation as one of the key factors of economic growth in the Central European countries. The study also have proved the significant effect on economic growth made by domestic credit provided by financial sector and significant correlation between GDP dynamics and export of goods and services.

Keywords: linear regression; correlation; variable; gross domestic product; inflation; broad money

1. INTRODUCTION

Economists have used both theory and empirical research to explain the cause of economic growth and develop effective economic policy. There has been a lot of discussion between proponents and opponents of dominant role of monetary policy in promoting economic growth. Economic growth can be defined as the increase in the Gross Domestic Product (GDP) of the country. That is why determinant factors of GDP dynamics should be analyzed to develop effective economic policy and promote economic growth in these countries. Successful transition experience of the Visegrad Group countries could be useful for other post-socialist countries. Especially it concerns some post-soviet economies, which have not overcome their post-transition difficulties yet.

Factors of economic growth have been being researched by many European and non-European scientists for years. One of the most cited research papers in this field was performed by Robert Barro (1996). Cross-country research performed by Barro was based on the data of around 100 countries from 1960 to 1990. The findings indicated that the growth rate is enhanced by higher initial schooling and life expectancy, lower fertility, lower government consumption, better maintenance of the rule of law, lower inflation, and improvements in the terms of trade. According to the research results, growth was negatively related to the initial level of real per capita GDP. The findings indicated that political freedom has only a weak effect on growth but there was some indication of a nonlinear relation. R. Barro found that at low levels of political rights, an expansion of these rights stimulates economic growth. However, according to the study results once a moderate amount of democracy had been attained, a further expansion reduced growth. Findings indicated that in contrast to the small effect of democracy on growth, there was a strong positive influence of the standard of living on a country's propensity to experience democracy.

Following Barro's study Jan Fidrmuc (2003) used regression analysis to study the effect of democracy on economic growth in post-socialists European countries. The results of his study showed that the introduction of relatively wide-ranging democracy did not adversely affect the transition countries' growth performance. Nevertheless, according to the research results, democracy reinforces economic liberalization, which in turn leads to better growth performance. J.Fidmurc stated that the experience of the post-communist transition countries was illustrating democracy results in policies and institutions that facilitate economic reforms and create an environment that is favorable to growth.

Parash Upreti (2015) analyzed variety of factors supposed to affect economic growth. The scientist used Ordinary Least Squares regressions for the years 2010, 2005, 2000, and 1995 to investigate the factors that contribute to economic growth in developing countries. The research results indicated that a high volume of exports, plentiful natural resources, longer life expectancy, and higher investment rates have positive impacts on the growth of per capita gross domestic product in developing countries.

When studying determinants affecting economic growth in post-communist countries many researchers considered monetary factors as the most important ones. Thus, Ali M. Kutan and Josef C. Brada (2000) investigating the impact of monetary policy on economic growth of Poland, Hungary and Check Republic made a statement that one of the key factor promoting economic growth in these countries is successful maintenance of inflation. They made the conclusion that monetary policy made a significant contribution to stabilization and, therefore, to the remarkable development in these countries' financial institutions and

markets. Ali M. Kutan and Josef C. Brada insisted that it would be important to continue to strengthen the capital market in these countries and to provide more active fiscal policy support for monetary policy.

Mariush Próchhiak (2011) on the basis of correlation and regression analysis of Central and Eastern European economies made the conclusion that the most important economic growth determinants in these countries were the following: investment rate (including FDI), human capital measured by the education level of the labor force, financial sector development, good fiscal stance (low budget deficit and low public debt), economic structure (high services share in GDP), low interest rates and low inflation, population structure (high share of working-age population), development of information technology and communications, high private sector share in GDP and favorable institutional environment (economic freedom, progress in market and structural reforms).

The study of Bogdan Florin Filip (2015) studying the magnitude and the direction of determination of economic growth in Central and Eastern Europe found significantly positive correlations of the economic growth with exports, imports, foreign direct investments and the domestic credit provided by financial sector. The study results indicated significant negative correlations of GDP growth rate with unemployment, the NPL rate and the manifestation of the financial and economic crisis.

The paper of Petr Hlavacek and Beata Bal-Domanska (2016) was focused on analysis of foreign direct investment and its impact on economic growth in the Central and Eastern European countries between 2000 and 2012, with an emphasis on the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. The growth model revealed that statistically significant relations existed between economic growth, FDI and investment growth. Ramona Jimborean and Anna Kelber (2014) also observed the impact of FDI on economic growth of the Central and Eastern European countries. The findings added to the scope of studies pointing out a positive effect of FDI inflows on growth. The role of the banking reforms among the other factors studied was observed by Alexander Chubrik (2004), basing on the estimations of panel data for 25 transition economies for 1989-2003. According to the results of his study, the main contributors to economic growth turned out to be the governance and enterprise restructuring, banking sector reform, trade and foreign exchange liberalization.

2. MATERIALS AND METHODS

This study have examined the effect of different monetary and non-monetary factors on GDP dynamics of the Visegrad Group countries. Study is concerned:

✓ to analyze the correlation between GDP dynamics and high-technology exports, GDP and domestic credit provided by financial sector, GDP and inflation, GDP and official exchange rate, GDP and broad money growth, GDP and foreign direct investment, GDP and real interest rate;
✓ to determine the factors affecting GDP dynamics more than other variables;
✓ to develop regression models for each country.

The focus of the research is the relationship between economic growth and monetary and non-monetary factors. As the analyzed factors (independent variables) are highly correlated, simple regressions have been estimated basing on the following approach. First, pairwise correlations of the independent and dependent variables (growth vs. factor of growth) were estimated. Second, Person's coefficient was calculated for each pair of predictors. Third, a choice of the model was made basing on the Farrar–Glauber test. Forth, the selected model was tested for the statistical significance (basing on Fisher test and significance test), and the final model was chosen.

Data was collected from Knoema, World data atlas. Because of some data missing time periods did not match and the following periods were analyzed:

- ✓ 1992 – 2006 for Poland;
- ✓ 1994 – 2014 for Check Republic;
- ✓ 1994 – 2005 for Slovakia;
- ✓ 1992 – 2014 for Hungary.

3. RESULTS AND DISCUSSIONS

In the study the multiple linear regression have been used to find relationship between economic growth and other variables both monetary and non-monetary. This study is focused on estimation of the linear relationship of the variables, and weak association between variables does not mean the absence of non-linear relationship.

The correlation coefficient (a value between -1 and +1) tells the researcher how strongly two variables are related to each other. High value (either positive or negative) of the coefficient indicates the strong association between two variables. As it shown in the Table 1, the strongest association is observed between GDP and inflation, GDP and broad money growth, GDP and high technology exports. GPD and high technology exports variables are positively associated. Causal relationship between GDP and high technology export needs additional tests.

Estimating GDP and broad money growth association of the countries one can observe, that economic growth of Check Republic is associated with broad money growth much less than the correspondent association of the other three countries. This fact let us to assume, that economic growth of Check Republic is much less monetary based than GDP dynamics of other Visegrad countries. At the same time, the findings indicated that GDP of Check Republic was associated with high-technology export much more than the economic growth of the other countries.

Research results show that domestic credit makes the most significant positive effect on GDP dynamics of Poland. In Check Republic it is weak and positive. Weak negative association between GDP and domestic credit in Slovakia and Hungary show that this relationship needs more tests.

The research results indicate strong positive relationship between GDP dynamics and export of goods and services of each of the Visegrad group countries. Causal relationship between these variables needs additional tests. That is why export of goods and services have not been used as predictor to develop regression models.

The correlation analysis shows a strong negative association between GDP and inflation in each country. The research results proved the well-known fact that high inflation does not promote economic growth.

Research results show that official exchange rate makes the most significant effect on GDP dynamics in Poland. Whilst the sigh of correlation coefficient of GDP and exchange rate is positive in Poland, Slovakia and Hungary, the association of GDP and exchange rate is negative in Check Republic. However, the causal relationship between GDP and exchange rate needs additional tests.

Association between GDP and broad money growth is negative. Although correlation analysis do not answer the question concerning causal relationship, we can assume that inflation and broad money growth affect GDP dynamics and not vice-versa. Thus, we can assume that in some periods monetization speed was too high and did not promote economic growth, but slowed it down.

GDP dynamics and foreign direct investments have positive association. The strongest it is in Poland, the weakest – in Check Republic. Real interest rate does not make significant effect on GDP dynamics in all four countries, but is significant enough to be used in regression model of economic growth of Poland.

The research results indicate strong positive relationship between GDP dynamics and household final consumption expenditure in all countries. Causal relationship between these variables needs additional tests. That is why household final consumption expenditure have not been used as predictor to develop regression models.

The correlation analysis of GDP per capita and unemployment variables brings contradictory results. The sign of correlation coefficient is supposed to be negative, because decreased unemployment is supposed to contribute economic GDP growth. Nevertheless, in three of four economies studied correlation is positive. The relationship between these variables needs additional tests.

Table 1. The correlation coefficient between GDP per capita (constant 2010 US$) and other factors for the Visegrad Group countries.

The variable	The correlation coefficient between GDP per capita (constant 2010 US$) and other factors			
	Poland	Czech Republic	Slovakia	Hungary
High-technology exports (% of manufactured exports)	0.615516	0.896832	0.715255	0.637987
Domestic credit provided by financial sector (% of GDP)	0.687869	0.231756	-0.44412	-0.19731
Exports of goods and services (constant 2010 US$) per capita	0.987317	0.972933	0.945392	0.952537
Inflation, GDP deflator (annual %)	-0.92077	-0.75911	-0.6904	-0.92545
Official exchange rate (LCU per US$, period average)	0.728661	-0.82981	0.128251	0.484802
Broad money growth (annual %)	-0.84656	-0.18421	-0.77981	-0.73059

Foreign direct investment, net inflows (% of GDP)	0.738379	-0.17528	0.569745	0.258259
Real interest rate (%)	-0.17302	0.269322	-0.23264	-0.1015
Household final consumption expenditure per capita (constant 2010 US$)	0.996937	0.988168	0.993381	0.956847
Unemployment, total (% of total labor force) (national estimate)	0.530864	0.187285	0.593576	-0.21835

The study have used correlation matrices to select predictor variables for the models. In the Tables 2-5 correlations coefficients between the possible pairs of variables are shown. High correlation level between two predictors of the regression model leads to multicollinearity of the model. To prevent the multicollinearity phenomena in the model a set of non-correlated predictors should be selected. In the Tables 2-5 the following predictors were used: unemployment (UN), high-technology exports (HTE), domestic credit provided by financial sector (DC), exports of goods and services (EGS), inflation, GDP deflator (DEF), official exchange rate (OER), broad money growth (BMG), foreign direct investment (FDI), real interest rate (RIR), household final consumption expenditure (HFCE). The most intensive color states for the highest correlation level. White color of a cell means no correlation between variables.

Table 2 presents the correlation matrix of predictor variables for the regression model of economic growth of Poland. As it is shown on the Table 2, the highest level of correlation have been indicated between the following pairs of variables: household final consumption expenditure and export of goods and services, household final consumption expenditure and inflation, broad money growth and inflation, official exchange rate and inflation, official exchange rate and broad money growth, household final consumption expenditure and broad money growth. To prevent multicollinearity some variables haven't been included to the regression model. Had excluded EGS and HFCE form the model as their causal relationship needed additional tests, inflation was chosen to be the main predictor of the model, because of the highest value of the correlation coefficient between DEF and GPD growth. Unemployment haven't been used in the model because of the contradictory analysis results of the association between UN and GDP growth. The strong association between DEF and OER, DEF and BMG, DEF and FDI have caused the elimination of OER, BMG and FDI from the model. There is rather low correlation between DC and DEF. But low t-stat. value of DC variable (as is stated below) have helped to make the final decision about the exclusion of the DC variable from the model of economic growth of Poland.

Table 2. The correlation matrix of predictor variables for the regression model of Poland.

	UN	HTE	DC	EGS	DEF	OER	BMG	FDI	RIR	HFCE
UN	1.00									
HTE	0.37	1.00								

DC	0.61	0.60	1.00						
EGS	0.54	0.68	0.73	1.00					
DEF	-0.48	-0.41	-0.56	-0.86	1.00				
OER	0.45	0.12	0.30	0.63	-0.89	1.00			
BMG	-0.69	-0.26	-0.57	-0.79	0.91	-0.88	1.00		
FDI	0.05	0.44	0.32	0.70	-0.65	0.57	-0.55	1.00	
RIR	-0.15	-0.18	-0.11	-0.26	-0.13	0.32	-0.03	-0.13	1.00
HFCE	0.57	0.59	0.70	0.98	-0.94	0.76	-0.88	0.71	-0.14	1.00

In case of Check Republic multicollinearity also haven't allow using the most significant factors (except the most significant one) to develop linear regression models. Table 3 presents the correlation matrix of predictor variables for the regression model of Check Republic. As it is shown on the table 3, the highest level of correlation have been indicated between the following pairs of variables: household final consumption expenditure and export of goods and services, household final consumption expenditure and high-technology exports, export of goods and services and high-technology exports, inflation and high-technology exports, official exchange rate and export of goods and services, inflation and household final consumption expenditure.

EGS and HFCE have been excluded from the model as their causal relationship with GDP needs additional tests. To prevent multicollinearity some variables haven't been included in the regression model. To begin with, rather strong association between HTE and DEF (-0.84) and between HTE and OER (-0.66) haven't allow to use in the model these two predictors. As a result, high-technology exports variable was chosen to be the main predictor of the model, because of the highest value of the correlation coefficient between HTE and GPD growth.

Table 3. The correlation matrix of predictor variables for the regression model of Check Republic.

	UN	HTE	DC	EGS	DEF	OER	BMG	FDI	RIR	HFCE
UN	1.00									
HTE	0.41	1.00								
DC	-0.55	0.03	1.00							
EGS	0.18	0.87	0.38	1.00						

DEF	-0.67	-0.84	0.19	-0.71	1.00				
OER	0.24	-0.66	-0.54	-0.82	0.41	1.00			
BMG	-0.32	-0.49	0.07	-0.18	0.32	0.01	1.00		
FDI	0.55	-0.03	-0.62	-0.20	-0.23	0.53	-0.17	1.00	
RIR	0.44	0.36	-0.12	0.22	-0.69	-0.11	-0.26	0.22	1.00
HFCE	0.29	0.94	0.15	0.95	-0.81	-0.78	-0.29	-0.13	0.31	1.00

Table 4 shows the correlation coefficients between the variables that are supposed to be used as predictors in the model of economic growth of Slovakia. Thus, the highest level of correlation have been indicated between the following pairs of variables: household final consumption expenditure and export of goods and services, export of goods and services and high-technology exports, household final consumption expenditure and broad money growth.

EGS and HFCE have the strongest association with GPD growth, but, as it was stated above, their causal relationship needs additional tests, and they have not been included to the model. As a result, BMG became the main predictor of the model. The next strongest association was observed between GDP growth and HTE that became the next predictor of the model. Rather high correlation between BMG and DEF haven't allow to include DEF in the model. There is also high correlation level between FDI and OER. Comparing the value of the correlation coefficient of GDP and OER (0.128251) to the correspondent value of GDP and FDI (0.569745) one should exclude OER from the model. Choosing between RIR and DC their correlation to GDP growth should be estimated. DC has stronger association with GDP (-0.44412) comparing to RIR (-0.23264).

Despite of rather high correlation level between UN and GPG growth (0.593576) unemployment haven't been used in the model because of the contradictory results of the correlation analysis.

Table 4. The correlation matrix of predictor variables for the regression model of Slovakia.

	UN	HTE	DC	EGS	DEF	OER	BMG	FDI	RIR	HFCE
UN	1.00									
HTE	0.27	1.00								
DC	-0.31	-0.35	1.00							
EGS	0.56	0.83	-0.61	1.00						
DEF	-0.11	-0.31	0.02	-0.52	1.00					
OER	0.70	-0.27	0.35	-0.06	-0.08	1.00				
BMG	-0.27	-0.48	0.05	-0.63	0.76	-0.11	1.00			

FDI	0.76	0.23	-0.27	0.53	-0.31	0.52	-0.49	1.00	
RIR	-0.52	-0.31	0.68	-0.47	-0.32	0.03	-0.20	-0.38	1.00
HFCE	0.65	0.66	-0.40	0.91	-0.70	0.23	-0.79	0.62	-0.21	1.00

Table 5 shows correlation between the variables, supposed to be the predictors in the model of economic growth of Hungary. The strongest association have been indicated between the following pairs of variables: inflation and household final consumption expenditure, inflation and export of goods and services, domestic credit and official exchange rate, household final consumption expenditure and export of goods and services.

EGS and HFCE have not been included to the model, as their causal relationship with GDP growth needs additional tests. Among all possible predictors, inflation has the next strongest association to GDP growth. That is why GDP deflator is the main input variable in the model. High correlation values have been observed between DEF and HTE, DEF and BMG, DEF and OER that have caused elimination of HTE, BMG and OER from the model.

Table 5. The correlation matrix of predictor variables for the regression model of Hungary.

	UN	HTE	DC	EGS	DEF	OER	BMG	FDI	RIR	HFCE
UN	1.00									
HTE	-0.63	1.00								
DC	0.78	-0.62	1.00							
EGS	0.01	0.47	-0.07	1.00						
DEF	0.31	-0.77	0.36	-0.86	1.00					
OER	-0.61	0.77	-0.86	0.42	-0.64	1.00				
BMG	-0.03	-0.49	0.21	-0.77	0.73	-0.52	1.00			
FDI	-0.28	0.12	0.08	0.18	-0.07	-0.09	-0.01	1.00		
RIR	0.28	-0.12	0.44	-0.12	0.02	-0.47	0.24	-0.13	1.00	
HFCE	-0.31	0.67	-0.15	0.84	-0.90	0.40	-0.64	0.31	-0.02	1.00

The regression models for each of the Visegrad countries are presented in the Table 6. All regression lines developed consider GDP dynamics as dependent variable. Multicollinearity haven't allow using all the most significant factors to develop all linear regression models. High level of correlation was observed mostly between monetary predictor variables (as it is shown in the tables 2-5 and explained above), that have led to the exclusion of these variables from the resulting model.

The rest predictor variables have been have been analyzed using the t-stat. test of their statistical significance in the resulting models. Thus, in the model of economic growth of Poland T-value of the DC variable haven't exceeded the Student's critical value for the confidence level 95% and the due degree of freedom. As a result, the regression line of Poland have included inflation (as the most significant variable), high-technology exports and real interest rate as predictors.

Regression model of economic growth of Check Republic shows the correlation between GDP dynamics as dependent variable and high-technology exports, domestic credit provided by financial sector and broad money growth as independent ones. Unemployment haven't been used in the model of economic growth of Check Republic because of the contradictory analysis results of the association between UN and GDP growth. Besides there is a weak association between these variables and the attempt to use it as a predictor have resulted in its low t-stat. level. FDI and RIR variables also haven't met t-stat. requirements and have been excluded from the model as not statistically significant input variables.

The following predictors are used to develop the regression model of Slovakia: domestic credit provided by financial sector and broad money growth. Some variables haven't been used in the model because the contradictory results of correlation analysis as it is stated above. T-test was used to analyze the remaining variables. As a result, HTE and FDI were excluded from the model.

Linear regression model of Hungary includes inflation and foreign direct investment, whilst the strongest association have been observed between GDP and inflation, GDP and broad money growth, GDP and high technology export. Some of these variables have been removed to eliminate multicollinearity. RIR and DC have been excluded because of their low statistical significance. Hungary is the only one country of the four studied, where the correlation sign of GDP and unemployment association is negative as it is supposed to be. However, insufficient t-value of the variable haven't allow to use it in the model.

Table 6. Dependent, independent variables and regression models for the Visegrad Group countries.

Country	Variables			Regression model
	Dependent	Independent		
Poland	GDP per capita (constant 2010 US$)	y	High-technology exports (% of manufactured exports)	x1	y = 7763.094 + 788.2703 × x1 - 98.9476 × x2 - 102.117 × x3
			Inflation, GDP deflator (annual %)	x2	
			Real interest rate (%)	x3	
Czech Republic	GDP per capita (constant 2010 US$)	y	High-technology exports (% of manufactured exports)	x1	y = 3876.654 + 818.851 × x1 + 45.8945 × x2 + 104.3326 × x3
			Domestic credit provided by financial sector (% of GDP)	x2	
			Broad money growth (annual %)	x3	

Slovakia	GDP per capita (constant 2010 US$)	y	Domestic credit provided by financial sector	x1	y = 17119.78 - 83.5856 × x1 - 209.668 × x2
			Broad money growth (annual %)	x2	
Hungary	GDP per capita (constant 2010 US$)	y	Inflation, GDP deflator (annual %)	x1	y = 13465.26 -230.314 × x1 + 27.32284 × x2
			Foreign direct investment, net inflows (% of GDP)	x2	

Table 7 shows the results of Farrar-Glauber (FG) test of the regression models. To reform the test the transposed correlation matrices have been developed. Basing on the transposed matrices, FG-value of each model have been calculated and have been compared with its critical value, respectively for three-factor and two-factor models. FG-value of each model does not exceed its critical value that indicates the absence of multicollinearity in each regression model.

Table 7. Farrar–Glauber test and critical values for regression models of the Visegrad Group countries.

Country	FG model value	FG critical value
Poland	3.303635	7.814728
Czech Republic	5.170904	7.814728
Slovakia	0.025401	3.841459
Hungary	0.108374	3.841459

Table 8 represents regression statistics for the regression lines. Regression analysis have been conducted using the confidence level 95%. The value of multiple R and R square is the highest in the model of Poland, the lowest in the model of Slovakia. Some missing data caused significant deviation of the number of observations.

In the table F-values of the models and its critical values have been stated. The following degrees of freedom have been used:

- ✓ f1 = 3 and f2 = 11 for the regression analysis of Poland;
- ✓ f1 = 3 and f2 = 17 for the regression analysis of Czech Republic;
- ✓ f1 = 2 and f2 = 9 for the regression analysis of Slovakia;
- ✓ f1 = 2 and f2 = 20 for the regression analysis of Hungary.

F-value of each model does not exceed its critical value, therefore all models should be considered adequate.

Table 8. Regression Statistics and Fisher critical values for regression models of the Visegrad Group countries.

Regression Statistics	Poland	Czech Republic	Slovakia	Hungary
Multiple R	0.984213	0.959171	0.878415	0.945072
R Square	0.968676	0.920009	0.771613	0.893162
Adjusted R Square	0.960133	0.905893	0.72086	0.882478
Standard Error	308.9751	855.1668	767.7929	686.2735
Observations	15	21	12	23
Fisher critical value	3.59	2.81	4.26	3.49
F calculated	113.3902	65.17466	15.2034	83.59931
Significance F	1.49E-08	1.57E-09	0.00130023219092821	1.94E-1

Table 9 represents regression coefficients, standard errors, t-statistics and p-value of the Vicegrad countries. Critical values of Students' t-distribution for the 95% confidence have been stated in the table. The following degrees of freedom have been used for the analysis of t-statistics:

- ✓ df = 11 for t-stat. analysis of model of Poland;
- ✓ df = 17 for t-stat. analysis of model of Czech Republic;
- ✓ df = 9 for t-stat. analysis of model of Slovakia;
- ✓ df = 20 for t-stat. analysis of model of Hungary.

As it stated in the table 9 all t-stat. values exceed the correspondent critical values of each country. Therefore, we can make the conclusion, that all variables used in the models are statistically significant.

Table 9. Coefficients, standard errors, t-statistics and p-value of regression models of the Vicegrad countries.

	Coefficients	Std. error	T-stat.	P-value
Poland			critical value = 2.201	
Intercept	7763.094	800.4729	9.698135047	1E-06
X1	788.2703	222.8181	3.53773062	0.004651

X2	-98.9476	6.900337	-14.33953689	1.83E-08
X3	-102.117	23.23902	-4.394183948	0.001074
Czech Republic			critical value = 2.1098	
Intercept	3876.654	1283.889	3.019461626	0.007727
X1	818.851	61.80529	13.24888222	2.18E-10
X2	45.8945	18.05376	2.54210133	0.021049
X3	104.3326	26.17362	3.986172917	0.000955
Slovakia			critical value = 2.2622	
Intercept	17119.78	1784.336	9.594479276	5.04E-06
X1	-83.5856	32.92824	-2.538415542	0.031793
X2	-209.668	44.07099	-4.757516646	0.001033
Hungary			critical value = 2.086	
Intercept	13465.26	255.2886	52.74525292	6.07E-23
X1	-230.314	18.51638	-12.43836532	7.19E-11
X2	27.32284	10.42459	2.620999474	0.016365

These findings are consistent with the previous research. The study confirms the strong positive effect have been made by foreign direct investment on economic growth of the post-communist countries. Thus, it corresponds with the researches of Petr Hlavacek and Beata Bal-Domanska (2016), Bogdan Florin Filip (2015), Ramona Jimborean and Anna Kelber (2014), Mariush Próchhiak (2011), who highlighted the role of FDI in economic development of the transition countries.

The research results also contribute to the thesis about low inflation as one of the key factors of economic growth in the Central European countries, that was observed by Bogdan Florin Filip (2015), Mariush Próchhiak (2011), Ali M. Kutan and Josef C. Brada (2000). Significant correlation of GDP dynamics and export of goods and services (including high-technology export) observed in this study, was also researched by Bogdan Florin Filip (2015), Parash Upreti (2015). The study also confirms the thesis concerning the significant effect on economic growth made by domestic credit provided by financial sector, observed by Bogdan Florin Filip (2015).

4. CONCLUSIONS

The main research results are the following:

✓ Many studies on the determinants of economic growth in the Central and Eastern European countries show the variety of different factors affecting GDP dynamics in these countries. Among the political, economic and cultural factors, the special place belongs to the policy of their monetary authorities. The study have showed that monetary factors do play an important role in promoting economic growth of the Visegrad group countries. Among the factors analyzed, household final consumption, exports of goods and services, inflation, high-technology exports and broad money growth have the strongest association with GDP dynamics of the countries.

✓ The research results have showed that among the factors analyzed household final consumption, exports of goods and services, inflation and broad money growth have the most intensive relationship with gross domestic product dynamics of Poland. The strongest association have been observed between GDP dynamics of Check Republic and its household final consumption, exports of goods and services, high-technology exports and official exchange rate. Studying relationship between GDP and other variables of Slovakia the highest level of correlation have been revealed between GDP dynamics and household final consumption, exports of goods and services, broad money growth and high-technology exports. The most intensive relationship have been observed between GDP dynamics and household final consumption, exports of goods and services, inflation, broad money growth and high-technology export of Hungary.

✓ Collinearity of certain variables have not allowed using the most significant factors to develop linear regression models. As a result, independent variables sets are not those of the highest statistical significance. Therefore, regression model of Poland have included inflation, high-technology exports and real interest rate as independent variables. Regression model of Check Republic have showed the correlation between GDP dynamics as dependent variable and high technology exports, domestic credit provided by financial sector and broad money growth as independent variables. The following independent variables have been used to develop the regression line of Slovakia: domestic credit provided by financial sector and broad money growth. Linear regression model of Hungary have included inflation and foreign direct investment.

✓ The transition period of the four Visegrad countries, can become the valuable lesson for those post-communist countries that have been trying to overcome some difficulties on the way to the developed economies. Therefore, there is still the need to study successful experience of the Central European countries to develop the policy able to provide sustainable economic growth of both post-transition and developing countries.

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