The Impact of Institutions on Economic Growth in the Central and Eastern European Countries before and during the Global Economic Crisis ♦

Trajko Slaveski* and Darko Lazarov **

Abstract

We investigate the influence of institutions on economic growth and the level of income per capita in the CEE region before and during the global economic crisis. We use principal factor component analysis in order to create a more reliable and representative variable to measure the institutional quality in our regression models and to avoid the multi-colinearity, a common statistical weakness of this type of regression model. The results from panel (random and fixed effects) regressions and a GMM dynamic panel regression lead to two contrasting insights. The first regression model shows positive and statistically significant correlation between institutions and economic growth, which would imply that the CEE countries that have created a strong institutional capacity during transition and post-transition period have experienced higher economic growth. The second regression model, which refers to the global economic crisis period, shows a negative influence of institutions on economic growth for the same sample of countries. One explanation for this result might be the fact that countries with a higher degree of integration into the EU were also more vulnerable to the global economic crisis.

Keywords: Economic growth, institutional infrastructure and quality of institutions, OLS panel regression, cross-country data, factor analysis.

JEL Classification: O10, P20

1 INTRODUCTION

Panel econometric techniques have been applied to data for representative CEE countries to investigate the impact of institutions on economic growth and the level of income per capita before and during the global economic crisis. However, testing the correlation and causality between institutions and growth involves the difficult issue how to measure the quality of institutions. International agencies and researchers have developed indicators that claim to measure different aspects of institutional quality such as financial stability, quality of government regulations, democracy, quality of laws and courts, corruption, and many others. One of the key challenges confronting us in this empirical study, having in mind the large number of theseindicators, is how to combine this set of indicators into one dimension with a clear-cut interpretation of quality of institutions and then to analyze itsimpactupon income per

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*Teaching Assistant, PhD, State Univeristy "Goce Delchev", Faculty of Economics – Shtip, Depertment of Economics, Republic of Macedonia, e-mail: darko.lazarov@ugd.edu.mk.

**Full Professor, PhD, State University "Ss Cyril and Metodius", Faculty of Economics – Skopje, Depertment of Economics, Republic of Macedonia, e-mail: slaveski@eccf.ukum.edu.mk

capita and economic growth. The most widely used approach to construct composite variables is to select relevant indicators and combinethem using predetermined weights.[3]

The empirical results obtained in this paper lead to two contrasting insights. The first regression estimation by using fixed, random and GMM models for the transition and post-transition period shows a positive and statistically significant correlation between the quality of institutions (proxiedby an index of corruption, political rights and civil liberties) and economic growth measured by thelogarithm of real GDP per capita,which would imply that the CEE countries that have created a strong institutional capacity during the transition and post-transition period have experienced higher economic growth. The second set of regressions, which refers to the global economic crisis period, shows a negative influence of institutions on economic growth for the same sample of countries. One explanation for this result isthat countries with a higher degree of integration into the EU were also more vulnerable to the global economic crisis.

2 LITERATURE REVIEW

Quite a few studies analyze the role of institutions in the process of economic growth. There are papers in the academic literature that investigate the influence of institutional quality on economic growth in the CEE region. Many of these studies are inspired by Hall and Jones (1999) who found a relation between institutional quality and economic growth for a large sample of countries. Beck and Laeven (2005) offer a political economy explanation of why institution building has varied so much across transition economies, using two major explanatory factors: reliance on natural resources and years under socialist government. This research is based on North's hypothesis that "institutions are not usually created to be socially efficient, but are created to serve the interests of those with bargaining power to create new rules" (North 1990). They conclude that countries with less open political systems in the transitional process and countries that have substantial natural resources have failed to develop of the market-compatible institutions and consequently had slower economic growth in the transitional period.

The research in this paper is directly linked to the literature on the relationship between institutions and economic growth and development. North (1981) emphasized the role of institutions for economic development. Acemoglu, Johnson and Robinson (2001) estimate large effects of institutions on income per capitaby using differences in mortality rates of European settlers as an instrument for current institutions. Easterly and Levine (2003) show that institutions, not policies, explain the cross-country differences in GDP per capita once controlled for the impact of endowments on institutions and on economic development. Rodrik (2004) sheds some more light on the new institutional focus and the so called "second generation reforms". The agenda of new "government" reforms aimed at reducing corruption, improving the regulatory apparatus, rendering fiscal and monetary institutions independent, strengthening corporate governance, enhancing the function of the judiciary is meant to overcome the apparent inefficiency of the earlier wave of reforms relying heavily on liberalization, stabilization and privatization.

On the other hand, Bartlett and Prica(2012), investigating the transmission channels and mechanisms from the global crisis to SEE countries, find a negative correlation between institutions and economic growth during the economic crisis period, first because countries that have made the most progress in integrating with the EU and in adopting EU-compatible institutions were more vulnerable to the crisis. But, at the same time, these countries were

[3]This is what the WB and others providing these ratings do.

better positioned to benefit from the recovery, since businesses in those countries operate within a more supportive institutional environment.

Over the past two decades the role and relationship between institutions and economic growth in transition countries have been of interest among many economists. In the table below we present the selected studies and their main findings.

Study	Measures	Techniques	Main findings
Paulo Mauro (1995)	Bureaucratic efficiency index, Political stability index and Corruption index	OLS and 2SLS regression	Find positive correlation between high bureaucratic efficiency, political stability and economic growth. Negative relationship between index of corruption and growth.
De MeloMartha, CevdetDenizer, and Alan Gelb (1996)	Index of liberalization for the transition countries	Panel regression	Find a positive relationship between progress of liberalization and output growth
Aslund Anders, Peter Boone, and Simon Johnson, (1996)	Structural and institutional reforms for the CEE countries	OLS and IV regression	Find no robust effect of measures of reform and macroeconomic policies on output change
Beck and Leaven (2005)	Natural resources and the historical experience of Transition countries as Instrumental variables	Instrumental variables – IV regression	Find positive relationship between institutional development and economic growth
Will Bartlet and Ivana Prica (2012)	Institutional quality WGI and Progress in transition – EBRD transition index	OLS regression	Negative correlation between quality of institutions and growth rate

Table.1 *Literature review of institutions and economic growth*

3 PANEL REGRESSION ANALYSIS OF INSTITUTIONS AND ECONOMIC GROWTH IN THE CEE REGION

3.1 Data, sources, descriptive statistics and variables description

In our sample we use data for 13 countries from the CEE region[4] collected from number of sources.[5]Table. 2 shows the arithmetic mean of the variables, their standard deviation and minimum and maximum of the variables, and how many observations, panel and average time periods. The variables are: the level of real GDP per capita; the rate of economic growth; the quality of institutions measured by the index of corruption, political rights and civil liberties, innovation capacity measured by royalty payments, general expenditure on research and development, and journal articles; human capital measured by gross enrolment in primary, secondary and tertiary education and education spending; export; bank credit to the private

[4]The CEE countries in our sample are: Albania, Serbia, Croatia, Bulgaria, Romania, Republic of Macedonia, Russia, Estonia, Hungary, Poland, Lithuania, Latvia and Slovenia.

[5]World Bank data base, EBRD index, CANA data set and many other international statistical agencies.

sector; openness measured as a share of total trade in GDP; the investment rate; FDI; the inflation rate; WorldWide Governance Indicators; and EBRD Transition Indicators.

Variable		Mean	Stand. dev.	Min.	Max.	Obs.
LGDP	Log GDP per capita, US$	8.08	0.74	6.09	9.51	N = 124
Economic growth	The rate of economic growth per capita	2.21	5.88	17.55	14.84	N = 55
Institutions	Log of Institution quality (Index of corruption, political rights and civil liberties)	0.53	0.71	-2.38	1.20	N = 122
Innovation	Log of Innovation capacity (Royalty payments, GERD and Journal articles)	-1.89	0.34	-2.69	-1.17	N = 120
Human capital	Log of Human capital (Gross enrolment in primary, secondary and tertiary education and education spending)	3.86	0.11	3.57	4.08	N = 135
Export	Log of Export, US$	18.14	1.59	13.92	21.09	N = 135
Bank credit	Log of Bank credit to private sector, as % of GDP	3.05	0.71	1.25	4.48	N = 131
Openness	Openness (Export minus Import), as a % of GDP	4.53	0.32	3.86	5.11	N = 53
Investment Rate	Investment rate, as a % of GDP	3.17	0.25	2.34	3.68	N = 50
FDI	Foreign direct investment	*17.25*	*1.44*	*13.69*	*20.46*	N = 51
Inflation Rate	Inflation rate, %	*1.54*	*0.60*	*0.04*	*2.72*	N = 53
WGI	WorldWide Governance Indicators	0.29	0.40	-0.27	0.986	N = 50
EBRD Index	EBRD transition Index	3.64	0.25	3	4.05	N = 55

Table.2 *Descriptive statistics and variables description*

3.2 Methodology of research

In this paper we use panel datarelated to the countries in the sample. Panel data are more informative data; they include more variability, less colinearity and more efficiency.[6] The question which researcher poses is which panel data methods to use: the Random Effects Model, or the Fixed Effects Model. The Random Effects Model seems appropriate when we think that unobserved effect is uncorrelated with all of the explanatory variables.Actualy, the rationale behind the random effects model is that the variation across entities is assumed to be random and uncorrelated with the explanatory variables included in the model. Estimation of the Random Effects Model by Generalized Least Squares (OLS) is easy and routinely done by many econometric software packages. The basic model is as follows[7]:

[6]Gujarati, Damodar N. (2003), Basic Econometrics. New York: McGraw-Hill
[7]Wooldridge, Jeffrey , (2002), Introductory Econometrics A Modern Approach, Thomson

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \beta_2 x_{it2} + \beta_k x_{itk} + a_i + u_{it} \quad (1)$$

wherewe explicitly include an intercept so that we can make the assumption that theunobserved effect, a_i, has zero mean (without loss of generality) and the symbol, u_{it} refers to between-entity error terms. If we define the **composite error term** as $v_{it}=a_{it}+u_{it}$, then (1) can be written as:

$$y_{it} = \beta_0 + \beta_1 x_{it1} + \beta_2 x_{it2} + \beta_k x_{itk} + v_{it} \quad (2)$$

We would usually allow for time dummies among the explanatory variables as well. In using fixed effects or first differencing, the goal is to eliminate $a_i$because it is thought to be correlated with one or more of the x_{itj}. But suppose we think $a_i$is*uncorrelated* with each explanatory variable in all time periods? Then, using a transformation to eliminate *ai*results in inefficientestimators.

The previous equation becomes RE model when unobserved effect a_i is uncorrelated with all of the explanatory variables i.e. covariance is zero:

$$Cov(x_{itn}, a_i) = 0 \qquad t = 1,2,\ldots T, n = 1,2..k \quad (3)$$

Now for the Fixed effect if we have the following expression: $y_{it} = a_i + \beta_1 X_{it} + u_{it}, t = 1,2..T$, for each cross-sectional unit average, this equation becomes, $\bar{y}_{it} = a_i + \beta_1 \bar{X}_{it} + \bar{u}_{it}$, here $\bar{y}_{it} = \frac{\sum_{t=1}^{T} y_{it}}{T}$, if we subtract two previous equations (in order to eliminate the unobserved time constant) we get:

$$y_{it} - \bar{y}_{it} = \beta_1 (x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i = \Delta y_{it} = \beta_1 \Delta x_{it} + \Delta u_{it} \quad (4)$$

So the Fixed effects estimator is efficient when idiosyncratic errors are serially uncorrelated, and there is no assumption about the correlation between the unobserved effect a_i and the explanatory variables.

Next, to test for the robustness of the results and to solve the endogenity problem as a serious problem in the panel estimation, the Dynamic panel data estimator namely Arelano/Bond GMM estimator is the most appropriate model, the basic model with lagged dependent variables is:

$$y_{it} = a_i + \gamma y_{it-1} + u_{it}, t = 1,2..T \quad (5)$$

In the previous equation residuals are assumed to follow normal distribution, i.e. $u_{it}, \sim (0, \sigma_u^2)$. Here y_{it-1} depends positively on a_i , this is easy to see when we are inspecting the model for t-1 period:

$$\gamma y_{it-1} = a_i + \gamma y_{it-2} + u_{it-1}, t = 1,2...T \quad (6)$$

So there existsanendogenity problem in the OLS and the GLS, i.e. FE and RE are not consistent. As a result of that theArelano/Bond GMM estimator is consistent. The moment conditions use the properties of the instruments, and the instruments in the GMM Arelano /Bond model are the differenced explanatory variables:

$$y_{it-m}; m \geq 2 . \quad (7)$$

Now the instruments are uncorrelated with the future errors u_{it} and u_{it-1} . The increasing number of moment of conditions is $t = 3,4...T$. The GMM estimation is combined with RE and FE estimator because as $T \to \infty$,estimates of the RE and FE model begin to converge.[8]

3.3 Econometric model, results and explinations

Since data cover 13 countries, and the period from 1993 to 2007, we apply panel estimation techniques. First econometric model that we estimate has the following structure:

$$g = \gamma_0 + \gamma_1 \ln Ins + \gamma_2 \ln Innov + \gamma_3 \ln Hum + \gamma_4 \ln Ex + \gamma_5 \ln Invest + \varepsilon_i \quad (8)$$

The outcome variable in the model iseconomic growth measured by the natural logarithm of real GDP per capita in different time periods, while the independent variables as determinants of economic growth for analysed group of the CEE countries are 1) *Institution quality* measured by index of corruption, index of democracy, economic and civil liberties and political rights; 2) *Innovation capacity* measured by royalty payments, number of patents and journal articles and GERD; 3) *Human capital* measured by gross enrolment in primary, secondary and tertiary education, education spending and number of teachers per student); 4) *Investment rate* - private and public capital investment as a share of GDP; 5) *Export* measured as a percentage of real GDP; and 6) *Bank credits* to the domestic private sector as a percentage of GDP.[9][10]

The estimated results from the empirical study that we have partly done by using data for a group of CEE countries in modified panel econometric methods and OLS regression analysis before and during the global economic crisis show two contrasting insights. First, regression analysis which we use to estimate the first econometric model shows strong positive and statistical significant correlation between quality of institutions and economic growth in time series of 1993-2007 (transition and post-transition period) for the sample of CEE countries. But the second regression model which refers to the global economic crisis period shows negative correlation between institutional quality measured by *WorldWideGoverneceIdicators* and *EBRD Transition Index* for the same sample of countries.

[8]Wooldridge, Jeffrey , (2002), Econometric Analysis of Cross Section and Panel Data, MIT press

[9]We used principal component factor analysis approach to create the more reliable variables.

[10]The database is composed by combination of sources from relevant specialised agencies and international institutions: World Bank, IMF, EBRD international institution.

DEPENDENT VARIABLES: Log of real GDP per capita	Fixed effects (within) regression, FE	Random-effects GLS regression, RE	Arrelano-Bond (GMM) regression
INDEPENDENT VARIABLES:	(1)	(2)	(3)
Log of real GDP per capita			
L.1			0.395
			(0.054)**
Institutions	0.131***	0.200***	0.078***
	(0.059)	(0.0693)	(0.0332)
Investment in human capita	1.149***	2.698**	0.989**
	(0.605)	(0.489)	(0.267)
Export/real GDP per capita	0.534***	0.292**	0.351**
	(0.0597)	(0.039)	(0.0398)
Innovation capacity	0.124**	0.344**	0.313***
	(0.104)	(0.112)	(0.0561)
	0.523	0.661*	0.187**
Investment rate	(0.082)	(0.100)	(0.0457)
Breusch-Pagan Lagrangetest for random effects			
(H_0:variances across entities is zero)			
Prob > chi2		0.000	
Pasaran test for cross sectional independence			
(Ho: residuals among entities are not correlated)	Pr=0.000		
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model			
(Ho: there is homoscedasticity: constant variance)			
Prob > F	0.000		
Wooldridge test for autocorrelation in panel data			
(H0: no first-order autocorrelation			
Wooldridge test for autocorrelation)			
Prob>F	0.000		
Sargan test for overidentifying restrictions:			
(Ho: overidentifying restrictions are valid)			0.566
Prob > chi2			
Constant	-7.709*	-9.263**	-5.419**
	(1.159)	(1.623)	(0.762)
Observations	101	101	87
R-squared	0.474	0.753	

Standard errors of the estimated parametars in parentheses

*** p<0.01, ** p<0.05 and * p<0.1 show the significance level of 1%, 5% and 10%.

Source:Author calculation

Table.3 *Results for the Fixed and Random effects model, and Arrelano-Bond (GMM) regression*

The first important question here is choosing an appropriate model for the estimation. The Breusch-Pagan LM test shows that there is significant difference of variance across countries i.e. we cannot use simple OLS, but rather the random effects model. But, the result from Hausman test is in favor of the fixed effects model. The ambiguity of these two tests made us use the RE and FE models. The fixed effects model assumes that individual heterogeneity is captured by the intercept term, while the random effects model assumes that individual heterogeneity is captured by the intercept term and some random component.But, the coefficients of the variables in the two models are similar in size and they are of the same sign. The quality of institutions has positive effect on economic performance during the transition and post-transition period for all representative countries in our model, i.e. those countries that have implemented growth-promoting institutions (high level of transition progress to market economy, successful results in integration process to EU and adaptation to EU-compatible institutions, high quality of government policy making) have experienced a superior economic performance in the analyzed period.

Correlation between institutional quality and economic growth is relatively significant– an increase of institutional quality by 1 percent will contribute by 0.131 and 0.200 percent to the increase in the rate of economic growth,respectively in FE and GLS models.

The innovation capacityand human capital as fundamental factors of economic growth based on endogenous growth models play an important role for economic growth, taking into consideration that factor productivity and human capital were binding constraints, and the process of creation of the National Innovation and Education System had positive implicationin this group of countries. The regression results show that an increase of innovation capacity and human capital by1% will increase the rate of economic growth for 0.124 and 1.149, respectively with FE. The results are similar using the GLS model. These correlations are statistically significant at the 95% and 99% level.

Most of the countries in our sample are small open economies and it is likely that there is positive and statistically significant link between export as a percent of real GDP and economic growth as a logarithm of real GDP per capita. Growth in openness measured by export share in GDP would make the economic growth more dynamic for 0.534% with a level statistical significance, p-value 0.000). Bank credits to the private sector as a main source for financing investment in CEE counties have important role for economic growth. Countries with market oriented financial sector which give support to private sector and businesses have better chance for economic growth. This conclusion can be proved by econometric results that we have obtained, efficiency of the financial sector presented by bank credit to private sector is positively and statistically significant correlated with economic growth in our sample of countries over the period (1992-2007).

The most serious problems that we have addressed in the FE model (by Pasaran and modified Wald test) are the presence of cross sectional independence (the correlation of residuals among entities) i.e. contemporaneous correlation and groupwiseheteroskedasticity (not constant variance). We used Driscoll-Kraay standard errors to overcome the contemporaneous correlation and robust standard errors to overcome the heteroskedasticity.

Our estimation might be biased due to counties' fixed effects and endogenity problems on the explanatory variables. We tackle these issues by including internal instruments (GMM). The Sargan test for over identifying restrictions does not reject the null hypothesis that our instruments are appropriate, indicating that the GMM estimation is consistent. Additionally, the comparison of Columns (1) with fixed effects, (2) with random effects, and (3) with GMM allows us to identify that the use of the GMM estimators confirm the positive impact of institutional quality on economic growth. While the coefficient on institutional quality obtained with the GMM estimator appears smaller, it is not significantly different from the one obtained based on fixed and random effects. This suggests that our indicator does not

suffer from endogeneity problems. The strong link between export sophistication and growth does not appear to be driven by simultaneity bias.

4 INSTITUTIONS AND ECONOMIC GROWTH IN THE CEE REGION DURING THE GLOBAL ECONOMIC CRISIS

The process of EU integration has required building a strong institutional capacity with new institutions appropriate to EU standards such as competition agencies, reform in the existing institutions and many others. The pre-condition for this process is harmonization of the system of laws to the *acquiscommunautaire*. There are many studies which have shown that the progress in EU integration has a positive effect on institutional quality measured by EBRD Transition Indicators and World Governance Indicators on one side, and the quality of institutions and economic growth, on the other. Consequently, countries which have made significant progress in adopting EU-compatible and market oriented reforms in the period before the crisis and as a result have become EU members, have had a higher average economic growth. However, the central issue in this paper is *how institutions influenced economic growth during global economic crisis period in this region*?

EU membership	Country	Average GDP growth 2008-2011	WGI	EBRD Index
EU Members	Bulgaria, Croatia, Hungary, Latvia, Romania, Slovenia	-0.37	0.53	3.74
Non-EU Members	Albania, Macedonia, Serbia, Turkey	2.39	-0.11	3.39

Table.4 *EU membership, the average GDP growth, WGI and EBRD index*

Table 4. above shows that EU member countries with higher quality of institutions measured by EBRD Transition Indicators Index and WGI were adversely affected by the economic crisis with negative average rate of economic growth (-0.37%). On the other side, countries which have lagged in EU integration process and in the process of strengthening the institutional capacity were not seriously affected by the crisis. The average rate of economic growth of non-EU members (2.39%) during economic crisis was significantly higher than the average growth of EU member countries.

The second regression model that we have estimated uses different set of variables to represent the quality of institutions (WGI, EBRD Transition Indicators, EU integration), for the time period during global economic crisis. The econometric equations that we estimate have the following structure:

$$g = \gamma_0 + \gamma_1 WGI + \gamma_2 Openn + \gamma_3 Inf + \gamma_4 Invest + \gamma_5 FDI + \varepsilon_i \quad (9)$$

$$g = \gamma_0 + \gamma_1 EBRDIndex + \gamma_2 Openn + \gamma_3 Inf + \gamma_4 Invest + \gamma_5 FDI + \varepsilon_i \quad (10)$$

The resultsshow that the quality of institutions measured by theWGI and the EBRD Transition Indicators has had a negative impact on economic growth during global economic crisis period, which is at least controversial. The logical explanation of the negative impact of

institutional quality rests upon the fact that countries in the CEE region which have made the most significant institutional progress by integration to the EU were more vulnerable to the crisis. This sensitivity and vulnerability to the crisis primarily came from the higher degree of openness to the transmission effects through financial flows and falling export demand.[11] But, at the same time they have better chance to overcome the crisis and better opportunities for recovering their economies, since the private sector in those countries operates within a more supportive and market oriented institutional environment.[12]

DEPENDENT VARIABLES: Economic growth per capita	(1) OLS Panel regression	(2) Random-effects GLS regression	(3) OLS Panel regression	(4) Random-effects GLS regression
INDEPENDENT VARIABLES:				
Openness	0.0940**	0.134***	0.0399	0.0588
	(0.0366)	(0.0441)	(0.0293)	(0.0360)
Inflation	-0.328	-1.445	-0.314	-1.283
	(1.278)	(1.433)	(1.401)	(1.543)
FDI	1.654**	2.094**	0.608	0.807
	(0.739)	(0.880)	(0.661)	(0.771)
Investment	6.449**	7.711**	8.852***	10.83***
	(3.063)	(3.557)	(3.034)	(3.448)
WGI	-1.931***	-3.441***		
	(2.357)	(3.099)		
EBRD Index			-1.585***	-3.083***
			(3.798)	(4.868)
Constant	-53.79***	-66.82***	-33.58**	-38.31*
	(13.79)	(14.73)	(15.80)	(19.68)
Observations	64	62	66	64
R-squared	0.456	0.583	0.358	0.409
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table.5 *Results for the OLS, fixed and random effects model estimation for the second model*

The regression results show negative correlation between institutional quality measured by World Government Indicators (voice and accountability, political stability and absence of violence, rule of laws, index of corruption, government efficiency and regulatory quality) and EBRD transitional index (large and small scale privatization, governance and enterprise restructuring, price liberalization, trade and foreign exchange system and competition policy) and economic growth in the period during the world financial and economic crisis.

[11]For detail information about the transmission channels and mechanisms of global economic crisis to SEE counties, see: Goce Petreski and Darko Lazarov (2013): The impact of global economic crisis in SEE, ASECU.
[12]Will Bartlett and Ivana Prica (2011): The variable impact of the global economic crisis in South East Europe, London School of Economics.

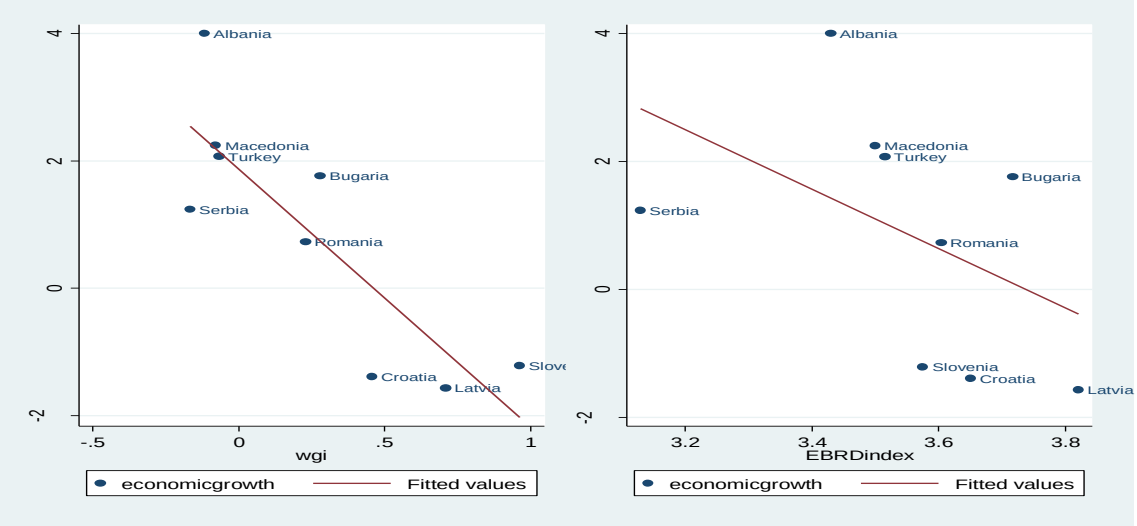

Figure1. Average economic growth and quality of institutions during global economic crisis

The graphicalpresentationon a scatterplot visualizes the negative partial correlation and interdependence betweenin stitutional quality measured by WGI and the rate of economic growth over the global economic crisis period. Thecountries thathave succeeded in the creation of comprehensive and EU-compatible institutional environment were more sensible to the shocks as a result of global economic crisis, and vice-versa. Slovenia, Latvia, Croatia, Bulgaria and Romania as countries with higher degree of financial and EU integration have had a slower economic growth compared to the Republic of Macedonia, Serbia, Turkey, Russia and Albania.

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