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**Regional Inequalities in the EU and the Role of
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Regional inequalities in the EU and the role of institutions

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The Cohesion policy has been one of the objectives of the European Union since the Treaty of Rome in 1957. Although, convergence is an essential goal of the European Union, investigating the dynamics of the convergence process has provided mixed and contradictory results. The potential explanation is the fact that European regional strategies have overlooked one of the significant determinants of the growth process. Taking into consideration that the unsuccessful recipe for greater economic and social cohesion in Europe has included greater investment in infrastructure, education, innovation and industrial activities, we test the role of institution quality, as a new determinant, for regional growth imbalances.

The research extends the literature in two directions. First, it tackles the importance of institutional quality for regional inequalities in EU and second tries to recognize which dimension of the institutional quality is important for pattern of regional imbalances by using index proposed by World Bank, Worldwide Governance Indicator (WGI). The results confirm the importance of institutions for inequalities in the EU and expose that key dimensions important for regional growth imbalances are presented by Voice and accountability indicator, Rule of Law indicator and Control of Corruption indicator. Confirmation of the these indicators shows that for regional growth inequalities are the most important processes that elevate the respect of citizens and the state for the institutions that govern economic and social interactions among them Process which boots the capacity of the government to effectively formulate and implement sound policies has showed not significant for regional growth inequalities pattern.

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Introduction

The Cohesion policy has been one of the objectives of the European Union since the Treaty of Rome in 1957. Its main purpose is to promote the “overall harmonious development” of the EU, to reduce disparities between the levels of development of the various regions, and to strengthen its “economic, social and territorial Cohesion” (Art. 158 Treaty on European Union).

To reach the goal, the European Union devised several policies and mechanisms and for the last budget period, 2007-2013, more than one third of the EU's total budget is allocated to Cohesion Policy.

Although, convergence is an essential goal of the European Union, investigating the dynamics of the convergence process has provided mixed and contradictory results (Mohl and Hahen, 2010; Le Pen, 2010). Some authors find positive trend in convergence process (Barro and Sala-i-Martin, 1991, Sala-i-Martin, 1996, Martin and Sanz, 2003, Quah, 1996b, Le Pen, 2010), some weakly positive (Fingleton, 1999, Hall, Robertson and Wickens, 1992) and some even a negative (Magrini, 1999, Pittau and Zelli, 2006).

The doubt on the convergence of European regions is also grounded in the economic theory. Arguments in favor of convergence are given by the neoclassical growth with exogenous technological change model (see e.g.: Solow 1957, 1994). Depending on the assumptions on preferences and demography, this model predicts unconditional or conditional convergence (Le Pen, 2010). On the other hand, divergence is initiated in the theory of endogenous growth, (Romer, 1986, 1990) and the “new” theory of international trade triggered by Krugman (1991) and Krugman and Venables (1995). In the presence of increasing returns, economic activity is expected to concentrate geographically in a few areas and economic disparities at the regional scale would be more pronounced. Traditional regional economics also gives arguments against convergence based on economies of scales and agglomeration, externalities and improvement in labor market efficiency (Le Pen, 2010)

The absence of the empirical and theoretical confirmation of the convergence process can have foundation in the use of imprecise data, different methods for testing the convergence process (Mohl and Hahen, 2010; Le Pen, 2010) or not taking into consideration significant determinants (Rodriguez – Pose, 2009).

Regarding the fact that first two reasons have been in focus of numerous papers (see e.g. Mohl and Hahen, 2010; Le Pen, 2010, Becker et al., 2010, Azomahou et al., 2010), this paper

tries to tackle the latter, or more precisely, the paper tries to investigate the role of the institutions in the regional convergence process in the European Union.

The rest of the paper is organized as follows. In the next section, we give a brief summary of the previous works on convergence of European regions, present the institution and discuss the role of institution for (regional) economic growth. Section 3 presents data and comments on the empirical results. We conclude and try to foresee where further work may be relevant in section 4.

Related literature on convergence and the role of institution in regional economic growth process

In the first part of the section, we identify salient empirical facts concerning regional convergence in European Union.

Three broad sets of approaches have been used to test for convergence. A first approach is based on the β and σ convergence criteria, second is the intra-distribution dynamics approach and the third is based on time series econometrics.

First approach includes two measures of convergence that are conceptually different, sigma (σ) convergence and beta (β) convergence (see, e.g. Barro and Sala-i-Martin, 1995). The sigma convergence describes how the distribution of cross-section incomes evolves over time, whereas the second emphasizes the income mobility. Beta convergence could be conditional and unconditional. If it is conditional than each economy can converge to its own steady state. Unconditional implies that all the economies have the same level of steady state. Barro and Sala-i-Martin (1991) are among the first to apply these criteria and they find evidence of σ and β convergence and demonstrate the path for others who enlarge the sample of regions and countries. An extension of the previous works consists in combining the β convergence criterion with an analysis of spatial interactions, panel methods and different time periods (Fingleton, 1999; Lopez-Bazo et al, 2004; Ertur et al, 2006, Le Gallo and Dall'erba, 2006).

The results of extension offer confirmation of convergence process in European Union. These results have been challenged by Quah (1993a, 1993b, 1996a, 1997) and the intra- distribution dynamics approach.

Quah (1993b) shows that a decrease in standard deviation may be compatible with a nonconvergent distribution of the per capita income and that β convergence can be consistent with cases where countries do not converge in the long run. Also it is emphasized that cross-

sectional tests for convergence reflect the average behaviour of per capita GDP and are uninformative about the behaviour of their entire distribution. Thus Quah (1993a, 1993b, 1996a, 1997) proposes the intra-distribution dynamics approach which uses stochastic kernel and Markov chain to estimate the shape of the income distribution and intra-distribution mobility and its change through time. Although Quah (1996) finds evidence for convergence process for a sample of 78 regions on the period 1980–1989, the results have been discussed as Quah's sample of countries excludes poor European countries. The subsequent examination has provided ambiguous results. Fingleton (1997), Magrini (1999) and Pittau and Zelli (2006) conclude that the process of integration is characterized by divergence, López-Bazo et al. (1999) conclude that while per worker GDPs are converging, the distribution of per capita GDPs is becoming bimodal. Recently, Ezcurra et al. (2006) evaluate the regional polarization and the results show a reduction in polarization and Hierro and Maza (2009) find evidence of structural shifts in the dynamics of the European income distribution between 1980–1993 and 1993–2005. They conclude to “high relative persistence” in this income distribution after mid-1990s.

The third approach to convergence is based on time series econometrics. The stochastic convergence criterion is proposed by Bernard (1991), Quah (1990), Bernard and Durlauf (1995) and Evans and Karras (1996) and it implies that convergence between two per-capita outputs is accepted if their log-difference is a zero-mean stationary process. Hall, Robertson and Wickens (1992) are among the first to apply this approach to European regions and they find evidence of a slow convergence. A recent application is De Siano and D'Uva (2006) confirmed the existence of convergence clubs in Europe.

All these approaches indicate the doubtful results and do not provide opportunity for establishing proper conclusion and further activities. Thus, further investigations should look for missing piece of regional growth puzzle pattern that could be found among institution framework.

Under a neoclassical growth framework, achieving economic development was mainly a matter of investing in physical capital (Solow, 1956) and after development of the endogenous growth theory, matter of two other additional factors – innovation (Romer, 1986) and education (Lucas, 1988).

Hence, the recipe to generate greater economic and social cohesion in Europe seemed rather straightforward: greater investment in infrastructure, in education and training and in the

promotion innovation and industrial activities channeled to lagging regions in the periphery of Europe. However, the results of such policy didn't provide expected results.

Obviously, the European regional strategies have overlooked an additional determinant of the growth process. But, which one? We think that the answer is institutions.

Despite the fact that social scientists had been analyzing the role of institutions for more than a century (i.e. Tönnies, 1887; Weber, 1920 and 1921), the link between institutions and economic growth had been fundamentally overlooked by mainstream economic theory, in general, and growth theory, in particular (Rodriguez –Pose, 2009). But, in the last twenty years researchers are increasingly resorting to analyzing institutions in order to have a better grasp of how economic growth takes place and they have made considerable progress in showing that institutions 'matter' more for economic growth than traditional factor-endowments (Hall and Jones, 1999; Acemoglu, Johnson, and Robinson, 2001; Vijayaraghavan and Ward, 2001; Rodrik, Subramanian, and Trebbi, 2004, Knack and Keefer, 1997; Zak and Knack, 2001; Beugelsdijk and van Schaik, 2004; Knack, 2003; Bengtsson, Berggren, and Jordahl, 2005, Putnam, 1993, 2000; Beugelsdijk and van Schaik, 2005)

But how do they impact economic growth patterns?

To deal with the aforementioned issues, we must first define what is understood by institutions. Defining institutions is notoriously difficult and the current literature on the topic far from agrees on a common definition. However, the most commonly cited definition describes institutions as “the rules of the game in a society; (and) more formally, (as) the humanly devised constraints that shape human interaction” (North, 1990: 477).

The complexity of institutions is confirmed by the existence of multiple types of institutions. First approach includes formal and informal institutions. As Amin (1999) indicates, any economy is molded by “enduring collective forces”, which include “formal institutions such as rules, laws, and organization, as well as informal or tacit institutions such as individual habits, group routines and social norms and values” Second approach recognizes political (constitutions, governance structures, checks and balances), economic (property rights, markets, regulatory structures) and social (formal groups and associations, norms) dimension of institutions (Farole, 2009). Third one distinguishes three different processes important for institution quality (Kaufmann et al, 2010). The first represent the process by which governments are selected, monitored, and replaced, second process which boots the capacity of the government to effectively formulate and implement sound policies and last process

which elevate the respect of citizens and the state for the institutions that govern economic and social interactions among them. Emphasizing the processes dimension of the institution in recent literature (Glaser, 2004) puts on top the third approach. Therefore regional patterns of the processes will be in particular tested in our paper, as possible direction where explanation for regional growth imbalances should be found.

What should we expected?

The relevant literature on national level identifies three main channels through which “human devised constraints” might enter into the production function to shape patterns of economic growth. First, institutions impact the efficiency of economic exchange through their effect on transaction costs. Second, they impact the rate of technical change in the economy, specifically through processes of innovation. Finally, institutions have significant impacts on socio-political processes, influencing individual participation and confidence, conflict resolution, and ultimately the speed and efficiency by which territories adjust to changing external circumstances (Farole, 2009).

But is this global pattern applicable for regional level of perspective?

Regarding beliefs of Institutionalists and their idea that markets are “social constructs made and reproduced through frameworks of socially constructed institutions and conventions” (Pike et al. 2006, p 91) local and regional institutions become much more than simple regulators of economic activity. They determine the level of activity and its efficiency. But, which kind of institutions and which channels?

The regional literature, like the national one, recognizes different forms of institutions and the different channels of influence on regional growth process (e.g. Farole 2009 for literature review). Moreover, different forms of institutions are in constant interaction and tend to affect one another in different ways (Rodríguez-Pose and Storper, 2006) which makes process of indentifying important form and channel even trickier.

Thus, up to knowledge of authors, there is no empirical study which addresses dimension of processes important for establishing institutions relevant for regional growth inequalities.

Data description and Econometric analysis

Data has been used from Eurostat database for period 2000 – 2007. Considering the fact that we used data for regional inequalities on NUTS II level, the dataset allows us to work with a sample of 18 European Union countries (see list of countries in the Appendix 1.).

The regional inequalities is measured by the sum of the absolute differences between regional (NUTS II level) and national GDP per inhabitant, weighted with the share of population and expressed in percent of the national GDP per inhabitant. The indicator is calculated from regional GDP figures based on the European System of Accounts (ESA95). The dispersion of regional GDP is zero when the GDP per inhabitant in all regions of a country is identical, and it rises if there is an increase in the distance between a region's GDP per inhabitant and the country mean. This measure of regional inequality has been chosen for two reasons. Firstly, it is the most important measure of regional inequality in European Union considering that it is the single available measure on the official statistical web page of European Union, Eurostat. Second, even more important reason, is the fact that this measure fulfills the standards introduced by Portnov and Felsenstein (2010) which are used to test sensitivity of commonly used income inequality measures to changes in the ranking, size and number of regions into which a country is divided.

Taking into consideration that defining institutions is notoriously difficult, it is even more challenging to choose an adequate measure for the institutions, or more precisely, appropriate proxy variable. However, we choose variable that has been proposed by World Bank for measuring quality of governance, Worldwide Governance Indicator (WGI). The reason is resemblance between their definition of governance and institutions. Although there is no strong consensus around a single definition of governance, the definition offered by the Kaufmann et al (2010) in *World governance indicator – Methodology an analytical issues* defines governance as "*rules, enforcement mechanisms, and organizations*" which covers essential part of institutional definition and candidates WGI indicator for appropriate proxy variable for institutional quality. The WGI covers over 200 countries and territories, measuring six dimensions of governance starting in 1996: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The aggregate indicators are based on several hundred individual underlying variables, taken from a wide variety of existing data sources and reflect the view on governance of survey respondents and public, private, and NGO sector experts worldwide. The broad aspect of the WGI permit meaningful cross-country and over-

time comparisons (Kaufmann et. al, 2010) which allows us to test which dimension of institutions is relevant for regional inequalities.

Taking assumption that regional inequalities were influenced by the institution only is rather restrictive and results can potentially suffer from the omission of other (possibly) significant determinants of regional inequalities. Thus we test whether the relationship between regional inequalities and institutions holds when including additional explanatory variables. In this regard, we would ideally like to include all potential determinants as suggested by the existing empirical growth and trade literature. In practice, however, regional data on these aspects are rarely available and/or of poor quality and we thus chose to focus on a limited number of variables. In process of choosing variables we follow the paper by Barrios and Strobl (2009).

The first explanatory variable considered is a measure of national trade openness. The inclusion of this can be seen as important given the technological spillovers, which have been found to be important in the literature for regional inequalities, are related to trade intensity (Coe and Helpman, 1995, Gianetti 2002). The empirical literature on trade and growth generally uses the ratio of total trade (import+export) to GDP in order to measure trade openness. However, Alcalá and Ciccone (2004) have criticized the use of this index and propose instead alternative indices: the real openness index, which is the sum of imports plus exports expressed in common currency (here the euro) relative to the GDP expressed in PPP terms and that indices has been confirmed by Barrios and Strobl (2009).

The second variable to be considered is a measure of fiscal decentralization, which also may have been a cause of regional divergence in the EU (Rodríguez-Pose, 1996, Rodríguez-Pose and Gill, 2003). The literature point out the Oates theorem on fiscal decentralization according to which differences in preferences about public goods across regions will require decentralized provision of such goods in order to improve regional economic performance¹. In order to control for the possible influence of fiscal decentralization we use the indicator expressed as the sum of the shares of local and state revenues as a percentage of national GDP.

The third additional explanatory variable is a measure of the impact of EU regional policy. As it was stressed before, the main objective of the EU policy is to increase convergence in EU regions and countries. Although the evidence on the effective impact of EU structural funds

¹ In contrast, other authors have found rather contradictory results finding little evidence for a significant effect of fiscal decentralization on regional growth; see, for instance, Xie et al. (1999) and Davoodi and Zou (1998). The question of the relationship between fiscal decentralization and regional inequalities thus appears to be an empirical one.

are controversial (see Boldrin and Canova, 2001, Beugelsdijk and Eijffinger, 2003, De la Fuente, 2002, Becker et al, 2010,) we use the level of Structural Funds per capita as a control variable.

The last variable to be considered is a measure of regional industrial specialization. Here we use the country/year average of the so-called adjusted Krugman specialization index (AK). The Krugman index (K) corresponds to the expression: $K_{j,k,t} = 0.5 \sum | X_{s,j,t} - X_{s,k,t} |$ where $X_{s,j,t}$ is the share of sector s in total employment of region j at a given year t , and $X_{s,k,t}$ is the share of sector s in total employment of region k at a given year t . Considering that Krugman index has not been confirmed as significant in research by Barrios and Strobl (2009), we have tested adjusted Krugman index which corresponds to the following expression: $AK_{j,c,t} = 0.5 \sum | X_{s,j,t} - X_{s,c,t} |$ where $X_{s,j,t}$ is the share of sector s in total employment of region j at a given year t , and $X_{s,c,t}$ is the share of sector s in total employment of country c at a given year t .

Table 1. Dispersion of regional (NUTS II level) GDP per capita (ppp) for period 2000.-2007.

Country	Regional inequalities
Belgium	25.3
Bulgaria	25.5
Czech Republic	24.7
Denmark*	15
Germany	17.5
Greece	24.6
Spain	19.2
France	20.4
Hungary	35.1
Netherlands	11.2
Austria	17.4
Poland	18.7
Portugal	22.7
Romania	25.1
Slovakia	28.8
Finland	16.2
Sweden	15.2
United Kingdom	22.3

* Available data for year 2000 and period 2005-2007.

Source: Eurostat

Before turning to the econometric testing of the hypothesis, we provide some descriptive statistics regarding the regional GDP per capita inequalities for period 2000 – 2007 for selected 18 EU countries (Table 1.).

According to the Table 1 Hungary is the country with the highest regional inequalities. The country with the lowest level of inequalities is Netherlands. Obviously, table shows that new member state countries display, on average, higher regional inequalities than old member states. This information and the Table 2 with summary statistics present proper introduction to our hypothesis.

Table 2. Summary statistics

	Mean	Overall Standard Deviation	Between Standard Deviation	Within Standard Deviation	Minimum	Maximum	Obs
disp	21.575	5.8548	5.7744	1.6787	10.6	37.8	140
AK	0.0766	0.0486	0.4647	0.0143	0.0094	0.3023	175
Sfpercapita	59.6678	75.5752	65.0856	40.2146	0	392.5347	270
Fiscal decen	11.9851	7.4732	7.4937	1.2538	0.6	36.6	270
Realopeness	1043.21	4084.473	4095.599	642.8103	23.6989	26547.55	269
I	1.1174	0.4661	0.4672	0.0787	-0.0759	1.900	243
CC	1.1154	0.7490	0.7506	0.1274	-0.3430	2.4665	243
PV	0.8537	0.3651	0.3358	0.1559	-0.1798	1.5768	243
VA	1.1751	0.3139	0.3091	0.0781	0.3440	1.8266	243
GE	1.2036	0.6028	0.5933	0.1515	-0.1266	2.124	243
RL	1.1316	0.5690	0.5705	0.0949	-0.1555	1.9640	243
RQ	1.225	0.4008	0.3921	0.1094	-0.1045	2.0120	243

Source: Calculation by authors

After introducing the descriptive statistics we can present econometric methods for challenging two key dimensions of our research. First tackles the importance of institution quality for regional inequalities in EU countries and second tries to recognize which dimension of the institutional quality is important for pattern of regional imbalances.

Following our hypotheses, the relative level of institutional quality, here denoted as I , of a country should explain where this country lies in terms of regional inequalities, represented by Y , expecting that the countries with poorer institutional quality experience higher regional imbalances. To test the relationship between Y and X it is required to introduce other explanatory variables, included in the matrix X .

Thus, starting point for the empirical confirmation is the model with the structure:

$$Y_{it} = \alpha + X_{it}^T \beta + \delta I_{it} + \varepsilon_{it} \quad (1)$$

where Y_{it} represents measure for regional inequalities measured by the sum of the absolute differences between regional (NUTS II level) and national GDP per inhabitant, weighted with

the share of population and expressed in percent of the national GDP per inhabitant in county i for a period t. Vector X_{it}^T presents control variable vector with dimensions 1 x k in county i for a period t and variable I_{it} institution quality in county i for a period t.

As it was stressed before, control variables were chosen based on paper written by Barrios and Strobl (2009) in which national trade openness is measured by real trade index, regional industrial specialization is measured by adjusted Krugman index, fiscal decentralization is measured by sum of shares of local and state revenues in GDP, EU regional policy is measured by amount of Structural funds per capita and institution quality is measured by WGI indicator which includes six dimension of indicator quality (Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption) in county i for a period t.

It is assumed that ε_{it} are $IID(0, \sigma_\varepsilon^2)$; identically and independently distributed error terms. It is essential that we allow for dynamics in behavior of regional inequalities indicator. Thus we introduce modified equation which includes dynamic behavior of dependent variable characterized by the presence of lagged dependent variable among the regressors.

$$Y_{it} = \alpha + \eta Y_{it-1} + X_{it}^T \beta + \delta I_{it} + \varepsilon_{it} \quad (1)$$

The dynamic OLS estimator is biased and inconsistent even if ε_{it} are not correlated. As a result, a new method for estimation was required. Arellano and Bond (1991) proposed new estimator for the dynamic panel model. In paper two step Arellano and Bond GMM estimator is used because one step estimation assumes the error terms to be independent and homoskedastic across counties and over time. Two step estimator relaxes the assumption of independence and homoscedasticity by using the residuals obtained from the first step estimation to construct a consistent estimate of the variance-covariance matrix. Thus, when the error term ε_{it} is heteroskedastic the two step estimator is more efficient (Cole, Moshirian and Wu, 2008)

Blundell and Bond (1998) proposed improvement of Arellano Bond estimator. That approach imposes an additional restriction on initial conditions process, under which all available the moment conditions available can be exploited by a linear GMM estimator in system of first differenced and levels equations. System GMM estimator can improve performance of usual Arellano Bond estimator when the autoregressive parameter is moderately high and number of time-series observations is moderately small. For the econometric model of these research

Arellano Bond estimator is good because all values of lagged dependent variable are around 0.63. Further, system GMM is not appropriate to use with dataset with small number of countries such as in this research where number of countries is 18.

All aforementioned econometric details have been integrated in our analysis with the results present in Table 3. The Table 3 offers negative and significant coefficient for institutional quality which could be interpreted as evidence for the first contribution of the paper, an evidence for hypothesis that institutional quality has important negative influence on the level of regional inequalities.

Table 3. The results of two step Arellano-Bond dynamic panel estimator

Variable	Model
Const.	10.7997***
Lagged disp2	0.6918***
AK	-4.0518
SFpercapita	0.0071***
Fiscal decen	-0.1565***
Realopeness	-0.0001**
I	-1.6761**
Number of observation	84
Sargan test (p-value)	0.4512
m1-test (p-value)	0.1081
m2-test (p-value)	0.7611

Correlation coefficients

Variable	AK	Sfpercapita	Fiscal decen	Realopeness	I
AK	1				
Sfpercapita	0.1478	1			
Fiscal decen	-0.33	-0.169	1		
Realopeness	-0.0999	-0.0434	0.0306	1	
I	-0.5393	-0.0175	0.513	-0.07	1

Source: Calculation by authors

It should be stressed that diagnostic tests (Sargan test and m_2 statistics) for estimated model in Table 3 are satisfying at 5 % confidence level and therefore proposed model is well specified. The correlation coefficients between each of the variables are reported in the lower part of the Table 3. The highest coefficient of correlation is – 0.5393 and it indicates that we should not expected high risk of multicollinearity problem between variables of our interest. The coefficients on control variables are all statistical significant. Only exception is adjusted Krugman index but it is in line with results from paper by Barrios and Strobl (2009).

Deviation of coefficients on control variables from expected signs can be reasonably explained and they do not influence value of coefficient of our main interest².

Relevance of the institution quality should not be an enormous surprise. After all, the literature already indicates that institutions should be important force in regional growth process (e.g. Farole et al, 2009). But, how the institutional factors contribute to the regional inequalities or how institutions shape the ability of an economy to use and develop its resources in particular ways? These questions are still looking for the answer. Thus, the next part of research investigates which processes of the institution quality are important for regional inequalities. To do so, we use six indicators included in WGI. The indicators are: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption.

1. Voice and Accountability (VA) – captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

2. Political Stability and Absence of Violence/Terrorism (PV) – captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

3. Government Effectiveness (GE) – captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

4. Regulatory Quality (RQ) – captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

5. Rule of Law (RL) – captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

6. Control of Corruption (CC) – captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

² Statistically significant positive effect of Structural funds for regional inequalities is direct consequences of propositions and short period of implementation. Although coefficient on real openness do not have expected sign, due to small value (influence) on regional inequalities could not be recognized as statistically significant.

The first two indicators represent the process by which governments are selected, monitored, and replaced, third and fourth indicators represent process which boots the capacity of the government to effectively formulate and implement sound policies and last two indicators represent the process which elevate the respect of citizens and the state for the institutions that govern economic and social interactions among them.

The indicators are based on several hundred variables obtained from 31 different data sources, which allow them to be comprehensive and representative pointers of different dimensions of institutional frame.

The next step of the research starts by testing the significance of indicators for regional inequalities in EU. For that purpose we will use model with the structure:

$$Y_{it} = \alpha + X_{it}^T \beta + \delta In_{it} + \varepsilon_{it} \quad (2)$$

where Y_{it} and X_{it}^T presents the identical measures introduced in equations (1). Variable In_{it} represents n dimensions of institution quality measured by different indicators (n = 1 to 6, where 1 stands for Voice and Accountability (VA), 2 for Political Stability and Absence of Violence/Terrorism (PA), 3 for Government Effectiveness(GE), 4 for Regulatory Quality(RQ), 5 for Rule of Law (RL) and 6 for Control of Corruption (CC)).

Table 4. Correlation coefficients of institutional quality indicators

Variable	CC	PV	VA	GE	RL	RQ
CC	1					
PV	0.5838	1				
VA	0.9096	0.64	1			
GE	0.949	0.6063	0.9142	1		
RL	0.948	0.6476	0.9282	0.9422	1	
RQ	0.8794	0.5823	0.8664	0.9023	0.8967	1

Source: Calculation by authors

The results represent in Table 4 indicate that we should expect high risk of multicollinearity problem between these variables and that we should test these indicators separately. Therefore, there are six models, each including control variable vector and different indicator for institutional quality. Thus, first model includes Voice and accountability indicator, second includes Political stability and absence of violence/terrorism indicator, third model includes Government Effectiveness indicator, fourth Regulatory Quality indicator, fifth Rule of Law indicator and sixth model Control of Corruption indicator.

Due to reasons explained with the results in Table 3 we have used adjusted Two-step Arellano and Bond GMM estimator. The Table 5 encompasses results of the testing these six models.

The models reveal the role of different dimensions of institutional quality for regional inequalities, recognizing key dimensions presented by Voice and accountability indicator, Rule of Law indicator and Control of Corruption indicator.

Table 5. The results of two step Arellano-Bond dynamic panel estimator for six indicators of WGI

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Const.	9.6130***	9.0647***	9.9428***	13.26931***	12.3103***	12.5813***
Lagged disp2	0.6877***	0.6520***	0.7329***	0.5383***	0.6479***	0.5929***
AK	-7.33425	-18.72206**	2.379746	-38.40294***	-2.9778	-11.71705
SFpercapita	0.0817***	0.0077***	0.00871***	0.011351***	0.0085***	0.00689***
Fiscal decen	-0.0981*	-0.0683	-0.2045***	-0.1112	-0.1248**	-0.1237**
Realopeness	-0.00007*	-5.0000	-0.00017***	-0.00014***	-0.00008	-0.00004
Voice and Accountability (VA)	-1.0111***					
Political Stability and Absence of Violence/Terrorism (PV)		0.377292*				
Government Effectiveness (GE)			-1.142454*			
Regulatory Quality (RQ)				0.2635324		
Rule of Law (RL)					-2.721868***	
Control of Corruption (CC)						-1.364107***
Number of observations	84	84	84	84	84	84
Sargan test (p-value)	0.5373	0.5721	0.3584	0.1796	0.3304	0.4064
m1-test (p-value)	0.0895	0.0974	0.1236	0.1977	0.0925	0.1141
m2-test (p-value)	0.8835	0.9344	0.8104	0.6936	0.8092	0.5929
*, **, ***- indicate significance at 10%, 5% and 1% level						
Source: Calculation by authors						

Correlation coefficients

Variable	CC	PV	VA	GE	RL	RQ
AK	-0.4594	-0.3888	-0.55	-0.532	-0.4975	-0.6299
Sfpercapita	-0.0647	-0.0544	0.0434	-0.0127	0.0205	0.0043
Fiscal decen	0.5715	0.2088	0.5141	0.5419	0.4628	0.4463
Realopeness	-0.1237	0.0263	-0.0334	-0.0914	-0.0711	-0.0169

Source: Calculation by authors

It should be stressed that diagnostic tests (Sargan test and m_2 statistics) for estimated models in Table 5 are satisfying at 5 % confidence level and therefore proposed model is well specified. The correlation coefficients between each of the variables are reported in the lower part of the Table 5. The highest coefficient of correlation is -0.6299 for adjusted Krugman

index and Regulatory quality and it could be used as explanation for fact that coefficient of Regulatory quality is not statistical significant. The other coefficients indicate that we should not expected high risk of multicollinearity problem between variables of our interest.

The confirmation Voice and accountability indicator, Rule of Law indicator and Control of Corruption indicator show that for regional growth inequalities are the most important processes that elevate the respect of citizens and the state for the institutions that govern economic and social interactions among them and, to some extent process by which governments are selected, monitored, and replaced. Process which boots the capacity of the government to effectively formulate and implement sound policies has showed not significant for regional growth pattern. Confirmation of the Rule of Law indicator and Control of Corruption indicator identifies the main channel through which institutions enter into the production function to shape patterns of economic growth at regional level. The existence of standard 'rules of engagement' backed by a stable and robust rule of law and control of corruption reduce transactions costs by lowering uncertainty and facilitating the mutual trustworthiness of individual economic agents. Such an environment facilitates technical progress by providing the appropriate incentives for innovation through patent, trademark, and other intellectual property laws as well as competition law proved at national level by several authors (North 1990; Aghion and Howitt, 2005 Acemoglu and Johnson 2004; Vijayaraghavan and Ward 2001; Rodrik, Subramanian, and Trebbi, 2004). Importance of Voice and accountability indicator, as a signal for functioning of the political frame, indicates that on the regional level institutions also shape economic outcomes indirectly through political channels, in terms of both policy and the performance of the government bureaucracy. This verifies the literature (Tabellini, 2005; Acemoglu, Johnson, and Robinson, 2005;) that argues that this is the fundamental channel through which institutions determine economic outcomes at the national level. Formal rules can level the playing field and ensure that participation is open to all. Where groups compete for power, these societal institutions can mitigate conflict by protecting minorities, guaranteeing basic freedoms, and facilitating cooperation for public goods provision. Equally they can be used to close off political competition and suppress participation from some groups within society. A large number of studies (La Porta et al 1999; Stasavage, 2000; Aghion, Alesina, and Trebbi, 2002) have shown that openness of political and economic participation, political competition, and the existence of 'checks and balances' are critical for the link between institutional quality and economic growth.

Summary and Conclusion

In this paper we examined the link between institution and regional inequalities for a number of European Union countries and found evidence of a relationship between these two variables.

Confirmation of the relevance of the institution quality is in line with the literature that already indicates that institutions are important force in regional growth process (e.g. Farole et al, 2009). But, how institutional factors contribute to the regional inequalities or which channels are used so that “human devised constraints” might enter into the production function to shape patterns of regional economic growth is area where we look for the main contribution of this paper.

The results show that for regional growth inequalities in EU the most important processes are those that elevate the respect of citizens and the state for the institutions that govern economic and social interactions among them. These processes reduce transactions costs by lowering uncertainty and facilitating the mutual trustworthiness of individual economic agents.

Also, it has been shown, to some extent that process by which governments are selected, monitored, and replaced are important for regional growth pattern indicating that on regional level institutions also shape economic outcomes indirectly through political channels, in terms of both policy and the performance of the government bureaucracy.

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Appendix 1.

List of the countries included in research

- Austria
- Belgium
- Bulgaria
- Czech Republic
- Denmark
- Finland
- France
- Germany
- Greece
- Hungary
- Netherlands
- Poland
- Portugal
- Romania
- Slovakia
- Spain
- Sweden
- United Kingdom