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## The Impact of Institutional Quality on Regional Innovation Performance of EU Countries

### Abstract

One of the key attributes of a competitive economy is the ability to innovate. This ability depends not only on technological progress and capital, but also on the environment in which innovations are implemented. There are significant differences in national economic performance among states and there exist even bigger differences at the regional levels. The differences are influenced by innovation potential or more precisely by innovation performance of individual nations or regions which are evaluated within the EU through regular reports of the European Innovation Newsletter. Activities leading to innovations are costly and very risky. Companies are therefore looking for stable environment for their activities. Stable environment can be provided by quality institutions, which includes: conditions for starting a business (so-called start-up), clear and transparent rules when dealing with public administration, investor protection, tax burden, low corruption, competence of public administration and its integrity, equal access to information etc. Nevertheless, the main stream economy ignores more or less the influence of institutions and abstracts transaction costs, thus getting trapped when it is unable to explain why traditional instruments and approaches of neoclassic economy in development schemes often do not contribute to sustainable development. An analysis of selected institutional quality indexes – Doing Business and Corruption Perception Index – and the regional innovation performance index – Summary Innovation index – showed significant effect of these indexes on the innovation performance of countries and therefore regions.

### Key Words

*innovation, institutional quality, doing business, corruption*

**JEL Classification: O31, O43, R11, O57**

## Introduction

Institutions are the key building block in constructing a competitive and innovative economy. The innovative economy is not a static model, but it represents a dynamic system that is changing constantly and that has to develop as fast as the hi-tech industry. Institutions form juridical and regulatory frame for economic competition, enterprise, business and innovations. The purpose of this article is to prove the impact of institutional quality, illustrated by particular indexes, on regional innovation performance. The first part will provide the methodology of measuring overall innovation, whilst the second part will introduce two indicators of institutional quality and its methodology. The last part will compare these indexes and scores together, show

the results for EU 27, analyze them and confirm or refute the relationships between these variables.

## 1. Innovation

Experts regard the ability to innovate as the key factor of long term sustainable economic competition not only in countries but also in individual regions. Innovation environment depends to certain extent on entrepreneurial environment, which represents overall external conditions in which a company makes its activities. It includes not only a legislative and support frame of enterprise, but also human resources, knowledge and information, size and structure of local economy, socio-cultural and natural environment etc. Creation and implementation of modern strategies and instruments of economic development require an operation analysis, continuous monitoring of regional innovation systems, as well as studies of factors that influence this process. For instance, Šimanová and Trešl [11] perceive the quality of innovation environment as the key factor of the embedding of direct foreign investment in the region. This not only reduces risk investment outflows, but also increases significantly regional non-price competitiveness.

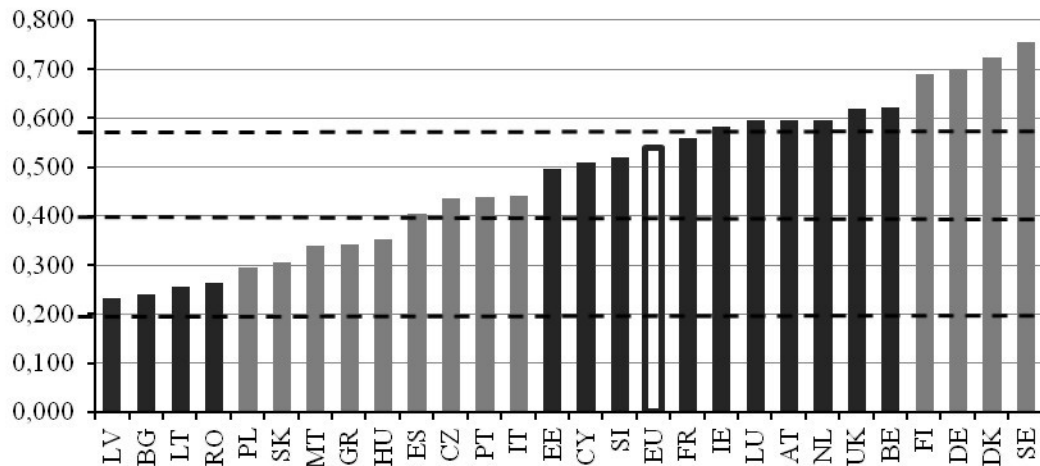
**Innovations** arise as a result of coordinated investments in know-how, human resources, infrastructure and corporate capital. They require cooperation of the government, university and corporate sector at the state and regional level. Innovations were defined and classified by many authors, e.g. Schumpeter [9], Drucker [3], Schwab [10], Valenta [14] etc. The ability to support and develop innovation is a prerequisite for sustainability and growth of economical performance. According to World Economic Forum (WEF), only innovations can increase the standard of living in the long-term point of view [10]. There are significant differences in national economic performance among states and there exist even bigger differences at the regional levels. The differences are influenced by innovation potential or more precisely by innovation performance of individual nations or regions which are evaluated within the EU through regular reports of the European Innovation Newsletter. It was first published by the European Innovation Scoreboard (EIS) in 2000. A major tool for international comparison of innovation environment and performance in EU countries is Summary Innovation Index [6].

**Summary Innovation Index (SII)** consists of 24 coefficients that are ranked into three main groups (activators, company activities and outputs) and eight categories. Based on Summary Innovation Index, there are evaluated innovation sources (human resources and funds), innovation activities of companies (investment, innovation outputs, registered patents etc.), and results in innovation (volume and percentage of implemented innovations, employment in industries with high added value etc.) According to SII, countries are divided into: (see Figure 1)

- **innovation leaders** (e.g. Sweden, Denmark, Finland, Germany)
- **innovation followers** (e.g. Austria, Belgium, France, Ireland, Luxembourg) whose innovation performance is above the EU average

- **average innovation countries** (e.g. the Czech Republic, Greece, Italy, Spain, Portugal, Slovakia)
- **catching-up countries** (e.g. Bulgaria, Latvia, Lithuania, Romania)

**Fig. 1 Innovation performance of European countries according to SII 2011**



Note: Innovation performance of leaders is at least 20 % higher than EU-27 average; innovation performance of followers fluctuates between -10 % and +20 % of EU-27 average; average innovative countries show the value between -10 % and +50 % of EU-27 average; catching-up countries are below 50 % of EU-27 average.

Source: [6, p.12]

Parallel with the evaluation of national innovation performance there appeared some tendencies to evaluate EU regional innovation performance. Since some data were not available, the evaluation was restricted to NUTS2 regions. **Regional Summary Innovation Index (RIS)** differs in structure from the national innovation index because the regional data for all indicators are not available. **RIS** was based on seven indicators that included human resources in science and research, participation in lifelong learning, public and corporate expenditures on science and research, employment in the area of medium and hi-tech production and services, and, finally, on the number of patents registered by the European Patent Office EPO. In 2009 innovation performance evaluation of NUTS2 regions was processed based on 16 out of 24 EIS indicators. This evaluation followed the European Regional Innovation Newsletter 2009 and presented the following conclusions [4]:

- In the regional innovation performance, there are significant differences not only among countries but also within these countries. The most heterogeneous countries are the Czech Republic, Spain and Italy.
- The highest number of innovation regions is in the most innovative countries.
- Regions show different strengths and weaknesses in all evaluated groups of indicators (innovation sources, corporate activities and innovation outputs).
- Regional innovation performance is relatively stable and does not change.
- According to the innovation performance index, the regions are classified into five groups: regions with high performance, with medium-high performance, with average performance, bellow average performance and low performance.

The regional level of innovation performance has a major impact on the economic growth of each country as well as on creating and implementing related strategies whether it concerns regional, industrial, scientific research or educational strategies that are related to the current existing paradigms. These highlight the role of regions when raising competitiveness by means of developing regional clusters, regional innovation systems, regional competitive advantages, regional know-how centers etc.

Although innovations represent a major aspect of successful corporate development in the long term, activities leading towards innovations are expensive and very risky. Companies therefore tend to look for **stable environment**. Such environment can be ensured by quality institutions among which there belong: conditions for setting up a business (so-called start-ups), clear and transparent rules for dealing with public administration authorities, investor protection, tax burden, low corruption, public administration authorities competency and integrity, equal access to information etc.

For example, according to the long-term research “**Politics and Regional Growth**” of BAK Basel Economics (specializing in international regional comparison), innovation strategies should concentrate on general conditions framework rather than on innovative company micromanagement. This means they should concentrate on institutional quality as, for instance, regulation burden and its impact on the innovation ability of economy [5].

## 2. Institutions

The concept of **institution** is most often defined as a certain set of rules in a society, or institutions are seen as specific organizations. Rules are both written, defined clearly in particular in the legislative system, and unwritten thus reflecting the behavior of individual market players. These rules affect business and legislative environment, law enforcement and also quality and standard of living in individual countries.

However, the question is why deal with institutions and their quality in economic issues such as growth, development, innovation, etc? Institutional economists use the elementary paradigm “Growth and development depend significantly on current valid institutions” [15. p.11] as their platform. As Robert Fogele and Douglas C. North, who were awarded 1993 Nobel Prize for economy, in their works stated, a mere technological change cannot explain increased productivity and economic growth. Institutions together with technology determine transaction and transformation costs that represent total production costs [8]. The absence of institutional stability raises both producer and consumer costs. Ownership rights are elementary part of each institution: their contents together with implementation costs. These rights are fundamental determinants that clarify growth and development. Nevertheless, the main stream economy ignores more or less the influence of institutions and abstracts transaction costs, thus getting trapped when it is unable to explain why traditional instruments and approaches of neoclassic economy in development schemes often do not contribute to sustainable development. Instead, they lead to strengthening economic

differences among global and national regions without supporting welfare and stability equally.

Of course, the new institutional economy faces many problems as well. One of the most important problems is the difference between formal and informal institutions: although formal rules result from political or legal decisions and thus can be changed in a very short time, informal restrictions are based on folk customs, tradition, culture or behavioral code, and they can hardly be changed. Formal rules implementation depends on their compatibility with current informal rules. That is why **institutional quality** can be defined as evaluation of the level and function of observed institutions. This evaluation is carried out by numerous international organizations by using many indexes and indicators that focus on partial aspects and rank the countries. Currently, there are many approaches to measuring and evaluating the quality of institutions, i.e. the institutional environment which can be used to characterize the influence of institutions on growth performance and competitiveness of the economy [1] [7].

For the purposes of this article, the basic soft data index **CPI (Corruption Perception Index)** was chosen, which measures a subjective opinion of managers on corruption, and hard data index **DB (Doing Business)**, which is based on the analysis of how the institutions supporting enterprise work. This index uses objective analytical methods. The indexes were chosen because of their complexity and direct impact on business environment in the particular countries.

### 3. Institutional Quality Indexes

**Corruption** reduces a country's credibility for foreign investors, reduces efficient use of sources and economic performance. It intensifies moral deterioration of society and, especially in transitive economies, it makes a cardinal problem that has a negative impact on operation of businesses entities.

Transparency International defines corruption as "the abuse of entrusted power for private benefit" [12]. **Corruption Perception Index (CPI)** focuses on corruption in the public sector, where government officials, public officials and politicians are involved. Research focuses on bribing civil servants, bribery in public procurement, or embezzlement of public funds. Further, the impact and effectiveness of anti-corruption measures in the public sector are monitored.

In general, corruption comprises illegal conduct, and so it is difficult to evaluate the absolute level of corruption based on hard empirical data (e.g. the amount of bribes paid, the number of prosecutions) – these data rather talk about the quality of the legal and judicial system. Therefore, surveys are the source of data, detecting views of business representatives and experts in the given country, while it may be residents of the surveyed countries as well as foreign experts.

**CPI 2011** evaluates the degree of perception of corruption in 183 countries, based on 17 sources of data from thirteen independent institutions. On a scale of 0 – 10, where 10

indicates a country with almost no corruption and 0 means a high level of corruption TI considers rating lower than 5 points as **rampant corruption**. Among the least corrupt countries in the world in the last assessment in 2011 there ranked New Zealand (9.5), Denmark and Finland (9.4). The lowest rating was reached by North Korea and Somalia (1.0) [14].

**DB Doing Business Index** is a project of the World Bank and it provides practical and specific information about the operation of the business environment and about the costs and administrative demands that are associated with running a business. Monitored parameters of the individual areas are assigned weights which contribute to the value of sub-indicators. Using the defined methodology, the ranking of all countries within each indicator is created. The average order of these sub-indicators creates the overall ranking of all surveyed countries, while a country's order means its index value at the same time. Countries with low index values are the best. To calculate **Doing Business Index 2012** there were used the following sub-parameters:

- **conditions for starting a business** – this includes all procedures necessary for setting up a business activity based on a model example of a business or manufacturing company with more than 50 employees and a simple ownership structure (this evaluates the number procedures, time, costs and financial aspects)
- **difficulty of obtaining building permission** – there are recorded all procedures that construction company must complete in a model example if it wants to build a ware-house (the number of procedures, time, costs for obtaining a building permit)
- **obtaining electricity connection** – the previous test case of the construction of a ware-monitors the number of procedures, days and financial costs required for obtaining electrical connections
- **ownership registration** is evaluated according to the number of procedures, days and financial costs required for the sale of a property between two businesses and the transfer of property rights
- **possibility of getting a loan** – legislation power index, index of credit information
- **protection of investors** assesses the strength of the minority investors protection against the misuse of corporate activities by managers for their enrichment (transparency of transactions, responsibility of managers for their own operations and the ability of shareholders to sue managers)
- **tax burden** – the number, the time for preparation and completion of tax returns, the share of the overall tax burden on gross profit
- **trading across borders** – documents, costs and time connected with exports and imports → **efficiency of courts in resolving commercial disputes** – procedures, costs and time for settling commercial disputes
- **declaration of insolvency** replaced the previously used closing a business. It monitors the time (in years) for which creditors get paid and the financial costs of insolvency proceedings (according to the costs and the rate of funds return that claiming entities can obtain from the insolvent companies).

#### 4. Relationships between Summary Innovation Index, Doing Business Index and Corruption Perception Index

In Table 1 there are recorded indexes SII 2011, CPI 2011 and DB 2012 (data from 2011) for European Union economies. The economies with a high innovation capability are also among the economies with the low level of corruption perception and these economies also occupy the leading positions in terms of ease of doing business. On the other hand, the countries with easy business and the high level of corruption (Lithuania and Latvia) also belong to the under-innovating countries. The exceptions are Portugal and Spain which belong to the average innovating countries although, based on the indexes, these are easy business economies with the lower level of corruption.

**Tab. 1 Indexes SII, CPI, a DB in EU (2011)**

Country	SII 2011	CPI 2012	DB 2012	Country	SII 2011	CPI 2012	DB 2012
AT	0.895	7.8	10	IT	0.441	3.9	73
SE	0.755	9.3	13	PT	0.438	6.1	30
DK	0.724	9.4	5	CZ	0.436	4.4	65
DE	0.700	8.0	20	ES	0.406	6.2	44
FI	0.691	9.4	11	HU	0.352	4.6	54
BE	0.621	7.5	33	GR	0.343	3.4	78
UK	0.62	7.8	4	MT	0.34	5.6	102
NL	0.596	8.9	31	SK	0.305	4	46
LU	0.595	8.5	56	PL	0.296	5.5	55
IE	0.582	7.5	15	RO	0.263	3.6	72
FR	0.558	7.0	34	LT	0.255	4.8	27
SI	0.521	5.9	35	BG	0.239	3.3	66
CY	0.509	6.3	36	LV	0.230	4.2	25
EE	0.496	6.4	30				

Note: Summary Innovation Index and Corruption Perception Index are presented in their value, and in the case of DB index the value is represented by the order of 183 countries evaluated.

Source: [2] [6] [12], own processing

The statistical analysis of these indexes consists of two steps. At first their mutual correlations were evaluated – see Table 2.

All three pairs of the variables are not independent, as P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level which was used for all the tests. To analyse particular pairs, DB has a negative correlation with the other indexes. The better position in DB that any state has (i.e. the lower the value of DB), the greater innovation capability exists (it means a greater value of SII). And the higher position in DB any state has, the better level of corruption perception appears there (it means a greater value of CPI). Indexes CPI and SII are positively correlated – the bigger the innovation capability, the better the level of corruption perception.

**Tab. 2 Correlations SII, CPI, DB (2011)**

	SII_11	CPI_11	DB_11
SII_11		0.8695	-0.6526
		(27)	(27)
		0.0000	0.0002
CPI_11	0.8695		-0.6909
	(27)		(27)
	0.0000		0.0001
DB_11	-0.6526	-0.6909	
	(27)	(27)	
	0.0002	0.0001	

Note: First row = Correlation. Second row = (Sample Size). Third row = P-Value

Source: own calculation

Then a linear regression model was built with SII as a dependent variable and CPI and DB as independent ones. It means

$$SII = \beta_1 + \beta_2 \cdot CPI + \beta_3 \cdot DB. \tag{1}$$

The estimated parameters are:

**Tab. 3 Estimates of Regression Parameters**

Parameter	Estimate	P-Value
$\beta_1$	0.0611	0.5862
$\beta_2$	0.0728	0.0000
$\beta_3$	-0.0007	0.4791

Source: own calculation

It means that parameters  $\beta_1$  and  $\beta_3$  are not statistically significant as their P-value is greater than the significance level  $\alpha = 0.05$ . So they will be excluded from the model. It is a corollary of the correlation of DB and CPI stated above. The recalculated model has a general form

$$SII = \beta \cdot CPI \tag{2}$$

where the estimate of  $\beta$  is

**Tab. 4 Estimates of Regression Parameters**

Parameter	Estimate	P-Value
$\beta$	0.0781	0.0000

Source: own calculation

Thus  $SII = 0,0781 \cdot CPI$ . The R-Squared statistic equals 97.217 %, so the model as fitted explains more than 97 % of the variability in SII.

Based on the regression analysis, a significant statistical dependence of SII on CPI and DB was demonstrated. The detailed analysis showed, however, that in the model with three variables, where the dependent variable is the SII again and the independent variables are CPI and DB, the level of corruption proves to be relevant to the innovation, whereas DB dropped out of the model.



## Conclusion

Quality business environment expressed by Doing Business Index and Corruption Perceptions Index determines the innovation capability of the country, with the effect of corruption has proved most. Firms in the countries with rampant corruption do not spend their resources effectively, but they use them to search for additional annuity, which ultimately reduces the innovative performance of the given region. Innovations are a prerequisite for the competitiveness of the economies. One of their basic building blocks is the institutional quality. Corrupt environment thus leads ultimately to lower competitiveness of the countries and regions themselves. It follows that corruption is not only an ethical problem, but it has a far-reaching impact on the economic and innovation performance which was proved above. Economic policy makers should therefore adopt such measures that will reduce corruption. One of the most effective means in the fight against corruption is transparency of decision-making processes at all levels of public administration and regulation of lobbying. Further research may focus on a comparison of the traditional EU members with new members, and the influence of other institutional factors on the innovation process in developed and emerging economies.

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