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## CORRELATION ANALYSIS OF INDICATORS OF REGIONAL COMPETITIVENESS: THE CASE OF THE REPUBLIC OF SERBIA

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The identification and analysis of the indicators of regional competitiveness is the most important phase of the process of measuring competitiveness. However, prior to the measurements, it is necessary to determine whether there is a high correlation between the selected indicators or not. The aim of this paper is to determine whether there is a high correlation between the most important indicators of regional competitiveness or not. The subject of this paper are the indicators of competitiveness in Serbia's regions, whose values are measured in the 2011-2013 period. For the indicators unrelated to each other or those having no logical mutual influence, no correlation was revealed. On the basis of these results, it turns out that there is a high correlation between the GDP of the region, the number of companies in the region, the number of employees, the extent of the cluster, investments in innovation and confidence in business institutions. The Pearson correlation coefficient statistical method has been used in the estimation. These data, whose measure cannot be achieved through quantitative measurement, have been obtained in the survey.

**Keywords:** regional competitiveness, indicators of regional competitiveness, correlation analysis of the indicators of regional competitiveness

JEL Classification: R10, R58, O18

### INTRODUCTION

The theory of competition is as old as economics itself as a scientific discipline. There is no representative of the school of economics who has not dealt with the issue of competition (either in terms of the international economy, or productivity, or pricing,

or consumer behavior etc.). Therefore, it can be said that the economy in the modern sense is a struggle for a market, taking into account the economic laws, principles and any other categories studied in this science. In particular, we can talk about the macro economy, human resources, finance, international relations, productivity, customer relations etc., where each of these branches or categories can differently be observed and analyzed, but where the combined effects more or less boil down to a "certain characteristic" or an output that will allow a better position in relation to another company, city, region or country.

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The term of competitiveness is widespread in the economic literature. Many economists have been explaining this term for decades, one can even say for centuries, with the key questions: How to understand this issue and what is the best possible way to do so? Which one is most important for the growth of economic wealth and the most effective for its distribution? Different authors define it differently at the level of companies, the industry, the region or the city; because of the complexity of the term, however, there is no generally accepted definition. The wider term of competitiveness refers to the propensity and skill of competition, the ability to win and retain a market position, and increase the market share and profitability. Hence, the term of competitiveness means the success of a business. Due to the complexity of the concept, a variety of factors and the nature of the competitive process, the term of competitiveness is difficult to explain and often confusing, especially at the regional level (Snieška & Bruneckienė, 2009).

The level which competitiveness is defined at is the most important aspect of this concept (Annoni & Kozovski 2010; Kitson *et al*, 2004). The indicators of regional competitiveness provide important information about the "strength" of the region to achieve an adequate economic performance, provide appropriate social care and quality infrastructure, generate innovation, develop human capital, possess geographical and natural potentials, have adequate institutions and promote culture and develop tourism. Competitiveness can be possible to measure by identifying, selecting and analyzing these indicators.

The subject of this paper are the indicators of competitiveness observed in the regions of Šumadija and Western Serbia, in Belgrade, Vojvodina, Eastern and Southern Serbia, as well as in the region of Kosovo and Metohija (for which data are not or are hardly available) in the period 2011-2013. The objective of this paper is to determine the correlation of the observed indicators. The paper does not deal with the issue of the indicator values and their comparison with the same competitors' indicators, but rather with their correlation dependence. The measurement of the indicators and their analysis have a full scientific and practical significance only in the case of the highly-correlated indicators of competitiveness. Such

a correlation must exist for related or associated indicators, rather than for all of the groups of indicators. For example, a high degree of correlation is expected between the group of economic indicators (high employment correlated with the GDP growth) or institutional indicators (the quality of the business environment is positively correlated with an increase in the number of companies), but these indicators are not expected to be positively correlated with the indicators of a natural environment or social indicators (a high correlation between the indicators of the number of housings and the amount of waste water). Based on the defined research objectives, this paper starts from the following hypothesis:

H: There is a correlation of the indicators of regional competitiveness.

The paper is structured in the following manner: after the introductory section, where the problems of the research and the hypothesis are defined, the theoretical background is presented, with the reference to the international literature. Further, the research methodology will be discussed in a separate section. Finally, the results of the researched problems and the conclusion are presented. The data representing the values of the indicators have been obtained in the following manner: a) the quantitative data have been obtained from the Statistical Office of the Republic of Serbia, the National Bank of Serbia and the Serbian Business Registers Agency; b) the qualitative data have been obtained through surveys.

## THEORETICAL APPROACH

The economy of the entire country and the world economy directly depend on the the economic and social sustainability of regions and their ability to be competitive. If the applied regional competitiveness strategy is not effective and also when the factors of competitiveness are not being fully utilized, then regions (or a region) will lose their competitive position and there will be a negative impact on national competitiveness (Vuković, 2013). In order to avoid a possible risk of a loss of a competitive position, it is necessary that regional competitiveness be measured.

Therefore, the measurement of competitiveness is the most important stage in strategic planning in order to improve regional and national competitiveness. Despite the growing interest of the scientific literature in the problem of regional competitiveness (Porter, 1990; Rugman *et al*, 1998; Cho & Moon, 2000; Reiljan *et al*, 2000; The European Commission, 1999, 2001; Gardiner *et al*, 2004; Martin, 2005; Lengyel, 2004; Houvari *et al*, 2001; OECD 1997; Boschma, 2004; Cho, 2005; Vuković *et al*, 2012), the theoretical explanations of this concept are amongst the most difficult and complicated ones in the economy. The competitiveness of a region can be expressed in various ways: by analyzing one or more factors of competitiveness, by using theoretical models of competitiveness, by the creating of a composite index, by combining several methods etc. In measuring regional competitiveness, a number of authors (Lengyel, 2004; Kitson *et al*, 2004; de Vet *et al*, 2004; Huggins, 2003) showed that competitiveness cannot only be based on the measurement of economic and social factors and their indicators, but a multifactorial complex measurement must be performed (Freudenberg, 2003; Wignaraja *et al*, 2004; IMD 2004; Giovannini *et al*, 2005; Saisana *et al*, 2005; Huggins, 2003; Snieška & Bruneckienė 2009; Vuković 2013). Thus, the identification of the indicators of regional competitiveness, which are an integral part of the factors of regional competitiveness, stands for the most important aspect of the analysis of regional competitiveness.

How does the international literature define the term of competitiveness? The macroeconomic concept of competitiveness is difficult to define and includes many controversies (The European Commission, 2003). In spite of the fact that the improvement of economic and regional competitiveness is often presented as the main goal of an economic policy, a lack of generally accepted definitions is an important argument stating that: It is dangerous to link the central policy to competitiveness-related issues. P. Krugman (1994) goes further, arguing that the concept of national competitiveness is meaningless, referring to it as a "dangerous obsession" for the following three key reasons:

- It is misleading and inaccurate to make analogies between nations (the economy) and the company.

For example, unsuccessful firms will be driven out of the market, but there is no such "bottom line" equivalent for a nation.

- When companies compete for a market share, then one company's success is achieved to the detriment of other less successful ones (which suffer higher costs). This rule cannot be applied to a national economy, because one economy's or one region's success rather improves than distorts international trade (other countries). This effect is referred to as the "zero sums" game.
- If competitiveness makes a sense, it is simply another way of expressing productivity. The growth of living standards in a country essentially depends on the rate of productivity growth.

According to the definition provided by The World Economic Forum, competitiveness is a set of institutions, policies and factors determining the level of the productivity of a country (Schwab & Porter, 2007). At the micro level, competitiveness is the ability of companies to compete, grow and be profitable (Martin *et al*, 2006; Powell, 2001), or the ability of a company to produce and sell products and services at a lower price compared to its competitors, or with other non-price factors more attractive than a competing bid (IMD, 2000). In other words, competitiveness is defined as a company's ability to consistently and profitably produce an output satisfying the requirements of an open market in terms of price, quality etc. Most often, the micro level of competitiveness refers to a company's performance (Domanović, 2013). Even though these are two different aspects, the two views of competitiveness, there is a strong and direct connection between the macro and micro levels (Schwab & Porter, 2007). Many authors, including P. Krugman (1994, 1996), considered that the definition of competitiveness refers to productivity, which measures the value of goods and services per unit of factor produced in a particular territory. According to these authors, the aims of competitiveness are related to achieving higher productivity, which affects the growth of the living standards.

Between the macro and micro levels of competition, the concept of regional competitiveness is defined. According to the original meaning covered in the

Global Competitiveness Index (the World Economic Forum), it may implicitly be understood that regional competitiveness is the level of the quality of life in one region. Also, regional competitiveness can be expressed as the ability to attract production factors. The term of regional competitiveness can neither be expressed as macro- nor microeconomic determinants because the regions are not simply the scaled versions of a particular nation or just an aggregate expression of companies in a regional space (Ward, 2005; Gardiner *et al.*, 2004). Therefore, competitiveness at a regional level does not only result from macroeconomic stability or entrepreneurship at a micro level, but from new forms of competitiveness inclusive of a regional component (Annoni & Kozovski, 2010). According to J. Meyer-Stamer (2008), the competitiveness of a territory is the ability of localities or regions to produce a high and rising income as well as to improve the living standards of the people living in that particular territory. This definition focuses on a close relationship between regional competitiveness and regional prosperity, characterizing not only the terms of "output relations" (such as productivity) but also overall economic performances (Bristow, 2005). R. Huggins (2003) points out that local and regional competitiveness occurs only when sustainable growth is achieved in the cost of labor, which affects the growth of the living standards.

Defining the term of regional competitiveness is a very difficult task to do, because there is still no generally accepted definition (Vukovic & Wei, 2010). One of the most commonly used definitions, or perhaps more appropriately "the least disputed one", is the definition provided by the European Commission (1999), where the competitiveness of a region is defined as its ability to produce goods and services that meet international market criteria, simultaneously maintaining a high and sustainable level of income. Generally speaking, the competitiveness of a region is its ability to produce, while at the same time being exposed to external competition, with relatively high levels of income and employment.

According to M. Porter (1990), if a government creates such a business environment where favorable conditions for business exist and where the government is doing the best it can to support companies performing their operations on the local

and global markets, these conditions represent the nation's competitive advantage. According to the same author, this argument can also be implemented on a regional level. P. Krugman does not agree with M. Porter: "The idea that the welfare and economic performances of a state depend on its success on the global market is a hypothesis and does not necessarily imply truth; moreover, the practical and empirical views proved this hypothesis to be completely wrong" (1994, 30). The same author believes that the world leading nations are not competing with one another and that there is no "significant degree of competition" among them. Many authors (Krugman, 1994, 31-34; Kern, 2005, 173; Ručinska & Ručinsky, 2007, 904) consider that competition between companies and regions cannot be compared. Companies can enter or exit from a market depending on their success, but regions cannot leave their territories regardless of their success. On the basis of this, it is possible to emphasize the main difference between the competitiveness of a company and a region: Companies fight with each other and can improve their position in the market by ousting another company or worsen the position of another company (the Pareto Optimum), while regions can improve their positions simultaneously without jeopardizing the positions of other regions.

The competitiveness of a region can be seen in two ways: First, through specific drivers providing a region with an opportunity to use its competitive advantage and compete with other regions; and second, through the results (incomes) achieved using specific factors and indicators. Bearing in mind the aforesaid, some papers analyze competitiveness based on a cumulative result created by the existence of different factors and the indicators a region possesses, while some analyze regional drivers (Rucinski & Ručinský, 2007). These drivers of regional competitiveness, or in other words these inherited conditions of competition, represent regional facilities that make such a region specific: infrastructure facilities, security, the technical characteristics of the region, natural resources, the level and scope of services, the number of enterprises, the quality and availability of labor, the number and quality of educational institutions, the quality of the public administration, the historical frame of the region. When competition is based on a particular

outcome, then it comes down to regional economic development indicators such as the regional GDP per capita, the unemployment rate, the average wage, the foreign direct investment, the innovation (Joksimović, 2008) etc. The drivers of competitiveness can be intangible indicators, such as confidence. According to V. Leković (2012), investments are not possible without confidence. Transaction costs increase, which accordingly creates serious obstacles in functioning and development. Informal institutions are also used as an indicator: the quality of the business environment, the extent of clusters and other indicators listed as intangible.

## RESEARCH METHODOLOGY

Numerous data are included using the method of a statistical analysis, required for determining the value of an indicator. These data can include: the education structure of the population, the physical infrastructure, patents, scientific projects in the country and abroad, the gross domestic product, business entities, initiated and completed bankruptcy proceedings, the productivity of workers, employment and unemployment rates, investment in capital assets, gross incomes, consumption, tourism facilities and so on. According to the result lists of the Statistical Office of the Republic of Serbia, the Republic Geodetic Authority and other relevant institutions of the Republic of Serbia, a considerable amount of the research data have been collected. Those data not included in these institutions' lists were generated from the sample created by the survey. The data have only been collected by means of the techniques, instruments and methods of a statistical analysis.

Both the quantitative and the qualitative data have been collected by means of this method. The general scientific statistical method is faced with all kinds of data that can be expressed in numerical indicators, i.e. all of those which can quantitatively be expressed. At the same time, for each quantified statement is related to the measurement, so this method almost identified with the measurements. The collected data show certain properties (or the quality) of a certain amount (the quantity) in a certain time (the chronological order) and in an area (geographically).

The correlation coefficient is a frequently used statistical method showing a correlation between the values of variables. A correlation analysis does not apply to the properties detected in relationships but only to the existence and frequency of those relationships. This analysis is one of the most complex ones. The value of the correlation is determined by measuring a correlation coefficient, which is a numeric value indicating a degree of correlation between two variables. This value ranges from -1 to +1. In this paper, the correlation coefficient was calculated using the SPSS as Pearson's and Spearman's correlation coefficients. Spearman's rank-correlation coefficient is a nonparametric equivalent of Pearson's coefficient of a linear correlation. The difference between these two ratios lies in the fact that the calculation is not performed by the numerical values of the dependent and independent variable phenomena, but rather in their relative ratios, i.e. ranks.

Spearman's correlation coefficient is calculated as:

$$\sigma = 1 - [ 6\sum d^2 / n(n^2 - 1) ] \quad (1)$$

where:  $\sigma$  - Spearman's correlation coefficient,  $d$  - the difference between the ranks of  $x$  and  $y$ ,  $n$  - the number

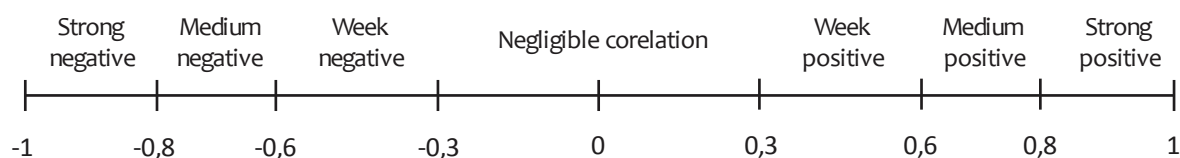


Figure 1 The scale of correlation

of the pairs of rank variables  $x$  and  $y$ . The correlation coefficient takes a value between -1 and 1.

The difference between Pearson's simple linear correlation coefficient and Spearman's rank correlation coefficient is in that the latter can be calculated from data when the measurement is performed on an ordinal scale. Spearman's coefficient can replace Pearson's coefficient if an interval data could be converted into ordinal one, i.e. if they are ranked by their size. Conversely, if a data has been presented in an ordinal scale, only Spearman's coefficient can be applied. The statistical strength of Pearson's coefficient is significantly higher in comparison with Spearman's and if the data are supplied in an interval, priority is given to Pearson's. Due to the easiness of calculation, Spearman's coefficient is only used as a test. All the data related to the indicators in this paper are calculated by Pearson's coefficient, due to its statistical power. The general rule in the correlation is next: When the value of a simple linear correlation coefficient is closer to one, the interdependency among the observed phenomena is stronger.

The correlation analysis has a goal to show a correlation between the variables, i.e. whether there is dependence between indicators of regional competitiveness or not. This analysis is not carried out to determine the dependence of all indicators, but only the one of those indicators (i.e. couples of indicators) for which there is some meaning or significance of measurements. For example, it would be absurd to measure a correlation of the pairs of indicators of the total water supply and the number of libraries or the quality of the railways and the number of cinemas. Therefore, only logically-interrelated indicators are measured in this analysis.

During the identification of the factors and the indicators of regional competitiveness, it was found that some indicators could not (statistically) be documented, but have rather been necessary to create the survey, such as interviewing techniques. This perceptual technique has a role to collect data that cannot quantitatively be collected or those very difficult to measure. A written survey has been used for the purpose of the analysis in this paper. The survey involves a written communication between the interviewer and the respondent in relatively

non-standardized forms. An informal or non-standardized form only applies to the modalities of the answers enrolled at their discretion and where a modality is only given in the frame. The structure of the questions, however, is more formalized because it is related to a number of questions (with clear instructions and a request for the accurate modalities of the responses). Compared to the subtypes of the survey, this survey was conducted by electronic mail. The sample which the survey was conducted for is effective and representative. It consists of a group of experts competent for the research. These experts include: government experts, experts from universities and research institutes and experts from companies (which have a regional influence or operate regionally). Given the fact that the sample was carefully chosen, the subjectivity of the responses and the possibility of errors were kept to a minimum. In this way, important data for the indicators of the quality of the business environment and informal institutions, which can only perceptually be measured, have been obtained.

## RESEARCH RESULTS

This paper analyzes the correlation of the 37 indicators of regional competitiveness. The number of the indicators determining the factors of regional competitiveness is larger and includes the following indicators: the geographic location, agricultural and industrial facilities and other indicators influencing the competitiveness of a region. However, due to the comparability of the data and the complexity of the analysis of a number of indicators, this study is limited to a group of 37 selected indicators (presented in the tables below). The correlation of the indicators is analyzed by using the SPSS, where the quantitative statistical and the qualitative data were previously grouped and processed. The following tables only account for the values of the obtained correlation coefficients.

The Gross Domestic Product (GDP) of the region has nearly a perfect positive correlation with the indicator of the number of companies in the region (close to 1). Pearson's coefficient of 0.998 tells us that an increase in the number of companies always affects an increase

in the GDP of the region (Table 1). The situation is similar with the indicator of the number of employees in the region. Even though this indicator is slightly less correlated with the indicator of the GDP, the correlation is positive and strong. This means that the growth of employment in a region has a large impact on its GDP growth rate. Investments in capital assets have a medium positive correlation. The growth of investment certainly affects the GDP growth rate, but not to the extent which they have companies and number of employees. The indicator related to the number of entrepreneurs in the region is weakly correlated with the indicator of the GDP, which means that it influences its growth to a lesser extent. The correlation analysis of these indicators has showed logical and expected results.

Regarding the indicator of employment (Table 2), there is a positive correlation with the indicator of the budgetary expenditures in education. This link shows that greater government investments in education affect the growth of employment. Investments in education have a slightly less positive correlation (medium-positive), but they certainly affect the growth of employment. These two indicators have the expected

correlation between the number of employees in the region. However, there is a surprising connection between the indicators of the working-age population and the population with higher education with the employment indicator. Not only is the correlation between the two negligible but it is also negative. Pearson's coefficient shows that these indicators in our region have almost no impact or negligibly influence the growth of employment (when their values fall).

Table 3 below accounts for the fact that the correlation analysis of the indicators of the business environment has yielded the expected results. The strong positive correlation between the quality of the state services, the attractiveness of the business environment and the extent of the clusters is indicative of the great importance of these indicators and their perfectly-positive correlation dependence. The Pearson coefficient is even maximally positive (1) when comparing the interdependence of the indicators of the extent of the clusters and the attractiveness of the business environment. When these indicators are concerned, the connectivity of air transportation with foreign countries and the independence of the judiciary have a strong-positive dependence, but at a slightly

**Table 1** The correlation of the GDP in the region with the basic economic indicators, according to Pearson's correlation coefficient

	The number of companies in the region	The number of employees in the region	Investments in capital assets	The number of entrepreneurs in the region
Regional GDP	0,998	0,981	0,726	0,391

Source: Author's calculations, according to the Statistical Office of the Republic of Serbia (2012a) and the Serbian Business Registers Agency (2012)

**Table 2** The correlation of the employment indicators and the basic indicators of human capital in the regions, according to Pearson's correlation coefficient

	Working-age population (16-64)	Population with higher education	Budgetary expenditures in education	Investments in education
The number of employees in the region	- 0,177	- 0,197	0,988	0,631

Source: Author's calculations, according to the Statistical Office of the Republic of Serbia (2011c, 2012b)

**Table 3** The correlation of the key indicators of the business environment, according to Pearson's correlation coefficient

	The extent of the clusters	Connectivity of air transportation with foreign countries	The share of the gray economy in business activities	The independence of the judiciary	The attractiveness of the business environment	The safety of property rights
The quality of the state services	0,994	0,827	0,527	0,801	0,996	0,608
	The extent of the clusters	Connectivity of air transportation with foreign countries	The share of the gray economy in business activities	The independence of the judiciary	The safety of property rights	The quality of the state services
The attractiveness of the business environment	1,000	0,862	0,581	0,772	0,602	0,996

Source: Vuković, 2012

lesser degree. The safety of property rights and the share of the gray economy in business activities have a medium-positive and a weak-positive correlation with the indicators of the business environment, respectively.

Innovations have a strong impact on the GDP growth rate in the region and on the creation and growth of the clusters (Table 4). The strong-positive correlation between the indicators of innovations just confirms this relationship. Almost all indicators of innovations

showed highly positive values of Pearson's coefficient (above 0.9), except for the indicator the number of registered patents and published scientific research papers, which has a weak-positive correlation. Confidence has a strong-positive correlation with the GDP. The highly positive coefficient indicates that the greater one's confidence in business institutions, the higher the GDP is.

Tourism is weakly correlated with the indicators of the infrastructure (Table 5). The small-positive values

**Table 4** The correlation of the key indicators of innovation and informal institutions, according to Pearson's correlation coefficient

	The number of organizations engaged in R&D	Expenditures for R&D	Investments in Innovation	The number of registered patents	The extent of clusters	Confidence in business institutions
Regional GDP	0,934	0,967	0,932	0,452	0,999	0,947
	The number of employees in R&D	Expenditures for R&D	The total number of scientific papers	Published scientific research papers	Investments in Innovation	The number of registered patents
The extent of the clusters	0,961	0,957	0,947	0,580	0,918	0,482

Source: Author's calculations, according to the Statistical Office of the Republic of Serbia (2011a; 2011b; 2011c)



indicate a negligible impact. The total of water supply is medium-positively correlated with tourism, but has a weak-negative correlation compared with corruption. Regarding the social factors, the largest positive correlation is between the indicators of investments in water supply and the amount of hazardous waste in the region. The amount of hazardous waste has a low- or highly negative correlation with the other indicators, which is expected.

## CONCLUSION

Through the researches they have carried out, many authors have confirmed this view (Porter, 1990, 1998; Storper, 2005; Cooke, 2004; Meyer-Stamer, 2008). Regardless of whether competitiveness is considered as productivity (Krugman, 1990, 9) and/or as an increase in the living standards (Porter, 1992), competition is based on cumulative results derived from the existence of factors typical of a particular region. Those regions that have developed faster and in which there are a large number of different factors also have a better competitive position. In other words, the higher utilization or availability of competitiveness indicators provides an opportunity for a region to build up an advantage over the factors of regional competitiveness, which are just composed of these indicators. In this paper, the actual and complex issues

of regional competitiveness have been analyzed, which has multiple interests in a large scale, particularly in our literature and practice. Given the fact that the issues of competitiveness and the regional policy are very important for Serbia, the correlation analysis of the indicators of regional competitiveness provides an opportunity to determine their relationships and interdependence. Policy makers can use the research in order to improve regional competitiveness if there is a significant correlation between these indicators. By influencing and investing in a particular indicator, the values of the other indicators highly and positively correlated with this indicator are indirectly enhanced. In addition, the indicators with low values are indicative for policy makers in that there are "potential bottlenecks of competitiveness".

This paper is limited in that it groups a certain (smaller) number of indicators. The other indicators of regional competitiveness (agriculture, the geo-location, the industry) have been omitted from the analysis. The results may not be incorrect because of this limitation, but they do not show the interdependence of all indicators. Although there are indicators with which it is absurd to examine correlation dependence, it does not mean they should be excluded from the measurement of competitiveness in the region. It can be concluded that of the majority of the indicators confirm the hypothesis, according to which there is

**Table 5** The correlation of the key indicators of the social factors and tourism, according to Pearson's correlation coefficient

	The total of water supply	Investments in water supply	The number of housings	The number of tourists	The average net salary in the region
The amount of hazardous waste in the region	- 0,600	0,975	- 0,518	- 0,355	- 0,424
	The total of water supply	The number of housings	The prevalence of corruption	The length of contemporary roadways	The quality of railways
The number of tourists	0,676	0,098	- 0,429	0,234	0,254

Source: Author's calculations, according to the Statistical Office of the Republic of Serbia (2011c, 2012a) and Survey (Vuković, 2012)

a correlation between the selected indicators. The growth of the number of employees and companies in the region has a nearly absolutely positive correlation with the GDP growth (Pearson's correlation coefficient is 0.99). This fact shows that the employment growth and entrepreneurship policy is very important when the economy or the region is concerned. When compared with the growth of employment in the region, expenditures in education have shown an almost identical match. The government investment in education does not only reduce unemployment, but it also indirectly affects a future growth of the GDP. A perfect correlation (Coefficient 1) exists between the interdependence of the clusters, the attractiveness of the business environment and the quality of the government services. Even though it only refers to the three mentioned indicators, which undoubtedly indicate the absolute interdependence, their development and strengthening have required many reforms and a long-lasting process of improving the business environment. The analysis also points out the great importance of investing in science and innovation. These indicators show that an increase in investment in scientific research and innovation have a significant influence (coefficient 0.9) on the GDP growth in the region. Finally, the results could initiate the theoretically-methodological and practical issues related to an increase in the value of some indicators of regional competitiveness as well as the competitive policies in Serbia.

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## APPENDIX

**Table 6** The variables of the indicators for the economic factor

Regions	Regional GDP (mill. RSD)*	The number of companies in the region **	The number of entrepreneurs in the region **	The number of employees in the region*	Investments in capital assets *
Serbia	2986614	103548	20500	1746138	425400001
Belgrade	1193867	45724	54239	576905	210458922
Southern and Eastern Serbia	433502	11600	40371	305543	100024608
Šumadija and Western Serbia	583366	15993	60595	403104	63607782
Vojvodina	775879	26089	54935	460588	42280261

Source: \*The Statistical Office of the Republic of Serbia, 2012a; \*\* The Serbian Business Registers Agency

**Table 7** The variables of the indicators for the human resources factor

Regions	Working-age population (16-64)	Population with higher education (%)	Budgetary expenditures in education (in 000 RSD)	Investments in education (in 000 RSD)
Serbia	4775996	9,5	140002218	3901604
Belgrade	1047347	7	41860479	1063191
Southern and Eastern Serbia	1088708	7	26040688	859503
Šumadija and Western Serbia	1334805	8,2	29853708	777722
Vojvodina	1305135	7	35750195	1170640

Source: The Statistical Office of the Republic of Serbia (2011c, 2012b)

**Table 8** The variables of the indicators for the innovations factor

Regions	The number of organizations engaged in R&D *	The number of employees engaged in R&D *	Expenditures for R&D (in 000 RSD) *
Serbia	271	20067	24944966
Belgrade	160	11384	18109050
Southern and Eastern Serbia	34	2115	998815
Šumadija and Western Serbia	32	1332	1137281
Vojvodina	45	5236	4699820
Regions	The total number of scientific papers *	Investments in Innovation (in 000 RSD) ***	The number of registered patents**
Serbia	7034	26543143	93
Belgrade	5044	21089554	26
Southern and Eastern Serbia	402	1039094	2
Šumadija and Western Serbia	357	1767264	5
Vojvodina	1231	2647231	60

Source: The Statistical Office of the Republic of Serbia (\* 2011a; \*\* 2011b; \*\*\* 2011c)

**Table 9** The variables of the indicators for the social factor

Regions	The number of housings	The prevalence of corruption (in %)
Serbia	3243587	9,3
Belgrade	739630	10,9
Southern and Eastern Serbia	748731	9,9
Šumadija and Western Serbia	902997	6,7
Vojvodina	852229	9,9

Source: The Statistical Office of the Republic of Serbia (2012a)

**Table 10** The variables of the indicators for the culture-and-tourism factor

Regions	The number of tourists	Total overnight stays of tourists
Serbia	2000597	6413515
Belgrade	618454	1319629
Southern and Eastern Serbia	392044	2649943
Šumadija and Western Serbia	663208	2516236
Vojvodina	281842	767304

Source: The Statistical Office of the Republic of Serbia (2011c)

**Table 11** The perception indicators, according to experts

Regions	The extent of the clusters	Connectivity of air transportation with foreign countries	The quality of railways	The quality of the electro-energy infrastructure
Serbia	100	100	100	100
Belgrade	124,19	218,63	122,38	143,09
Southern and Eastern Serbia	75,00	61,75	68,29	72,00
Šumadija and Western Serbia	85,43	48,06	74,78	85,93
Vojvodina	98,83	49,45	91,42	105,01

Source: Vuković, 2012

**Table 12** The perception indicators, according to experts

Regions	Confidence in business institutions	Safety of property rights	The share of the gray economy in business activities	The independence of the judiciary	The attractiveness of the business environment	Quality of state services
Serbia	100	100	100	100	100	100
Belgrade	100,31	91,79368	103,44	83,81211	193,71	121,6984
Southern and Eastern Serbia	76,02	88,39	93,20	74,39	64,77	72,73
Šumadija and Western Serbia	85,94	88,95	86,72	79,33	94,20	88,14
Vojvodina	93,49	94,36	83,15	85,62	126,14	97,97

Source: Vuković, 2012