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Competitiveness of Nations in selected SEE Countries

Zubović Jovan[a]*, Aleksandra Bradić-Martinović[b]

[a]*Economic Institute, KraljaMilana 16, Belgrade, 11000*
[b]*Institute of Economic Sciences, ZmajJovina 12, Belgrade, 11000*

Abstract

There have been several attempts to benchmark competitiveness of nations and show that its levels have significant impact on the wealth measured by growth of GDP per capita, especially during the recession. Countries of South Eastern Europe including Serbia and Romania are going through deep recession, and some authors have confirmed that the level of competitiveness, measured by several existing indices, is highly influential on welfare and wealth of those countries. Some studies have confirmed that the Global Competitiveness Index - GCI is the most appropriate measurement tool for countries in the SEE region. However, the large number of variables composing GCI index does not allow observing particularities of individual countries. By the mean of factor analysis in this paper it was confirmed that it is possible to extract 11 statistically significant factors which explain the competitiveness level of the country, and enable comparison among countries differently than the original index. Moreover factorsLegal rights and Government impact stand out as a common variable for most SEE and especially for Romania and Serbia as principal generator for increasing competitiveness.

Keywords:competitiveness of nations, factor analysis, see region, gci;

* Corresponding author: Dr Jovan Zubović, tel: 00 381 66 357 000
E-mail address: zubovicj@ikomline.net

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1. Introduction and literature review

During the period of last thirty years competitiveness had become one of the most analyzed economic phenomena. However, despite the large number of papers published on this topic, there is no clear consensus on how to define and measure competitiveness. A broad notion of competitiveness refers to the inclination and skills to compete, to win and retain position in the market, to increase market share and profitability, and eventually to consolidate commercially successful activities (Filó, 2007).

Probably the best overview of different opinionsin understanding the concept of competitiveness was given by Porter (1990)back in the 90's.He noted that although there is a clear and agreed definition of the company's competitiveness, it is not the case with the definition of the competitiveness of nations.He points out that there are positions for which the national competitiveness is macroeconomic phenomenon that depends on exchange rates, interest rates and budget deficits, and those who believe that it is the function of cheap and large workforce.According to him, some believe that it is possible to link competitiveness with an abundance of natural resources.Furthermore,he notes that some relate national competitiveness with government policies that regulate the protection, promotion of imports and subsidies.Finally, he points out the possibility of interpreting this concept in its relation to management practices, including the human resource management. In his work Porter (1990) concludes that national prosperity is not inherited, but it is rather created by strategic choices, and national competitiveness can be seen through the prism of the four elements of every national economy:factor conditions, demand conditions, related and supporting industries and firm strategy, structure and rivalry.

Further on, OECD (1992) accepted the views that competitiveness can be defined as the degree to which, under favorable market conditions, the country can produce goods and services that can meet international competition, while simultaneously enabling the growth of real domestic income and standard of living.

Moreover the World Economic Forum (WEF, 2012) defines competitiveness as "set of institutions, policies and factors that determine the level of productivity of a country."This suggests that the nation is competitive if its population can on a sustainable basis revel in high and rising standard of living with high levels of employment (EC, 2012).At the macro level national competitiveness is defined as the ability of countries to achieve economic growth faster than other countries and to increase the well-being so that its economic structure changes and better adapt to the movement of international trade (Bienkowski, 2006).

However, there are opposing views, like Krugman (1994), who is member of the group that believes that there is a significant difference between the perception of the competitiveness of the economy and companies and the competitiveness is meaningless term when applied in the context of the national economy.Schuller and Lindbom (2009) also find that there is no need to measure the competitiveness of the nation.

Despite different opinionsin respect to the definition of national competitiveness, public and politicians show high interested for the country's competitiveness level.The issue of achieving, maintaining and increasing the level of competitiveness, both at micro and macro level, is one of the key questions to which the creators of modern development policy tend to find answers.Competitiveness primarily involves the improvement and economic development of all the factors in diamond of national competitiveness together, rather than improving one on account of others.The importance of the concept of competitiveness is now firmly embedded in the economic policies of countries around the world.Therefore, measuring, understanding and analyzing competition in different geographic levels become a vital factor for policy makers with intention to find the ways for possible enhance of economic performance of countries and regions.For this reason, various international institutions create indices which measures and rank individual countries according to various aspects of competitiveness.

Lovrinčević, Mikulic and Rajh (2008) distinguish between two groups of studies, according to the approach of measuring the competitiveness of use.The first group is consists of research carried by WEF (Global Competitiveness Index) and International Institute for Management Development (World Competitiveness Ranking).The basis of their analysis is the ranking of countries according to a social and international relations, to the role of the state and institutional framework.The second group of studies, carried out by the World Bank (Doing Business Index) and The Heritage Foundation (Index of Economic Freedom), focuses on regulations related to business activities, as determinant of development.Besides the two approaches that are applied globally, there is also transition progress index that forms and monitors European Bank for Reconstruction and Development.All the above studies have a tendency to, in addition to statistical data (hard data), use appropriate survey (soft data) which

measure the aspects of competitiveness that are not available in standard statistics, such as for example the quality of the judiciary, the nation's propensity to innovate, the presence of corruption or the quality of company management.

Despite efforts to measure the competitiveness with adequate measures, the results of individual analyzes (Lall, 2001; Staskeviciut and Tamošiūnienė, 2010) indicate that, for example, the GCI index does not provide full reliability, since there are two major problems regarding rating the competitiveness of countries' development level.The first problem is the starting assumption that implies existence of market efficiency, and the second is related to the definition of competitiveness, which focuses on direct competition between countries, ignoring the constraints that arise when there is a transfer of methodology that is used at the micro and macro level. Berger &Bitsow (2009) also argue that the indices used to measure national competitiveness "are poor proxies in predictors of growth and are thus potentially misleading for policy makers". They perceive that indices constructors also "face the additional challenge of choosing relevant indicators and how to aggregate them".

The above issues suggest that this index provides an opportunity for further analysis in order to improve his accuracy, especially when it comes to developing countries. Therefore it is feasible to continue research from that point by differentiating more factors that may be responsible for determining competitiveness of the nation.

A common feature of all national competitiveness measures is the large number of variables that influence its formation, and multidimensionality. For that reason, it is possible to perform generalization and reduction of variables with appropriate methodologies, in order to highlight those with biggest impact on the index value.Research with similar objective (Caudillo et al, 2000) performed on the Index of Economic Freedom, established by The Heritage Foundation showed that the improvement of index can be achieved by factor analysis (PCA method).The results indicated the existence of few dominant components in the index, which enabled more precise measurement of this phenomenon. Similar research (Ganegodage, 2008) was carried out in the work in which the author create an index that measures the degree of development of the economy made up of 42 variables. By the means of using the factor analysis the number of variables was reduce to a smaller number of dominant factors, with the aim of finding a successful measurement and obtaining new perspectives in the design of national policies and development strategies.

The goal of this paper is to determine whether it is possible to use factor analysis in order to determine which factors, that are important for developed countries of EU and OECD in describing their competitiveness level, may differ for 10 countries of South Eastern Europe (SEE) and to find out if there are some other factors that are most important for certain countries belonging to SEE region. The paper consists of five sections, first of which is this introductory part, followed by brief explanation of the research methodology used. Further on there is data presented with the explanation of how it was sorted and reduced. That is followed by presenting the research results and discussions, and at the end it is possible to find conclusions and recommendations for further research.

2. Methodology

In this paper, we used factor analysis, the method of multivariate analysis. Factor analysis can be used in case of the large number of variables' reduction, like it is the case with GCI which uses 111 variables. If the variables are mutually dependent it can be definedless number of basic variables, called factors (Kovacic, 1994).

All analysis in this paper is performed by using SPSS software. The first step of the analysis implies testing the data using the Kaiser-Meyer-Olkin's test (KMO test), which is a measure of sampling adequacy. The next step implies generating the correlation matrix using Principal Components Analysis (PCA). Based on the obtained matrix it is possible to determine the factors and to eliminate those variables which cannot be uniquely determined to one single factor. Variables can be eliminated in the case of loadings belonging to more than one factor, under the condition that the difference between them is less than 0.05. After deciding on the final number of variables which are to be retained, it is necessary to repeat the KMO test.

After this step it is necessary to make a decision on a number of factors. For this purpose, we used three methods. The first method is based on the characteristic root (*eigen value*). The second is the Scree test (Catell, 1966, Kovacic, 1994), and the third method is Horn'sParallel Analysis (Horn, 1965). Horn's PA is an adaptation of the Kaiser criterion, which uses information from random samples (Monte Carlo method). The rationale underlying PA is that factors from real data with a valid underlying factor structure should have larger Eigen values than those derived from random data having the same sample size and number of variables.

Based on the rotated component (factor) matrix, after determining the number of factors it is necessary to determine which variables belong to which factor, and assign the names of factors. The main factors usually represent starting point of regression analysis which is shown in the last part of the discussion. In regression analysis the authors are attempting to discover which factors may be most responsible for achieving higher level of national competitiveness for SEE countries.

3. Data

The initial point of the research was the analysis of the GCI index, which was selected in accordance with the research conducted by Lovrincevic, Mikulic and Reich (2008) in which they concluded, based on ANOVA (cluster) analysis, that Croatian economy as one of the SEE countries is best described by that index. Having in mind the similarity of the Croatian economy with the other economies in SEE region, we have adopted the index as initial benchmarking point.

Index GCI created by WEF is a comprehensive measure of microeconomic and macroeconomic foundations of competitiveness at the global level, which is calculated since 2005.The structure of the index is determined by assuming that the competitiveness is a complex phenomenon that is strongly influenced by many factors, which are based on theoretical concepts included in the index. It is composed of 111 variables divided into 12 pillars, some of which are divided and sub-pillars. The analysis in this paper covers the value of GCI index for 144 countries for the period 2012-2013, namely 144 observations. Data are available on the official web site of the WEF.

The GCI data set contains five types of data. Most variables are given in the range of 1-7 (82 out of 111 variables). All other 29 variables are presented by using different scaling methods, including those that are set in the range of 0-10 (2 variables) and in the range of 1-100 (1 variable). Moreover, there are 15 variables included in their absolute values (for instance number days to start a business) and 11 variables represented as a fraction (for instance Inflation as an annual %).

Since the data are not distributed uniquely it was necessary to test whether data normalization and/or logarithmic transformation might help get more reliable results. Therefore we have created two additional sets of data in order to test the factor analysis sensitivity and robustness on the different types of data. Both adjustments had a goal to normalize all variables so as to be distributed in the range 1-7.

In the first transformation, we had redistributed initial 29 variables to correspond to the 1-7 range. They included the following variables used in original GCI composition, in addition to those used in second transformation (listed in the following paragraph): 1.22 Strength of investor protection; 2.06 Available air seats; 3.01 Government budget balance, 3.02 Gross national savings, 3.03 Inflation; 3.05 Country credit rating; 7.08 Women in labor force; 8.08 Legal rights index.

In the second transformation, we have made logarithmic transformation with an ***e*** basis (ln) since the original figures may have extremely high values, prior to ranging them into the 1-7 scale for the following variables: 2.08 Mobile telephone subscriptions; 2.09 Fixed telephone lines; 3.04 General government debt; 4.06 HIV prevalence; 4.07 Infant mortality; 4.08 Life expectancy; 4.10 Primary education enrollment; 5.01 Secondary education enrollment; 5.02 Tertiary education enrollment; 6.05 Total tax rate; 6.06 No. procedures to start a business; 6.07 No. days to start a business; 6.10 Trade tariffs; 6.14 Imports as a percentage of GDP; 7.04 Redundancy costs; 9.04 Individuals using Internet; 9.06 Int'l Internet bandwidth; 9.07 Mobile broadband subscriptions; 10.03 GDP (PPP); 10.04 Exports as a percentage of GDP and 12.07 PCT patents.

Factor analysis was further on tested on all three sets of data, resulting with original data giving the most consistent results in the analysis. In the remaining part of the paper the result of the analysis were based only on the original set of data.

4. Results and discussion

The first step in the empirical analysis was to apply KMO test on the initial set of 111 variables. The results are shown in the table 1, in the column named "Initial". Since the KMO value is greater than 0.6 we were able to continue with the testing. The Bartlett's test value of p=0.000 points out that the correlation matrix is not unit matrix. Observing the correlation matrix and by the means of explorative testing we have eliminated several

variables in order to exclude all those which have significant loading (over 0.3) on more than one factor. Using that rule we came down to 65 variables that were kept for the further research. Repeated KMO and Bartlett's test have reconfirmed adequacy of selected set of data (table 1, last column).

Table 1. KMO and Bartlett's Test of data quality

		Initial	Final
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,886	,910
Bartlett's Test of Sphericity	Approx. Chi-Square	6605,925	4570,378
	df	6105	2080
	Sig.	,000	,000

Application of three different methods for selecting the number of factors that will be distinguished as principal has shown that the method based on the characteristic root (*eigen value*) proved to give the best results as compared to Scree test (Catell, 1966, Kovacic, 1994), and Horn's Parallel Analysis (Horn, 1965). Despite the reduced number of variables there was no change in initially determined number of 11 factors, with the variance explained by those factors reaching the cumulative value of just below 79% (table 2) which is sufficient to allow us to continue using 11 factors with certainty of being representative for the whole set of data.

Table 2. Total variance explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total
1	28,282	43,511	43,511	18,300
2	5,024	7,729	51,240	13,325
3	3,649	5,614	56,853	9,288
4	2,890	4,446	61,299	11,257
5	2,419	3,722	65,021	2,728
6	1,970	3,031	68,052	13,162
7	1,709	2,629	70,682	6,381
8	1,643	2,527	73,209	3,984
9	1,355	2,084	75,293	5,937
10	1,237	1,902	77,196	2,077
11	1,119	1,721	78,917	7,660
12	,985			

Based on the rotated component (factor) matrix, after determining the number of factors it was necessary to determine which variables belong to what factor, and to assign the names of the factors. By observing the rotated component matrix it was possible to distribute variables to different factors. Grouped variables have led to determining the type and the name of newly created independent factors, which are entitled as follows.

F_1 Business environment
F_2 Health, education and communication disposability
F_3 Foreign trade
F_4 Sophisticated industry
F_5 Labor market
F_6 Crime and basic education
F_7 Business startup
F_8 Legal rights
F_9 Externalities in business
F_{10} Government impact on business
F_{11} Disposable income

The first factor includes 21 variables, the second 13, and the others respectively 3, 6, 3, 6, 3, 2, 3, 3, 2 variables. Therefore it is understandable why the first factor is explaining as much as 43% of the variance which is shown in table 2, and the others less than 10% each.

The main factors represented starting point for the regression analysis. Eleven factors were used as the eleven independent variables and the initial GCI index was used as a dependent variable. The aim of the regression analysis was to determine the significance and to confirm the statistical importance of all selected factors. Descriptive statistics of regression analysis is shown in table 3. High R^2 values and low standard error prove the significance of the regression conducted.

Table 3. Summarizing regression of 11 factors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,979[a]	,959	,955	,14368

a: Predictor is a constant

The acquired regression coefficients are shown in table 4. It is notable that all 11 factors are statistically important. For that reason we may accept this model for further analysis in specific countries and group of countries.

Table 4. Regression coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Constant	4,201	,012		350,882	,000
F_1 Business environment	,216	,014	,319	15,712	,000
F_2 Health, education and communication disposability	-,246	,013	-,363	-18,274	,000
F_3 Foreign trade	-,033	,013	-,049	-2,483	,014
F_4 Sophisticated industry	,212	,014	,312	15,544	,000
F_5 Labor market	,034	,012	,050	2,736	,007
F_6 Crime and basic education	,113	,014	,166	8,043	,000
F_7 Business startup	-,033	,013	-,048	-2,535	,012
F_8 Legal rights	-,056	,013	-,083	-4,440	,000
F_9 Externalities in business	-,057	,013	-,085	-4,470	,000
F_{10} Government impact on business	-,067	,012	-,098	-5,426	,000
F_{11} Disposable income	-,141	,013	-,208	-10,665	,000

a. Dependent Variable: GCI

Regression formula may be created in accordance with data shown in table 4:

$$GCI = 4.201 + 0.216*F_1 - 0.246*F_2 - 0.033*F_3 + 0.212*F_4 + 0{,}034*F_5 + 0{,}113*F_6 - 0{,}033*F_7 - 0.056*F_8 - 0.057*F_9 - 0.067*F_{10} - 0.141*F_{11} \quad (1)$$

As expected the first factor has strong impact on the final value of the index. However it was unexpected to find that factors 2 and 4 have so high nominal impact. Having in mind that the first factor contains as much as 21 and the second 13 variables; it is remarkable that the factor 4 which contains of only 6 variables has that high influence (table 5).

Table 5. Variables creating factor 4: Sophisticated industry

Variables
Patents applications per million of population
Control of international distribution
Nature of competitive advantage
Value chain breadth
University industry collaboration
Quality of scientific research institutions

It is necessary to test whether factor 4 has the same impact on all countries. That will be done by comparing factor scores on selected countries and groups of countries, which is shown in table 6.

Table 6. Factor scores for selected countries and groups of countries

	GCI	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8	F_9	F_{10}	F_{11}
EU*	4,82	0,48	-0,71	-0,67	0,62	-0,71	0,85	-0,47	-0,55	-1,01	0,41	-0,32
OECD**	5,08	0,82	-0,78	0,26	1,09	0,08	0,27	-0,78	-0,52	-0,51	0,07	-1,27
SEE	4,00	-0,99	-0,64	0,00	-0,59	0,00	0,07	-0,30	**-0,45**	-0,57	**0,15**	0,40
Romania	4,07	-1,21	-0,57	0,08	-0,70	0,01	-0,44	-0,19	**-0,98**	-0,67	**-0,04**	0,31
Serbia	3,87	-1,58	-0,87	0,03	-0,79	0,09	-0,45	0,01	**-0,76**	-0,38	**-0,01**	0,41
Other	3,96	-0,12	0,33	0,13	-0,22	0,16	-0,25	0,24	0,25	0,37	-0,12	0,19
All	4,20	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

* Excluding Croatia, Romania, Bulgaria and Greece
** Excluding EU member states

Data in table 6 confirms that factor 4 has high influence on generating the GCI score. However it is evident that different groups of countries have significantly different scores for that factor. The highest is in OECD countries, whereas the lowest belongs to SEE countries and specifically low are in Serbia and Romania. In an attempt to determine whether any factor affects GCI score for Serbia and Romania more positively than other countries, we have detected factors 8 and 10, named Legal Rights and Government impact on business. Factor consists of only two variables which are the share of women in labour force and the legal rights index. Factor 10 consists of 3 variables: government budget balance, total tax rate and general government debt. It is interesting to note that in both factors Serbia and Romania have better scores than average SEE countries.

Let us now go back to original GCI scores and find out what are the scores given to Serbia and Romania. One can see those scores in table 7.

Table 7. Realized scores for Serbia and Romania for selected variables in GCI

Series	Romania	Serbia
3.01 Government budget balance	7	7
3.04 General government debt	6	6
6.05 Total tax rate	6	7
7.08 Women in labor force, ratio to men	3	3
8.08 Legal rights index	7	6

With the score 7 being the highest possible, it is obvious that both Serbia and Romania are well rated according to

four out of five selected variables. The only one where it is still possible to improve is the share of women in labour force.

5. Conclusions

The research conducted in this paper has confirmed that the existing competitiveness indices are not precise enough to determine which variables have the greatest impact on increasing the index of competitiveness in countries belonging to SEE region. For that reason, using the method of factor analysis we have generated 11principal components (factors) that were used in a regression analysis. As a result of regression analysis we were able to create a formula for calculating the GCI score which significantly differs from the original one made by WEF. The results showed that some of the obtained factors have greater positive impact on the countries in SEE region, especially on Romania and Serbia.

For those countries we have extracted factors 8 and 10 Legal rights and Government impact as factors on which those two countries need to build its competitiveness of nations and to promote them worldwide. It is not possible to improve significantly on those factors in Serbia and Romania since they are already on the highest levels, but they have to be promoted and branded as factors which distinct two countries in a positive manner even from the most developed countries of EU and OECD. It is also important to emphasize that the factor Business Environment which consists of 21 variables has the most negative impact on countries in the SEE region. That means that it might be feasible to focus on improving in all variables, without promoting any changes in them, since the real value observed by others is very negative. Finally the factor 4 Sophisticated Industry has proven to be the best in EU and OECD countries, which is well known fact, and which is having the most influence on the positive branding of those countries. At the same time that factor is underdeveloped in SEE region, and it does not seem to be good point of focus of policy makers in Serbia and Romania at current time.

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