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Multidimensional Comparative Analysis of the Competitiveness of the European Union Countries' Economies

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Abstract

Research background: The basic question we ask is, whether it is possible to talk in today's globalizing world about the uniform of the competitiveness of the economies. Posing such questions is particularly important in the case of such political and economic structures such as the European Union. The strategic developmental objectives of the EU include the aspiration to harmonious development of all of its members but it is very difficult task. The competitiveness of the economies is now one of the most frequently discussed topics. It is very difficult to precisely define the notion of competitiveness unambiguously, particularly in terms of international competitiveness of economies. The competitiveness of economies can be discussed both in the context of : a) international competitive capacity, b) international current competitiveness or c) international competitive standing of national economy. In this work, due to the context of the conducted research (international comparisons of the EU countries' economies) the competitiveness of international economies will be considered in terms of international competitive capacity with regard to investment attractiveness of a country. In addition to the problems associated with defining this concept they are also important dilemmas associated with the measurement of the competitiveness. In the performed comparative analyses of European economies the research results presented within reports of „Global Competitiveness Index" will be used.

Purpose of the article: The aim of the work is multidimensional comparative analysis of the competitiveness of the European Union countries' economies.

Methodology/methods: In the work to study the spatial differentiation of the EU countries' economies in the context of their competitiveness, the taxonomic measure of development based on median vector Weber has been used.

Findings & Value added: As a result the classification and the typological groups of the EU countries obtained by means of the taxonomic measure of development calculated on the basis of the characteristics of their competitiveness arises.

Keywords: *competitiveness of the economies, multidimensional comparative analysis, the European Union*

JEL Classification: *C38, O11, P36*

Introduction

A steady development of the European Union in various socio-economic areas is one of the EU's strategic development objectives. This is a difficult task to implement, mainly due to the significant differences in the rate of development of individual member states, internal differences and historical developmental conditions of these countries.

In the literature of the subject (Porter, 1988; Krugmann, 1994, 1996; Feinberg, 2000, pp. 155-167; Thompson, 2004, 62-97; Bossak & Bieńkowski, 2004; Pearce, 2006, pp. 39-74; Pearce & Zhang, 2010, pp. 481-498; Castro-Gonzales et.al., 2016, pp. 373-386) a lot was devoted to analyzing the level of development of the European Union, including: sustainable development, technological development, innovation, quality of life and many others. These are mainly comparative analyzes showing the differences and similarities in the development of individual EU Member States.

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In recent years, in the face of many changes and crises in the European Union such as 2007-2008 economic crisis, the Great Britain's decision to leave the EU structures (so-called Brexit) or the ongoing migration crisis, addressing the possibility of further EU development is particularly important. One of the important directions of research in this area is the analysis of the competitiveness of the economies of individual EU Member States and the uniformity of Union development in this area. The EU economy, in many sources, is referred to as the second world economy (after the USA economy), (Stefanescu & On, 2012, pp. 889-898). The competition from the high-tech economy of the United States as well as from developing economies in Asia is, however, significant, and the pursuit of increased competitiveness of the Union economy is included in all strategic EU documents. The pursuit of competitiveness of national economies has been at the top of the priorities of all political forces for years at all latitudes. The very concept of competitiveness of the economy is very popular today and is often abused. Paul Krugmann (1996) described it even in his work as "dangerous obsession". It must be mentioned that in the past not all authors was agree with the opinion that competitiveness might be considered with regard to national economy. Such doubts were expressed mainly by M.E. Porter (1988) and P. Krugman (1994). In the next years that view was slightly verified by Porter in his later works (Porter 1998).

In view of these concerns, there is nothing surprising in the fact that it is very difficult to define precisely the term of competitiveness, particularly in the context of international competitiveness of economies. One of the first definitions of international competitiveness was the notion developed by the Presidential Council on Competitiveness founded by Ronald Regan in 1983, according to which: „competitiveness is the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expending the real incomes of its citizens". Similarly as the references to competitive capacity found in definitions developed by: European Commission, Office Analysis of the New York Stock Exchange, Competitiveness Policy Council, OECD and World Economic Forum.

The literature (ex. (Bossak, 1984; Durand, 1986; Porter, 1988; Krugman, 1994; Porter et al., 2000; Bossak & Bieńkowski, 2004; Misala, 2011) contains many different definition of this notion e.g.:

a) international competitive capacity defined as a power (the capacity) of a given country in the rivalry for the benefits gained from the participation in the international division of work (Durand, 1986; Bossak and Bieńkowski, 2004);
b) international current competitiveness of national economy (Misala, 2011), reflects the present condition and the directions of changes in inherent ability to compete up to now;
c) international competitive standing of national economy (Bossak, 1984), refers to owned shares in the widely understood international business.

In this work due to the context of the conducted analysis (international comparisons) the competitiveness of European Union economies, it was decided to consider in terms of competitive capacity. The aim of the work is therefore a multidimensional comparative analysis of the competitiveness of the European Union countries' economies.

The paper is organized as follows: the introduction contains a brief review of the literature in the area of competitiveness of national; the second part presents basic information about the research of competitiveness of the world's economies carried out annually by the World Economic Forum (WEF) and presented in the report: The Global Competitiveness Index (GCI) and the last one looks at contemporary analysis in the field of competitiveness of the EU economies. In the last section the authors formulate conclusions.

Method of the Research

A comparative analyzes of the competitiveness of economies of individual Member States of the European Union are based on the following assumptions:

1. Due to the context of the conducted analysis (international comparisons) the competitiveness of EU economies is considered in terms of competitive capacity defined as a power (the capacity) of a given country in the rivalry for the benefits gained from the participation in the international division of work.
2. The study was based on the data from 2006 (first published report), (Lopez-Claros, 2006) and 2016 (last edition), (Schwab, 2017) gathered by World Economic Forum and published in the reports: „Global Competitiveness Index".
3. The original data base included 70 diagnostic features describing 12 area of the GCI index. Hellwig's parametric method was used for the purpose of the selection of the representatives of respective sets (Nowak, 1990).

To the final set of features which are characterized by high spatial variability with low correlation within the selected sets and asymmetric distribution, 17 variables were selected: x_1 - intellectual property protection (in the scale 1-7, where 7 is the best), x_2 - burden of government regulation (1-7, best), x_3 – available airline seat km/ week, millions, x_4 – fixed telephone lines/ 100 pop., x_5 – mobile telephone subscriptions/ 100 pop., x_6 – gross national savings, % GDP, x_7 – general government debt., % GDP, x_8 – tuberculosis cases/ 100,000 pop., x_9 – tertiary education enrollment, gross %, x_{10} – quality of math and science education (1-7, best), x_{11} – effectiveness of anti-monopoly policy (1-7, best), x_{12} – hiring and firing practices (1-7, best), x_{13} – flexibility of wage determination (1-7, best), x_{14} – FDI and technology transfer (1-7, best), x_{15} – exports as a percentage of GDP, x_{16} – domestic market size index (1-7, best), x_{17} – local supplier quantity (1-7, best). Features: x_7 and x_8 are destimulants, other features are stimulants. The stimulants are numbers whose bigger values indicate a higher level of progress of a given phenomenon, while the destimulants are diagnostic characteristics whose smaller values signify a higher level of development[3] (Bąk, 2014, pp. 134-145).

In the work to study the spatial differentiation of the EU countries' economies in the context of their competitiveness, the taxonomic measure of development based on median vector Weber (1971) has been used. The median Weber is a multi-dimensional generalization of the classical notion of the median. It is about vector that minimizes the sum of Euclidean distance (Euclidean distance) of the data points representing the considered objects, and therefore is somehow "in the middle" of them, but it is also immune to the presence of outliers (Weber, 1971).

The positional option of the linear object assignment takes a different standardization formula, based on a quotient of the feature value deviation from the proper coordinate of the Weber median and a weighed absolute median deviation, using the Weber median (Weber, 1971):

$$z_{ij} = \frac{x_{ij} - \theta_{0j}}{1{,}4826 \cdot \tilde{mad}(X_j)} \qquad (1)$$

where: $\theta_0 = (\theta_{01}, \theta_{02}, ..., \theta_{0m})$ is the Weber median, $\tilde{\mathrm{mad}}(\mathrm{X_j})$ is the absolute median deviation, in which the distance from the features to the Weber vector is measured, i.e.: $\tilde{\mathrm{mad}}(\mathrm{X_j}) = \underset{i=1,2,...,n}{\mathrm{med}} \left| \mathrm{x_{ij}} - \theta_{0j} \right| \quad (j = 1,2,...m)$. The aggregate measure is calculated with the following formula:

[3] Sometimes the category of *nominants* is used. In their case the most favourable situation is when they reach a fixed value or number interval.

$$\mu_i = 1 - \frac{d_i}{d_-} \qquad (2)$$

where: d_- = med(**d**)+2,5mad(**d**), where $d=(d_1, d_2,\ldots,d_n)$ is a distance vector calculated with the formula: $d_i = \underset{j=1,2,\ldots m}{med} \left| z_{ij} - \varphi_j \right| \quad i = 1,2,\ldots,n$, $\phi_j = \max_{i=1,2,\ldots,n} z_{ij}$ – the coordinated of the development pattern vector, which is constituted of the maximum values of the normalized features.

The assignment of objects with a positioning measure is the basis for a division of objects into four classes:

- Class I: $\mu_i > \text{med}_1(\mu)$,
- Class II: $\text{med}(\mu) < \mu_i \leq \text{med}_1(\mu)$,
- Class III: $\text{med}_2(\mu) < \mu_i \leq \text{med}(\mu)$,
- Class IV: $\mu_i \leq \text{med}_2(\mu)$.

The Weber median was calculated in *R program: l1median* of package: *pcaPP*.

Study results

Table 1 shows the results of the classification and the typological groups of the EU countries obtained by means of the taxonomic measure of development. It is clear that the positions of individual countries in the obtained rankings were usually different, with only the one exception of Romania (26th position in the rank). Thirteen EU countries improved their situation in 2016 in comparison to 2006 (the United Kingdom, Malta, Sweden, the Netherlands, the Czech Republic, Germany, Portugal, Belgium, Slovenia, Lithuania, Greece, Croatia and Bulgaria). The greatest leaps were observed in the case of Malta which was on the 13 position in the 2006 ranking and then in 2016 jumped 18 positions higher to the 3rd positions. The situation in the field of competitive capacity in 2016 compared to 2006 deteriorated in the case of 14 EU countries – the most affected were Italy (down from the 13th to the 28th position), Spain (the fall from the 6th to the 19th position) and the Slovak Republic (down from 10th to the 18th position).

Table 1. The EU countries sorted by their competitive capacity in: 2006 and 2016

Country	Value of meter (μ_i)	Rank	Group	Country	Value of meter (μ_i)	Rank	Group
2006				2016			
Luxembourg	0,680	1	I	United Kingdom	0,789	1	I
Denmark	0,626	2		Luxembourg	0,529	2	
Finland	0,568	3		Malta	0,523	3	
Ireland	0,556	4		Sweden	0,492	4	
United Kingdom	0,552	5		Netherlands	0,466	5	
Spain	0,542	6		Denmark	0,448	6	
Estonia	0,505	7		Czech Republic	0,426	7	
Sweden	0,440	8	II	Germany	0,422	8	II
Netherlands	0,432	9		Estonia	0,417	9	
Slovak Republic	0,404	10		Finland	0,408	10	
Czech Republic	0,387	11		Ireland	0,378	11	
France	0,377	12		Portugal	0,374	12	
Italy	0,376	13		Belgium	0,372	13	
Belgium	0,375	14		Slovenia	0,333	14	
Hungary	0,371	15	III	France	0,333	15	III
Austria	0,365	16		Hungary	0,307	16	
Germany	0,309	17		Lithuania	0,305	17	

Portugal	0,305	18		Slovak Republic	0,302	18	
Poland	0,293	19		Spain	0,301	19	
Slovenia	0,291	20		Austria	0,297	20	
Latvia	0,256	21		Greece	0,271	21	
Cyprus	0,239	22		Poland	0,261	22	
Greece	0,233	23		Cyprus	0,250	23	
Malta	0,228	24		Croatia	0,204	24	
Lithuania	0,186	25	IV	Bulgaria	0,156	25	IV
Romania	0,158	26		Romania	0,140	26	
Croatia	0,124	27		Latvia	0,082	27	
Bulgaria	0,103	28		Italy	0,080	28	

Source: own calculations based on WEF data

Both rankings are characterized by low positions occupied by both Southern and Eastern European countries. In both rankings in the last two groups, which includes t countries with the lowest scores almost all countries in these geographical regions of Europe are classified. Similar changes have also been described in the papers describing the situation of European countries in areas such as sustainable development, investment attractiveness and socioeconomic development in general. On the other hand, in the case of Eastern European countries, despite the traditionally low position occupied by such countries as Romania or Bulgaria, attention should be paid to the significant improvement in the position occupied by the Czech Republic, which for several years has been perceived by investors as an attractive location for investment. Among the countries of Eastern Europe, it is the Czech Republic that was the best in 2016 ranking. The first two groups were classified primarily by countries located in Northern and Western Europe. The first place in 2016 was the United Kingdom, which in 2006 was also classified in the first group but only in position 5. Despite the events of last year and the decision to leave the European Union by this country, the United Kingdom was ranked first in the 2016 ranking. Comparing the results of both rankings, one should also pay attention to the wider range of results achieved in 2016, which should be interpreted as a greater variation in the countries studied during that period.

Conclusions

The results published annually by the World Economic Forum were used to examine the competitive capacity of the economies of the European Union. The original database contained 70 variables describing different areas of competitiveness, or rather the competitive capacity of the world economy. According the definition of WEF the competitiveness is defined as “the set of factors that determine the level of productivity of a country and this level of productivity determined the level of prosperity earned by an economy”. The Global Competitiveness Index (GCI) is calculated based on data covering 12 categories gathered in the so-called pillars of competitiveness, which together describe the competitiveness of the economies. Finally, 17 characteristics were selected for the study describing different areas of competitiveness (competitive ability) of economies of European Union countries. The results obtained confirm the observations of other authors where it is clear that so far a division of Europe into a more developed West and less developed East, or a division into so called "old" and "new" EU Member States are not supported by indicators used by the WEF to examine the competitiveness of countries.

The results of the analyzes presented in this paper are particularly important in the light of recent developments in the European Union, which face a number of crises and in the context of the proposed changes and divisions of the European Union into so called Europe of two speeds.

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