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EU-28 ECONOMY`S DEVELOPMENT IN THE CONTEXT OF GLOBALIZATION AND INTEGRATION: DYNAMIC DEA APPROACH *

The main aim of this paper is to develop a comprehensive view on the level of productivity as the factor of competitiveness in the EU countries and on technical and technological efficiency changes contributing to overall productivity of the evaluated countries assessed in the period 2000–2015 through multivariate method and multicriteria decision making method. The paper strives to validate the relationship between competitiveness and performance. This relationship is given by the initial hypothesis based on level of productivity, which is perceived as a crucial factor for competitive potential. Conclusions show that new EU member states have a comparable level of productivity to advanced original EU members. In many respects, there is a convergence of competitiveness level between these two groups of countries due to changes in productivity.

Keywords: *competitiveness; DEA; efficiency; EU member states; productivity.*
JEL classification: C67; C82; E61; O11; O52; P47.
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РОЗВИТОК ЕКОНОМІКИ ЄС-28 У КОНТЕКСТІ ГЛОБАЛІЗАЦІЇ ТА ІНТЕГРАЦІЇ: АНАЛІЗ ІЗ ЗАСТОСУВАННЯМ DEA

У статті проаналізовано рівень продуктивності як чинник конкурентоспроможності країн ЄС, акцент зроблено на технічній та технологічній ефективності, які є чинниками впливу на загальній рівень продуктивності економік ЄС. Період дослідження – 2000–2015 роки. Дані проаналізовано методами багатофакторного аналізу та багатокритеріального прийняття рішень. Описано взаємозв'язок між конкурентоспроможністю та продуктивністю економік. Доведено гіпотезу про те, що рівень продуктивності є суттєвим фактором для конкурентного потенціалу країни. Також доведено, що рівень продуктивності в нових країнах ЄС є порівняним з показниками початкових членів Євросоюзу. Одразу за декількома паарметрами спостерігається зближення показників конкурентоспроможності між цими двома групами (старі на нові країни-члени ЄС) у зв'язку зі змінами в показниках продуктивності.

Ключові слова: *конкурентоспроможність; DEA; ефективність; країни-члени ЄС; продуктивність.*
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РАЗВИТИЕ ЭКОНОМИКИ ЕС-28 В КОНТЕКСТЕ ГЛОБАЛИЗАЦИИ И ИНТЕГРАЦИИ: АНАЛИЗ С ПРИМЕНЕНИЕМ DEA

В статье проанализирован уровень продуктивности как фактор конкурентоспособности стран ЕС, акцент сделан на технической и технологической эффективности, которые являются факторами влияния на общий уровень продуктивности экономик ЕС. Период исследования – 2000–2015 годы. Данные проанализированы методами многофакторного анализа и многокритериального принятия решений. Описана взаимосвязь между конкурентоспособностью и производительностью экономик. Доказана гипотеза о том,

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уровень продуктивности является существенным фактором для конкурентного потенциала страны. Также доказано, что уровень продуктивности в новых странах ЕС является сравнимым с показателями изначальных членов Евросоюза. Сразу по нескольким параметрам наблюдается сближение показателей конкурентоспособности между данными двумя группами (старые и новые страны-члены ЕС) в связи с изменяющимися показателями продуктивности.
Ключевые слова: *конкурентоспособность; DEA; эффективность; страны-члены ЕС; продуктивность.*

Introduction. The process of the EU enlargement creates new conditions and possibilities for old and new member states for their further development within European and global economies. On the one hand, the EU member states must deal with challenging competitive environment of the single internal market, on the other – the EU members are gaining more opportunities within open global economy. The main condition for successful existence in this environment is competitiveness – the ability to compete in the international environment and to ensure the growth of welfare and living standards.

The issue of competitiveness is currently the subject of interest for many economic analyses. Although there is no uniform definition and understanding of this concept, competitiveness remains one of the basic measures in performance evaluation of economies and is also seen as a reflection of success in broader comparisons. Growth and competitiveness of a territory refers to top priorities of economic policies between countries. In the EU, competitiveness issues are associated with the issue of economic, social and territorial cohesion, which is the reflection of existing economic, social and territorial disparities among the EU member states and regions. These disparities have a negative impact on the balanced development of the whole Union and thus weaken its competitiveness in the global context.

The main aim of this paper is to evaluate productivity and efficiency as the factors of competitiveness for the EU Member States in the period of 2000–2015 using quantitative methods. For that matter we have determined the following main hypothesis: areas with higher levels of productivity are better suited for achieving competitiveness, i.e. have significant competitive advantages over other areas, and are able to utilize these advantages more effectively and efficiently thus leading to strengthening competitiveness. The paper is divided into 3 chapters, of which two provede theoretical insights and one is practical. These chapters are supplemented by the first chapter (introduction) and fifth chapter (conclusion). The second chapter is devoted to the theoretical aspects of competitiveness phenomenon in terms of performance analysis. The third chapter focuses on the analysis of relevant methods for measuring competitiveness factors and evaluating productivity. The fourth chapter presents complex measuring of productivity and efficiency changes in the EU member states during 2000–2015.

Literature review of competitiveness and performance concepts. The process of European integration is guided by striving for two different objectives: to foster economic competitiveness and to reduce regional differences. The economy may be competitive but if society and environment suffer too much the country will face major difficulties (Molle, 2007). The same problem would happen vice versa when the economy is too weak. Therefore, governments in the long run cannot focus on

economic competitiveness alone; instead, they need an integrated approach to govern the country. Measurement, analysis and evaluation of productivity changes, efficiency and level of competitiveness are controversial topics attaining great interest among researchers (Camanho and Dyson, 2006; Khan and Soverall, 2007). Competitiveness remains a concept that can be understood in different ways and levels despite the widespread acceptance of its importance. Competitiveness is distinguished at different levels – microeconomic, macroeconomic and regional (Krugman, 1994). Current economic fundamentals are threatened by shifting of production activities to the places with better conditions, i.e. competitiveness is affected by regionalization of public policy because of shifting decision-making and coordination of activities at the regional level (Porter, 2003).

Territories need highly performing units in order to meet their goals, to deliver the products and services they specialized in, and finally to achieve competitive advantage. Low performance and not achieving the goals might be experienced as dissatisfying or even as a failure. Differences in performance across territories are seen by government as important policy targets. Performance can be achieved under the conditions of maximizing the results of an action in relation to the resources used, and it is calculated by comparing effects/outputs obtained in their efforts/inputs. Figure 1 illustrates the conceptual framework of efficiency and effectiveness. Efficiency is given by the ratio of inputs to outputs, but there is difference between technical efficiency and allocative efficiency. Technical efficiency implies a relation between inputs and outputs on the frontier production curve (i.e., productivity), but not any form of technical efficiency makes sense in economic terms, and this deficiency is captured through allocative efficiency that requires a cost/benefit ratio. Effectiveness implies a relationship between outputs and outcomes. But there is no efficiency without effectiveness, because it is more important to do well what you have proposed (effectiveness) than do well something else that was not necessarily concerned (efficiency). The concept of competitiveness is thus usually linked to productivity. Increasing productivity is generally considered to be the only sustainable way of improving living standards in the long term = the main aim of competitiveness.

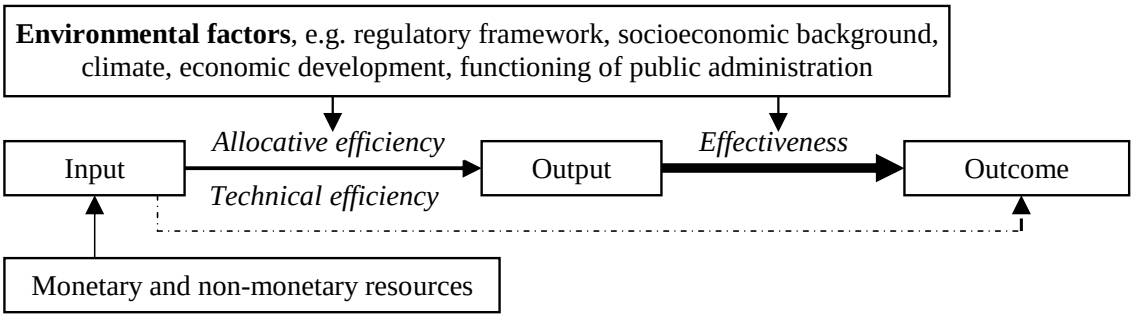

Figure 1. **The relationship between the efficiency and the effectiveness** (Mandl et al., 2008)

Methodological background. Performance management is one of the major sources for sustainable organizational efficiency and a systematic understanding of factors effecting productivity (Mohammadi and Ranaei, 2011). Analysis of productivity has always been a controversial topic and has enjoyed a great deal of interest

among scholars and practitioners. In 1957, M. Farrell already investigated how to measure efficiency and highlighted its relevance for policy makers (Farrel, 1957: 11). In the case of international comparisons, quality of inputs and outputs and quality adjustment are the most pressing challenges in measuring efficiency. Good quality data are needed because the techniques available to measure efficiency are sensitive to outliers and may be influenced by exogenous factors. If quality of inputs and outputs is not properly taken into account when measuring efficiency, underestimation of efficiency may result. The goal of evaluation of the areas' operation is correction, improvement and promotion of performance. Nowadays considering the increasing growth and importance of organization in the society and in the competitive world, evaluation of performance has been remarkably considered and various measures are brought up as criteria for evaluation. Data Envelopment Analysis (DEA) is one of the most powerful techniques in management so that to estimate countries' performance in comparison with other competitors and make better decisions (Hajiha and Ghalavi, 2012). Our scheme of productivity measuring is shown in Table 1.

Table 1. **Scheme of procedures,** *authors'*

Pre-processing phase
Collection of indicators → Analysis of indicators → Groups of input and output indicators
Factor analysis
Correlation → Set of newly selected indicators → Input and output factors → Factor description
DEA modelling
MPI based on CCR CRS model → Productivity and efficiency evaluation

Since DEA was first introduced by (Charnes et al., 1978) in the form of CCR model, researchers in a number of fields have quickly recognized that it is an excellent and easily used methodology for modelling operational processes in performance evaluations. DEA is a mathematical approach for relative efficiency assessment and evaluating performance of a set of peer entities called Decision Making Units (DMUs) which are mutually comparable – using the same inputs, producing the same outputs, but their performances are different. Definition of a DMU is generic and flexible. In recent years, research efforts have been focused on investigation of causes in productivity change and its decomposition. Malmquist productivity index (MPI) has become the standard approach to productivity measurement over time within non-parametric research. MPI was firstly (Caves et al., 1982), it allows measuring total productivity by means of distance-functions calculation, which can be estimated through mathematical programming problems of DEA kind.

Suppose there are n DMUs which consume m inputs to produce s outputs. If a performance measure (input/output) is added or deleted from consideration, it will influence relative efficiencies. Empirically, a when number of performance measures is high in comparison with the number of DMUs, then most of DMUs are evaluated as being efficient. Hence, the obtained results are not reliable. There is a rule of thumb proposed by (Cooper et al., 2007) which expresses the relation between the number of DMUs and the number of performance measures, see formula:

$$n \geq 3(m+s). \quad (1)$$

Suppose there are n DMUs (DMU_j, $j = 1, ..., n$) with m inputs, $x_j = (x_{1j}, ..., x_{mj})$, and s outputs, $y_j = (y_{1j}, ..., y_{sj})$. The CCR model (2) measures the efficiency of the under evaluation DMU, i.e. DMU_o for $o \in \{1,...,n\}$:

maximize $$\theta_0 = \sum_{r=1}^{s} u_r y_{r0},$$

subject to

$$\begin{gathered} \sum_{i=1}^{m} v_i x_{i0} = 1; \\ \sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0, j = 1,...n; \\ u_r \ge 0, \forall r; \;\; u_i \ge 0, \forall i, \end{gathered} \tag{2}$$

where v_i and u_r are unknown i^{th} input and o^{th} output weights. It is proved that CCR model is always feasible and its optimal objective value is bounded; i.e. $0 < \theta_j^* \le 1$ for $j = 1, ..., n$.

In contrast to traditional DEA models which measure the efficiency of DMU, MPI enables measuring productivity change of DMU between two time periods, t and $t + 1$. MPI is defined as product of Catch-up and Frontier-shift. Catch-up deals with degree to which DMU improves or worsens its efficiency – technical change, while Frontier-shift shows change in efficient frontiers between two time periods – technological change. It is denoted $DMU_j^1 = \left(x_j^1, y_j^1\right)$ and $DMU_j^2 = \left(x_j^2, y_j^2\right)$ to show data set of DMU_j for Period1 and Period2. There are two efficient frontiers with these assumptions. Catch-up effect from Period1 to Period2 is defined as follows:

$$Catch-up = \frac{Efficiency\ of\ (x_o^2, y_o^2)\ with\ respect\ to\ Period2\ frontier}{Efficiency\ of\ (x_o^1, y_o^1)\ with\ respect\ to\ Period1\ frontier}. \tag{3}$$

To evaluate Frontier-shift effect more computations are required. Let us have (4) and (5):

$$\phi_1 = \frac{Efficiency\ of\ (x_o^1, y_o^1)\ with\ respect\ to\ Period1\ frontier}{Efficiency\ of\ (x_o^1, y_o^1)\ with\ respect\ to\ Period2\ frontier}; \tag{4}$$

$$\phi_2 = \frac{Efficiency\ of\ (x_o^2, y_o^2)\ with\ respect\ to\ Period1\ frontier}{Efficiency\ of\ (x_o^2, y_o^2)\ with\ respect\ to\ Period2\ frontier}. \tag{5}$$

Using these notations, Frontier-shift effect can be defined as:

$$Frontier-shift = \sqrt{\phi_1 \phi_2}. \tag{6}$$

Finally, MPI is calculated as product of Catch-up and Frontier-shift via:

$$MPI = Catch-up\ x\ Frontier-shift. \tag{7}$$

As a result, MPI < 1 indicates deterioration in the total factor productivity of DMU_o from Period 1 to Period 2; result of MPI =1 shows there is no change in total factor productivity and MPI > 1 shows progress in total factor productivity (for more

details see (Cooper et al., 2007)). And in Table 2, trends of MPI and efficiency change are also shown.

Table 2. **Characteristics and trends of MPI and efficiency change,** *authors'*

MPI (Catch-up, Frontier-shift)	Productivity	Efficiency Change
> 1	Improving	Improving
= 1	Unchanging	Unchanging
< 1	Declining	Declining

The following linear programming (8) measures the efficiency score of $\left(x_0^s, y_0^s\right)$ with respect to Period t where $s,t \in \{1,2\}$:

maximize $$\sigma_s^t = \sum_{r=1}^{s} u_r y_{r0}^s,$$

subject to

$$\begin{gathered} \sum_{i=1}^{m} v_i x_{i0}^s = 1; \\ \sum_{r=1}^{s} u_r y_{rj}^t - \sum_{i=1}^{m} v_i x_{ij}^t \le 0, j = 1,\ldots,n; \\ u_r \ge 0, \forall r;\ u_i \ge 0, \forall i. \end{gathered} \tag{8}$$

In this model, $\frac{\sigma_2^2}{\sigma_1^1}$ indicates the Catch-up effect, $\sqrt{\frac{\sigma_1^1}{\sigma_1^2} x \frac{\sigma_2^1}{\sigma_2^2}}$ shows the Frontier-shift effect and $\sqrt{\frac{\sigma_1^2}{\sigma_1^2} x \frac{\sigma_2^1}{\sigma_2^1}}$ displays MPI. For solution of DEA models software tools based on solving linear programming problems is used, i.e. DEA Frontier Add-In.

Empirical analysis starts from building the database of indicators that are part of Regional Competitiveness Index (RCI) by (Annoni and Kozovska, 2010) and then updated by (Annoni and Dijkstra, 2013). For better understanding of territorial competitiveness at regional level, the European Commission has developed this index which shows strengths and weaknesses of each EU NUTS 2 region. The index also exists at national level in the form of Country Competitiveness Index (CCI). It is based on 11 pillars describing both inputs and outputs of territorial competitiveness, grouped into 3 sets describing basic, efficiency and innovative factors of competitiveness. Index pillars are grouped by different dimensions (input vs. output aspects) of competitiveness they describe. Terms "inputs" and "outputs" are meant to classify pillars into those which describe the driving forces of competitiveness, and those which are direct or indirect outcomes of a competitive society and economy. From this point of view, the CCI approach seems to be convenient with respect to using DEA and its division to input and output nature of incoming database.

The database consists of 94 indicators within CCI for national competitiveness level, i.e. 54 input indicators and 40 output indicators. Not all indicators are used in this paper due to correlation conditions. The database coming into analysis consists

of 61 indicators (35 inputs and 26 outputs). The sources of indicators are the European Statistical Office, the World Bank, Euro Barometer, Organization for Economic Cooperation and Development and European Cluster Observatory. Territorial background of analysis is at the national level (NUTS 0/1) within the group of EU28 member states – old (EU15) and new (EU13). The study period is 2000–2015, because year 2000 is the year when all these countries were in some way already integrated (member, candidate or potential candidate), and 2015 is the last year of data availability.

Analysis and evaluation of EU28 national competitiveness. What is the background of national competitiveness? What are the crucial factors behind competitive differences and gap among countries? These are the questions that motivate the empirical study of the EU competitiveness. Policy makers need a clear sense of current competitive position and its functioning and the latent factors of competitiveness: the starting point. By understanding both position and factors of competitiveness, policy makers can better understand the potential development options and limitations for countries and thus plot a development trajectory towards the desired state. Also, they can more clearly identify the required interventions to be undertaken to make the best use of the competitiveness factors to achieve their desired point. Through Factor Analysis (FA) we determine the factors of inputs and outputs and competitiveness is determined by the level of influence of these factors on performance dynamics of a territory. Subsequently, with the help of DEA, the level of productivity and efficiency changes for all these countries is assessed. FA is a statistical procedure used to identify a small number of factors that can be used to the represent relationship among the sets of interrelated variables. FA is applied as a structure detection method and as data reduction method for DEA. For calculation of factors by FA: Principal Component Analysis is used as an extraction method; Varimax with Kaiser Normalization is used as a rotation method; Rotation is converged in several iterations. For FA solution, statistical package "IBM SPSS Statistics Version 23" is used. The driving forces of competitiveness are divided into factors crucial for the EU economies. In this paper, 6 dominating factors for inputs explained 65.274% of total variability in the period 2000–2015, and this can be considered as a satisfactory result. In this paper, 3 dominating factors for outputs explained 70.452% of the total variability in the period 2000–2015, what can be considered as a very satisfactory result.

Inputs factors: Factor 1 – Economic growth and development is composed of 15 indicators, i.e. Government effectiveness, Rule of law, Control of corruption, Voice and accountability, Regulatory quality, Political stability, Lifelong learning, Total public expenditure at tertiary level of education, Infant mortality rate, Road fatalities, Level of Internet access, Cancer disease death rate, Gross fixed capital formation, Total public expenditure at the secondary level of education, Volume of freight transport. Factor 2 – Level of infrastructure is composed of 7 indicators, i.e. Income, saving and lending/borrowing, Accessibility to universities, Air transportation of passengers, Motorway transport, Railway transport, E-government availability, Air transportation of cargo. Factor 3 – Health phenomena in human life and education is composed of 2 indicators, i.e. Hospital beds, Total public expenditure at primary level of education. Factor 4 – Inflation trends, transport, healthy lifestyle, performance of educational institutions and public administration is composed of 5 indicators, i.e.

Harmonised index of consumer prices, Mathematics, science and technology enrolments and graduates, Healthy life expectancy, Volume of passenger transport, Participants in early education. Factor 5 – Participation in education is composed of 4 indicators, i.e. Early leavers from education and training, Participation in higher education, Financial aid to students, Pupils to teachers' ratio. Factor 6 – Civilization diseases is composed of 2 indicators, i.e. Heart disease death rate, Suicide death rate.

Output factors: Factor 1 – Labour market and economic performance is composed of 10 indicators, i.e. Unemployment rate, Long-term unemployment rate, Male unemployment, Female unemployment, Male employment, Employment rate (15 to 64 y.o.), Gross domestic product, Female employment, Gross value added in sophisticated sectors, Human resources in Science and Technology. Factor 2 – Innovation and knowledge based economy is composed of 7 indicators, i.e. Employment in technology and knowledge-intensive sectors and then by level of education, by gender, type of occupation, High-tech patent applications to EPO, ICT patent applications to EPO, Biotechnology patent applications to EPO. Factor 3 – Human resources and innovation potential is composed of 9 indicators, i.e. Compensation of employees, Employment in sophisticated sectors, Total patent applications, Patent applications to EPO, Public expenditure on labour market policies, Disposable income, Total intramural R&D expenditure, Human resources in science and technology, Labour productivity.

Input and output factors are the initial variables for DEA analysis. In this paper, the rule of thumb specified in formula (1) is met, i.e. DMUs number is 3 times higher than the sum of input (6 factors) and outputs (3 factors), i.e. $28 \geq 3\ (6 + 3)$, $28 \geq 3\ (9)$, $28 \geq 27$. In DEA analysis, the initial hypothesis was confirmed through analysis by MPI based on CCR CRS model, as illustrated in Table 3. The results are highlighted by the traffic light method. Range of colours of this method changes in the shadows of grey colour. Countries with the highest and higher values of MPI, Catch-up and Frontier-shift mean better level of efficiency and thus competitiveness, they are highlighted by dark grey colour – the higher is value, the darker is the shadow of grey. On the contrary, countries with the lowest and lower values of MPI and its two dimensions (Catch-up and Frontier-shift) mean worse level of efficiency, resp. the level of inefficiency are highlighted by light grey colour – the lower is the value, the lighter shadow of grey is used. Countries with MPI higher than 1 are categorized based on decimal values, i.e. 1.02XX, 1.01XX and 1.00XX (Table 3). Based on these differences, countries are classified as "efficient", "highly efficient" and "slightly efficient", i.e. these countries are considered as countries with the best, better and lower competitive potentials. Countries classified as "inefficient" are those with MPI less than 1, i.e. 0.9XXX.

Part of the explanation to the inequalities within EU15 and EU13 countries may have to do with the differences in competitiveness. An economic entity in a country which has low competitiveness may not have similar opportunities as an economic entity in a highly competitive country. This fact remains and is confirmed. But what does it mean for efficiency in competitiveness? In the case of efficiency analysis of competitiveness and in time comparison analysis of change throughout years (2000–2015), the results are just a little bit different. Why? The concept of competitiveness may be important not only to evaluate why some countries grow faster than

others, but also why some countries have better and more efficient distribution of competitiveness over time. Is high level of competitiveness necessarily associated with high efficiency, and vice versa? It may not always be the case because the evaluated countries having lower level of inputs and convenient level of outputs, therefore this combination seems to be relevant for the evaluated countries and level of transformation inputs into outputs could be marked as efficient. These results are not surprising. Competitiveness level may not be high in such countries, and even in less competitive countries is actually not, but it is necessary to compare the values of inputs and outputs. In this sense, it is critical to take into account the results.

Table 3. **Results of MPI and its components for EU28, 2000–2015,** *authors'*

Results based on countries					Results based on rank order			
NUTS	**MPI**	**TEC**	**EFS**	**EU**	**Rank**	**NUTS**	**MPI**	**Change**
BE	1.0131	1.0000	1.0131	EU15	1	LV	1.0229	+++
BG	1.0136	1.0000	1.0136	EU13	2	HU	1.0193	++
CZ	0.9949	1.0010	0.9938	EU13	3	EL	1.0162	++
DK	1.0095	1.0000	1.0095	EU15	4	IT	1.0161	++
DE	1.0096	1.0000	1.0096	EU15	5	NL	1.0159	++
EE	0.9973	0.9963	1.0010	EU13	6	UK	1.0144	++
IE	1.0075	1.0000	1.0075	EU15	7	BG	1.0136	++
EL	1.0162	1.0031	1.0131	EU15	8	BE	1.0131	++
ES	1.0125	1.0000	1.0125	EU15	9	HR	1.0130	++
FR	1.0100	1.0000	1.0100	EU15	10	ES	1.0125	++
IT	1.0161	1.0000	1.0161	EU15	11	SI	1.0114	++
CY	0.9905	0.9928	0.9976	EU13	12	LT	1.0113	++
LV	1.0229	1.0024	1.0204	EU13	13	FR	1.0100	++
LT	1.0113	1.0026	1.0087	EU13	14	DE	1.0096	+
LU	1.0053	1.0000	1.0053	EU15	15	DK	1.0095	+
HU	1.0193	1.0000	1.0193	EU13	16	IE	1.0075	+
MT	0.9566	1.0000	0.9566	EU13	17	SE	1.0066	+
NL	1.0159	1.0000	1.0159	EU15	18	LU	1.0053	+
AT	1.0036	1.0041	0.9995	EU15	19	RO	1.0048	+
PL	0.9910	0.9940	0.9967	EU13	20	AT	1.0036	+
PT	0.9784	0.9940	0.9844	EU15	21	EE	0.9973	-
RO	1.0048	1.0000	1.0048	EU13	22	FI	0.9956	-
SI	1.0114	1.0101	1.0014	EU13	23	CZ	0.9949	-
SK	0.9947	1.0000	0.9947	EU13	24	SK	0.9947	-
FI	0.9956	1.0000	0.9956	EU15	25	PL	0.9910	-
SE	1.0066	0.9983	1.0085	EU15	26	CY	0.9905	-
UK	1.0144	1.0000	1.0144	EU15	27	PT	0.9784	--
HR	1.0130	1.0076	1.0053	EU13	28	MT	0.9566	---

Note: MPI and rank is based on the average of efficiency coefficients throughout the years.

Based on FA and DEA approach, it is possible to characterize the EU Member States in terms of their facilities and prerequisites for achieving adequate results, which in the reference period presents a competitive or less competitive economy. The most competitive countries in the EU are Scandinavian/Nordic economies (Denmark, Finland, Sweden), which are characterized by stable macroeconomic environments, balance or surplus and relatively high levels of taxation and public

spending above average. Labour markets in these countries are also seen as very flexible, as reflected in high levels of total employment, as well as in relatively small differences in employment between men and women. These countries also have high levels of population education at all levels. Nordic countries are characterized by high-quality healthcare systems, as well as sophisticated businesses, significant expenditures on R&D, which is associated with high quality of their research institutions, which in turn, impact on the ability of the workforce in advanced areas to create and implement innovations and transfer them into practice. These countries are characterized by certain negatives, and thus do not have a clear ideal model for other EU member states to follow, e.g. Sweden faces high levels of unemployment among the young, but this is a big problem even in Mediterranean economies. While Finland faces a decrease in the growth rate of productivity, as evident from its MPI.

Another group of countries, characterized by good level of competitiveness, are older members, Western European countries (especially the Benelux countries, France, Germany and Austria). In a number of sub-criteria analysis they recorded very good results. Competitiveness of these countries supports stable macroeconomic environment, availability of the latest technologies related to high innovation capacity and widely available research and education services. Above average public expenditure and relatively high tax burden in these countries are the factors that undermine competitiveness. Very similar results and characteristics also have the Anglo-Saxon countries, the UK and Ireland. These countries are characterized by very good results at the labour market, particularly employment and population structure of employment in advanced areas. Competitiveness of these countries also support quality of research institutions. The strength of the UK is its highly competitive market of goods and services, flexible labour market and skilled workforce. The growing problems are mainly related to Irish banking sector and structural deficits.

In the group of old EU15 countries there are also the least competitive countries – Southern European or Mediterranean countries (Greece, Italy, Spain and Portugal) which face lack of productivity, lower quality of education systems, and high wages at the same time through. Competitiveness of these countries was also impacted by the economic crisis as here reflected mainly through high unemployment rates, especially among youth, there also remains a large gap between female and male employment. To negative phenomenon in this group we could also refer the problems with government deficits and growing public debt.

Countries evaluated as new EU members are considered as relatively less competitive. These are the economies that have undergone transformations, but in the last decade, reaching dynamic growth, which is subsequently suppressed the effects of economic crisis. The labour market in these countries is rather rigid and not very mobile, business environment is less sophisticated than in the EU13 and partnership between public and private sectors does not work properly. The countries in this group must continue with intensively focus on improving the basic factors of competitiveness such as infrastructure in all its dimensions and institutional environment quality. Competitiveness of these countries is also hampered by high levels of corruption and bureaucracy, slow liberalization, lack of transparency in public policies and lagging innovativeness and investments in research.

Conclusion. Competitiveness is a very frequent term, used to describe states, groups, institutions or individuals. This concept has become quite common, but on the other hand – it is so poorly understood. There are many theoretical definitions of this concept and so many different variations of measurement but we cannot clearly say which of these options is the right choice. Today the idea of competitiveness is emphasized increasingly serving as the basic measure of success in comprehensive international comparisons. The term "competitiveness" represents many challenges as well as opportunities. Competitiveness of economy's aggregates country's ability to succeed in the global market with a range of positive after effects. This ability is not just determined by productivity and economic efficiency, but it also covers a wide range of economic, political, social, cultural and educational factors that are different in each country. The importance for individual factors of economic development have been changing over time. We observe a substantial decline in importance of material factors of production (natural resources, labour and capital), and at the same time relatively rapid growth of importance of intangible factors of production (generate and use of innovations, quality of human resources, bringing additional added value for all stakeholders). Traditional factors are critical but not sufficient for economic competitiveness. Economic competitiveness is not based solely or mainly on a single factor, but multifactor competitiveness of states is conditional. Great importance has mutual combination of factors that create favourable local environment. In this context, further research will be focused on localization theory and theory of core-periphery to find out specific territorial options concerning the whole economic-society development in individual countries and regions. Based on FA and DEA approach, we have known internal factor endowment of EU28 countries, but analysis must be oriented on lower territorial units (NUTS 2 – cohesion regions, or NUTS 3 – decision territorial units) to recognize the required set-up of input and output structure in territorial factor endowment. These results could lead to relevant orientation of development strategy to boosting territorial competitiveness. Thus, subsequent research will be based on specific quantitative methods such as spatial econometrics and spatial autocorrelation.

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