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REGIONAL COMPETITIVENESS OF THE EUROPEAN UNION

REGIONALNA KONKURENTNOST EUROPSKE UNIJE

ABSTRACT

The aim of this paper is to analyse the competitiveness of the European Union (EU) NUTS 2 regions by estimating the regional competitiveness function based on labour (productivity) as the determinant of regional competitiveness. The dynamic panel data analysis is applied in accordance with the explained theoretical framework on defining and measuring regional competitiveness. The results of the study have shown that employment and labour productivity have significant, positive and the highest impact on regional competitiveness, human capital has significant and positive influence while real unit labour costs have significant and negative influence on regional competitiveness of the observed regions in the EU. Human capital is not a significant determinant if the modelling is applied only on convergence regions and regions of the new member countries while unit labour costs are not a significant determinant in the sample of the new member countries of the EU. The results imply that competitiveness is not homogeneous between the regions of the EU and can have implications for regional policy makers, regarding utilisation of examined determinants. The importance of less developed regions should not be disregarded in competitiveness analysis especially if we take into account that this may result in a re-allocation of resources from the less developed to ("better places") the more developed regions which will contribute to widening inequalities and possibly lower the competitiveness of less developed areas or even problems in more developed regions regarding its capacity and problems of congestion. This has confirmed the need to analyse competitiveness on regional level and that it is necessary to observe regional specificities in future creation of competitiveness measures.

Key words: *regional competitiveness, NUTS, labour productivity, human capital, unit labour costs*

SAŽETAK

Cilj rada je analizirati konkurentnost NUTS 2 regija Europske unije (EU) procjenom funkcije regionalne konkurentnosti kojom se pobliže utvrđuje utjecaj (produktivnosti) rada, jedne od temeljnih odrednica regionalne konkurentnosti. Primijenjena je dinamička panel analiza u skladu sa prikazanim teorijskim okvirom o definiranju i mjerenju regionalne konkurentnosti. Rezultati istraživanja ukazuju na pozitivan i najznačajniji utjecaj zaposlenosti i produktivnosti rada na regionalnu konkurentnost u EU, ljudski kapital ima značajan i pozitivan utjecaj, dok jedinični troškovi rada imaju značajan i negativan utjecaj. Ljudski kapital nije značajna odrednica ukoliko se modeliranje provodi na uzorku regija konvergencije i na uzorku koji obuhvaća regije novih država članica EU, dok jedinični troškovi rada nemaju značajan utjecaj na konkurentnost regija novih država članica EU. Rezultati istraživanja također upućuju na značajne razlike u konkurentnosti između pojedinih skupina regija, odnosno impliciraju da u promišljanju o ulozi promatranih odrednica u jačanju konkurentnosti kreatori regionalne politike trebaju sagledati regionalnu heterogenost. Mogućnosti slabije razvijenih regija u analizi konkurentnosti ne smiju ostati zanemarene. Naime, nedovoljna participacija slabije razvijenih regija u implementaciji mjera regionalne politike koje su usmjerene prema jačanju konkurentnosti može doprinijeti realokaciji resursa od slabije razvijenih prema razvijenijim regijama, što dovodi do povećanja regionalnih nejednakosti i smanjenja konkurentnosti slabije razvijenih regija. Navedeno ujedno može i oslabiti konkurentnost razvijenijih regija ukoliko se pojave problemi narušavanja njihovog razvojnog kapaciteta, odnosno prevelikog iskorištavanja postojećih resursa. U konačnici, u radu je potvrđeno da je u cilju jačanja konkurentnosti EU potrebno sagledati regionalnu konkurentnost te da je u kreiranju mjera za jačanje konkurentnosti nužno uključiti regionalne specifičnosti unutar pojedinih država članica EU.

Ključne riječi: *regionalna konkurentnost, NUTS, produktivnost rada, ljudski kapital, jedinični troškovi rada*

1. Introduction

Frequently used (sometimes abused) and controversial term of competitiveness entered the public debate when the rise of Japan challenged the economic dominance of USA in the 1990s. Firstly, the term had been focused on nations, but it was also applied to regions (Ketels, 2013). Looking from the European perspective, the European Union (EU) wants to become the most competitive economy in the world. Regional competitiveness and employment is one of the goals of the EU cohesion policy, while competitiveness is emphasized as one of the priorities in Lisbon strategy and strategy Europe 2020.

Even though there are numerous works about defining, measuring and enhancing competitiveness (e.g. Porter, 1990, Aristovnik, 2012, Annoni and Dijkstra, 2013, Ketels, 2013, Aristovnik and Obadić, 2014, International Institute for Management Development (IMD), 2014, Obadić and Tijanić, 2014, World Economic Forum (WEF), 2014), there are still discussions and lack of empirical research considering the influence of the specific determinants of regional competitiveness. One of the most important determinants of regional competitiveness is labor productivity (European Commission - Regional Policy, 1999, Cambridge Econometrics et al., 2003). Our study tries to investigate the influence of labor productivity on EU regional competitiveness, regarding also the determinants of labor productivity that can be important for future regional investments directed towards the strengthening of the EU regional competitiveness.

The paper is structured as follows. The main research questions of our paper are grounded in theoretical framework presented in the next section which synthesizes and critically evaluates the insights on defining and measuring the regional competitiveness. The empirical part of this paper

will estimate the influence of the mentioned determinants and regional differences on the competitiveness of the EU NUTS 2 regions (to the authors' knowledge for the first time on the sample of the EU 28 countries) by using dynamic panel data analysis. The final section concludes and gives implications for future studies.

2. Literature Review – Theoretical Framework for Measuring Regional Competitiveness

There are different approaches that deal with competitiveness. After the work of Porter (1990), discussions about the mentioned concept and critics of competitiveness can be seen in Krugman (1994), Bristow (2005) and other papers, which lead us to the question: *is it possible to define and measure competitiveness?* We agree with Snieška and Bruneckienė (2009) that it is hard to sum up the theory of competitiveness because of the complexity of the concept and many different determinants it includes. There is no generally accepted theory of regional competitiveness (Kitson et al., 2004), but the key issues in regional competitiveness analysis are those that economic theorists have been trying to address in theories of economic growth and development. The comparison of studies implies that national competitiveness can be analyzed on several levels (micro, mezzo and macro-economic), in regards to different areas of observing (technological, economic, political, social, ecological aspect) and time perspectives (short, middle and long term) (Zaharieva and Čiburniene, 2008). Nowadays the role of regions as policy actors or territorial units for policy interventions should not be excluded in competitiveness analysis due to the fact that regions represent a unique economic system, aggregations of internal development capability that influence the regional and national competitiveness performance. In the EU regional competitiveness has been adopted as a policy goal, so regions must become active participants in creation of regional policy, able to fulfill the needs and generate rising standards for people living and working there better than other areas, which can be seen through utilization of its development preconditions in terms of competitiveness determinants. This leads to the definition of (regional) competitiveness by Meyer and Stamer (2008, 7), given in Annoni and Kozovska (2010), who define "competitiveness of a territory as the ability of a locality or a region to generate high and rising incomes and improve livelihoods of the people living there".

In this paper region is defined as a homogeneous unit, region-subject that has the possibility to participate in allocation and utilization of regional resources (looking from the perspective of economic theory and policy makers) and in more detail according to NUTS (*The Nomenclature of Territorial Units for Statistics*) categorization of Eurostat (due to statistical categorization that is based on analytical purposes and is important for EU regional policy implementation). NUTS 2 regions are eligible for aid from the EU Structural Funds (convergence regions[1] from the objective in which the most of the total resources are allocated). But to successfully absorb the EU funds and use the funds for strengthening the competitiveness in an effective way, each of NUTS 2 regions must have a suitable regional internal endowment. Furthermore, utilization of the determinants of competitiveness has an impact on the outcomes of competitiveness, so it can be assumed that there will be differences in competitiveness of NUTS 2 regions in regards to differences in internal endowment and its competitiveness determinants. This heterogeneity between the EU NUTS 2 regions can also be observed as the homogeneity of the groups of NUTS 2 regions based on their similarity regarding the development level and the similarity between two groups of old (EU 15) and new EU member states (EU 13[2]), in the field of competitiveness. The same strategies can not be directed toward competitiveness strengthening in distinctive types of regions so it is important to analyze and highlight the differences before making policy implications.

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[1] Those having the GDP (gross domestic product) per capita less than 75% of the EU average, called less developed regions in 2014-2020 programming period (more in: European Commission - Regional Policy, 2013).
[2] EU member countries that have became members in 2004, 2007 and 2013.

Complexity in defining regional competitiveness implies that special concern must be directed to choosing the appropriate information system and creating indicators but also to applying reliable models in measuring the mentioned concept. There is no "unique" regional competitiveness model that can be applied in measuring. Depending on the subject and aim of the analysis, *different indicators* (Porter, 1990, Gardiner, 2003, Kitson et al., 2004, Annoni and Kozovska, 2010, Annoni and Dijkstra, 2013, IMD, 2014, WEF, 2014)*, models* (Cambridge Econometrics et al., 2003, Lengyel, 2004) *and methods of measuring competitiveness* (Melecký and Nevima, 2011, Lengyel and Szakálné Kanó, 2012) are used but with constrains regarding each of the mentioned concepts.

After examining advantages and disadvantages in measuring, and also considering the theoretical review, we have chosen to use the *regional competitiveness function* (according to Lengyel and Szakálné Kanó, 2012) as the best solution to derive econometric specification in our paper. As this study relies on a higher number of observed units and longer time period, appropriate method for estimation can be found in the framework of the econometric panel data analysis.

3. Econometric Specification and Empirical Results

In our study the modeling relies on extended regional competitiveness function based on labor where the determinants of regional competitiveness are independent variables and the dependent variable represents the proxy measure of competitiveness. We have estimated the function of regional competitiveness as the relation *between regional competitiveness* (output), *labor productivity, employment, human capital* (determinants of the labor productivity) and *unit labor costs*. In the empirical part of the analysis we also wanted to test if *regional differences* (between convergence regions and other regions, as well as between EU 15 and EU 13 regions) are significant and whether they have significant influence on regional competitiveness so it was necessary to assign dummy variables in modeling (dummy 1 to differ between convergence regions and the rest of the regions, dummy (2) to differ between EU 15 and EU 13 regions). Regional competitiveness functions that will be estimated in models (1), (2), (3) and (4) are given hereinafter (see *Table 1* for a detailed explanation of the variables):
MODEL (1):
$$COMP_{it} = f\,(LP_{it}, EMP_{it}, HCII_{it}, RULC_{it}, D_{ij})$$
$i = 1,\ldots,\ 272$, refers to one of the NUTS 2 regions; $T = 1,\ldots,\ 11$, refers to years 2000 to 2010 (because the last available data (at the time of performing analysis) for GDP per capita refer to 2010). $j = 1,\ldots,\ 2$, represents the dummy variables.
MODEL (2):
$$COMP_{it} = f\,(LP_{it}, EMP_{it}, HCII_{it}, RULC_{it}, D_{ij})$$
$i = 1,\ldots,\ 85$, refers to one of the NUTS 2 convergence regions in model (2); $T = 1,\ldots,\ 11$, refers to years 2000 to 2010; $j = 2$, represents the dummy variable (2) to differ between EU 15 and EU 13 regions in the model (2).
MODEL (3) and MODEL (4):
$$COMP_{it} = f\,(LP_{it}, EMP_{it}, HCII_{it}, RULC_{it})$$
$i = 1,\ldots,\ 215$, one of the EU 15 regions in the model (3);
$i = 1,\ldots,\ 57$, one of the EU 13 NUTS 2 regions in the model (4); $T = 1,\ldots,\ 11$, refers to years 2000 to 2010.

Variables that will be used in this empirical analysis are presented in *Table 1*, according to given regional competitiveness function and the described models.

Table 1 *Description of variables and data sources*

Code	Variable	Description of variable	Source of data
Dependent variable			
COMP	Competitiveness, proxy variable that is used as the measure of competitiveness: GDP per capita, as it is shown in European Commission - Regional Policy (1999), Gardiner (2003) and others.	GDP per capita (PPS)	European Commission - Eurostat (2013a) and European Commission - Eurostat (2013b)
Independent variables			
LP	Labor productivity	GDP in mil. PPS / (total) employment	European Commission - Eurostat (2013a) and European Commission - Eurostat (2013b)
EMP	Employment	Number of employed / working age population	European Commission - Eurostat (2013a)
HCII	Human Capital Intensity Index	Index is customized according to Dijkstra (2009)	European Commission - Eurostat (2013a)
RULC	Real unit labor costs	(Compensation of employees in mil. EUR / number of employees) / (gross domestic product in mil. EUR / total employment) Calculation: according to the methodology of European Commission - Economic and Financial Affairs (2013)	European Commission - Eurostat (2013a)
D_1	Dummy variable, convergence regions	The variable has the value 1 if it takes data of the convergence regions (those regions having GDP per capita < 75% of the EU average), otherwise variable has the value 0.	European Commission - Regional Policy (2013)
D_2	Dummy variable, region in EU 15	The variable takes the value 1 for regions that are one of the EU 15, otherwise variable has the value 0.	EU 15 are member countries before the enlargement in 2004, 2007 and 2013.

Source: created by authors

Considering the theoretical approach that observes regional competitiveness in the dynamic context, the *dynamic panel data models* are used as reliable methodology in order to estimate regional competitiveness function in this analysis. The relationship between the variables in dynamic panel models can be described in the following way (customized according to Verbeek (2004)):

$$\ln y_{it} = \varphi \ln y_{i,t-1} + \ln X_{it}' \beta + \delta_i + \varepsilon_{it}$$

As can be seen from the presented relation, the model includes a dependent variable (y_{it}, in our case COMP) with one or more time lags ($y_{i,t-1}$). Economic interpretation is that past values of competitiveness of regions have the influence on current values of the region i in time t. X_{it}' is vector of independent variables (labor productivity, employment, human capital, real unit labor cost, dummy variables in model (1) and (2)) for the observed regions i ($i = 1,…, 272$ in model (1); $i = 1,…, 85$ in model (2); $i = 1,…, 215$ in model (3) and $i = 1,…, 57$ in model (4)); in period t ($t = 1, 2, …, 10$)), while δ_i is fixed effect or individual heterogeneity. ε_{it} represents idiosyncratic error term for region i, in period t. It is assumed that the error term is independent and identically distributed over individuals and time, with mean zero and variance σ_ε^2.

System dynamic panel data estimator is used in the empirical analysis conducted in this paper and is estimated in two-step procedure because the mentioned procedure solves the problem of endogeneity, it is robust to heteroscedasticity and cross-correlation according to Roodman (2009), which were also the problems confirmed in the estimation in this analysis. More about this estimator and econometric diagnostics can be found in Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (1998) and Sarafidis et al. (2009). Model diagnostics confirms that the assumptions and the tests are satisfied. The results of the estimation are shown in *Table 2*.

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Table 2 *Results of the estimation of regional competitiveness function by using dynamic panel system GMM estimator in two-step*

Dependent variable: **COMP**

	Model 1 **(total)**	**Model 2** **(convergence regions)**	**Model 3** **(EU 15)**	**Model 4** **(EU 13)**
	Coefficients	Coefficients	Coefficients	Coefficients
Constant	0.8611	0.7903	0.4119	0.2346
	(0.000)*	(0.006)*	(0.035)**	(0.562)
Lag COMP	0.5994	0.2840	0.8306	0.3201
	(0.000)*	(0.000)*	(0.000)*	(0.000)*
LP	0.2902	0.6004	0.1200	0.6266
	(0.000)*	(0.000)*	(0.000)*	(0.000)*
EMP	0.3072	0.6749	0.1493	0.6184
	(0.000)*	(0.000)*	(0.000)*	(0.000)*
HCII	0.0006	0.0005	0.0006	0.0120
	(0.056)***	(0.458)	(0.000)*	(0.249)
RULC	-0.0322	-0.2763	-0.0644	-0.0321
	(0.015)**	(0.002)*	(0.007)*	(0.604)
D_1	-0.0728			
	(0.003)*			
D_2	0.0041	0.1095		
	(0.051)***	(0.000)*		
Model diagnostics				
Number of observations	2485	788	1986	540
Number of groups	272	85	215	57
Number of instruments	237	79	207	51
Wald test	16999.47	4574.42	14619	654.35
Prob > chi^2	0.000	0.000	0.000	0.000
Sargan/Hansen J statistics	268.91	77.39	210.61	53.01
Prob > chi^2	0.196	0.105	0.170	0.165
Arellano-Bond test for AR (1) in first differences	-4.22	-3.09	-5.14	-2.73
Prob > chi^2	0.000	0.002	0.000	0.006
Arellano-Bond test for AR (2) in first differences	-1.56	-1.34	-1.62	-1.36
Prob > chi^2	0.118	0.180	0.105	0.174

Notes: Standard errors are corrected using the approach by Windmeijer (2005), p values are shown in parentheses. In modeling are included time-dummies but are not significant (at the significance level 5%).
Full name and description of variables are shown in *Table 1*. Number of groups refers to number of cross-section units.
* Significant at 1%, ** Significant at 5%, *** Significant at 10%
Estimations are done with order xtabond2 (Roodman, 2009)
Source: authors' calculation

All of the chosen regional competitiveness determinants are statistically significant (even though at different significance levels) in model estimated on total sample (model (1)) where the differences between the convergence and other regions and between EU 15 and EU 13 regions are statistically significant too. Employment has the highest (positive) influence on regional competitiveness in model (1); followed by the labor productivity that also has positive influence, as well as the human capital, while real unit labor costs have shown negative and statistically significant influence. Convergence regions and regions of the EU 13 regions have lower competitiveness in comparison with the rest of the EU regions. Statistically significant differences between these regions imply that it is necessary to conduct analysis on separate samples which is done in models (2), (3) and (4).

The highest influence of employment is also confirmed in model (2), which estimates the regional competitiveness function of the convergence regions, and in model (3) which estimates the regional competitiveness function of the EU 15 regions. Other variables have the same (positive or negative) influence on regional competitiveness as it was shown in model (1). Labor productivity has the highest influence on regional competitiveness of the EU 13 regions (which can be explained with high unemployment in most of the EU 13 countries), so it can be concluded that labor productivity is significant driver force of competitiveness in all observed regions but it should be observed with its other determinants. It is interesting to highlight that human capital is not statistically significant determinant of regional competitiveness in convergence regions and in regions of the EU 13, which is important to observe in future regional strategic planning and programming. Unit labor cost is not significant determinant of regional competitiveness of the EU 13 regions. This confirms the need to define and measure competitiveness based on different determinants and not only from the side of the unit labor costs. The importance of less developed regions should not be disregarded. This may result in a re-allocation of resources from the less developed to ("better places") the more developed regions which will contribute to widening inequalities and possibly lower the competitiveness of less developed areas or even problems in more developed regions regarding its capacity and problems of congestion.

Comparison between different economic theories that deal with factors of growth and connected competitiveness determinants implies that (qualitative and quantitative aspect of) labor as one of the main competitiveness determinants maintained its important position from the works under classical theories until modern regional economic studies, which is again confirmed in empirical analysis presented in this paper.

4. Conclusions

Regions, as homogeneous units, characterized with their internal endowment, represent important actors in competitiveness analysis. We outline the determinants that can contribute to higher or lower regional competitiveness of the EU. This can help in setting the right priorities of EU regions and in debates about the future of regional competitiveness policy.

It is underlined that strengthening of competitiveness of the labor force must begin on regional level of the EU member countries. Furthermore, the modeling has shown that competitiveness is not homogeneous between the regions. Homogeneity within and heterogeneity between groups of regions is important for developing regional and competitiveness policies. It can be concluded that in the competitiveness analysis we should look at the regional specificities and compare the regions in order to create more complete regional competitiveness measures directed towards homogeneous regional needs. Here is the task and the open possibility of regional policy (as well as of other policies that deal with competitiveness analysis) to discover the potentials for future competitiveness enhancing, to create adequate measures and directives in order to achieve higher level of competitiveness that will in the first place be based on the labor force potentials (considering the results of this study that observes regional competitiveness as the function of labor). Negative influence of real unit labor costs on regional competitiveness implies the need to direct potentials to other determinants but also to observe the relation between labor costs and labor productivity. Further directives in strengthening competitiveness of the convergence and EU 13 regions have to be directed to human capital which can also be observed from the aspect of EU funds allocation.

In following investigations it is necessary to include some other determinants of labor productivity (like demographic characteristics, sectoral structure of the employment and/or gross value added), or other indicators to describe the chosen determinants. The relation between Structural and Cohesion Funds allocation/absorption and utilization of regional competitiveness determinants can

provoke further research. Beside other variables, different models of regional competitiveness or growth and convergence models, as well as other measures of regional competitiveness (e.g. composite indices that highly depend on data availability), can be used in measuring regional competitiveness. One of the main constraints of this study which is another implication for future works is the need to use other methods in estimating regional competitiveness function as data envelopment analysis or spatial econometrics estimators.

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