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ECONOMIC GROWTH, COMPETITIVENESS AND CONVERGENCE IN THE EUROPEAN REGIONS. A SPATIAL MODEL ESTIMATION

Abstract. *In this paper, we test whether competitiveness matters for economic growth and regional convergence in the context of the European Union. We employ the Regional Competitiveness Index (RCI), the 2013 version, computed by the European Commission as a proxy for competitiveness and data on regional GDP per capita, for the period 2000-2013.We test several cross-section spatial models, controlling for the beta –convergence and we estimate the relationship for the 247 NUTS2 European regions and separately for 189 UE15 regions and 56 CEE regions. We control for spatial autocorrelation by employing either a spatial error model (SEM) or spatial lag model (SLM). When both beta-convergence and spatial dependence is accounted for, the relationship between RCI and growth becomes highly significant. When separate models are estimated for CEE and EU15, no relation is found in the case of EU15 regions. In the case of CEE regions, RCI is significant for growth (at a 10% level), when a beta-convergence model with spatial lag is considered. Our results also show that although a convergence process is indeed taking place at a Community level, there is a divergence process emerging within the EU15 regions and a lack of convergence in the CEE regions.*

Keywords: *competitiveness, economic growth, European regions, regional competitiveness, Regional Competitiveness Index, regional convergence, spatial model.*

JEL: Classification: R11, R38

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1. Introduction

European Union (EU) still has in its agenda the purpose of reaching the US in terms of sustainable, inclusive and smart economic growth by year 2020. However, it has become obvious that, unfortunately, this goal is far to be attained, although year 2020 is not so far anymore. We believe that this goal could be attained if, and only if, there is a convergence between regions, first inside the countries and secondly, between regions from all over EU. The link between convergence and economic growth becomes clearer if we refer to competitiveness, since being competitive should trigger higher growth and a higher speed of convergence. We focus our paper on this idea and we bring our contribution by proposing several cross-section spatial models that would permit us to control for beta convergence.

For measuring competitiveness, there are efforts in the literature that define it based on traditional measures (cost-price) or based on other non-standard measures. Most known work in measuring global competitiveness is attributed to World Economic Forum (WEF) which builds the Global Competitiveness Index (GCI) (see Schwab (2014)). This is a composite index, based on multiple pillars (12 in total), each component being given a certain weight. Based on this indicator and its components, various rankings are possible among countries. By studying the available data on GCI, we noticed that there is a considerable gap between the EU15 countries and the newly acceded CEE countries, both in terms of global competitiveness and more importantly in terms of the innovation component (see Table A1, Appendix). This situation raises concerns not only for the 2020 Agenda goals, but for the overall growth and convergence of the EU.

At the regional level, by following the same methodology employed in GCI, the European Commission computes the Regional Competitiveness Index (RCI). Analysing the stylized facts at the regional level, we notice that some issues regarding competitiveness, productivity and economic growth can be hardly seen at the national level. Such is the case with the primary education and health pillars, which raise concerns at the regional level, undetected by studying the Global index (see Figure A1 Appendix). The regional averages and the standard deviations of RCI also show that some regions can be under the national average values in terms of competitiveness and that the developed countries from Western Europe struggle with significant interregional differences. Authors such as Annoni and Dijkstra (2013),who contributed to the development of the RCI, invite to a complex debate regarding the harmful (or not) effects that the interregional differences may have for the development of the economies and they also challenge us to think how these discrepancies can be solved.

Although in practice the link between competitiveness and growth seems straightforward, there are also conceptual elements that connect the two notions together. On a theoretical level, both in the cases of GCI and RCI, the definition behind competitiveness relies very much on Porter's approach, who considers competitiveness to be the sum of "factors that determine the level of productivity in an economy". From this point of view, competitiveness is, indeed, linked to the

concept of economic growth via productivity. Given the strong link between competitiveness and economic growth theory and also, the expected causality between the two in practice, modelling the relationship between the two concepts becomes straightforward. Still, to the best of our knowledge, there are very few studies that attempt this, or consider competitiveness in the process of economic growth. Especially in the context of regional development, there is very little empirical evidence that increasing competitiveness is a disruptive process enough to push the economic growth rate forward and speed up the convergence process. Our paper aims to model this idea, by testing the impact of competitiveness on economic growth in a beta convergence model.

In doing so, we employ data at the regional level in the EU28 regions, by looking at RCI dataset for the NUTS2 regions and GDP per capita. RCI is computed every 3 years by the European Commission and it contains a composition of various micro and macroeconomic datasets going back a few years (2007-2013, according to European Commission[1]). In order to be in line with the timeline of this index, descriptive statistics in relation to the Global Index (2006-2014) were also referenced. Although RCI 2016 is also available, we feel that the extended timeline covered by the RCI 2013 makes it more suitable for studying the competitiveness-growth relationship. We build on the idea used by Schwab (2014), which we extend and adapt for the regional context. We use a cross sectional model with spatial effects and we compute different models for UE15 and CEE regions. We emphasize the results for the CEE regions, as CEE could benefit greatly from both economic growth (by speeding up the convergence process) and an increase in competitiveness. We use the 2013 version of the Regional Competitiveness Index (RCI 2013) and the series of GDP per capita at purchasing power parity, NUTS2 level, for 2000-2013. Both data series were taken from European Commission and EUROSTAT.

The rest of the paper is organized as follows:Section 2 briefly reviews the literature on competitiveness, section 3 describes the methodology,section 4 discusses the results, while the final section concludes.

2. Literature review

The studies around competitiveness focus mostly on finding a proper definition and measurement for the concept and less on testing the outcomes of competitiveness. On the other hand, when it comes to economic growth, there is a plethora of studies that test the effect of various factors on growth and convergence process.

Initially defined at a national level strictly by the success of the international trade,

[1]http://ec.europa.eu/regional_policy/en/information/publications/studies/2013/eu-regional-competitiveness-index-rci-2013

the recent work on competitiveness is shaped by Porter (1990)'s quest of analysing the factors that contribute to this success. Today, his definition of competitiveness as'the factors that determine the level of productivity in an economy' is widely accepted and competitiveness becomes closely related to the concept of economic growth. Moreover, competitiveness can be considered similar to the Total Factor Productivity (TFP) concept: they are both linked via the idea of productivity and they both resemble a 'black box', the factors that define them being very much still open to debate. In this way, the quest for discovering the competitiveness factors becomes closely interlinked to the vast literature on economic growth factors.

When it comes to the factors of growth, exogenous growth models (Solow, 1956; 1957) consider physical capital and labour supply asthe root of high growth rates, while endogenous growth believes that the long-run economic growth is determined by forces internal to the economic system, mainly factors that are able to create technological knowledge. The stock of knowledge introduced by theorists takes the form of human capital accumulation, research and development, institutions, which all contribute to the creation of innovation. In a similar way, competitiveness seen as productivity, and measured viaThe Global Competitiveness Index, is expressed heavily viaendogenous growth factors like human capital (Lucas 1998), innovations (Romer (1990), Aghion and Howit (1992)), institutions (Romer, 1986), competition and openness (Grossman and Helpman, 1991)). In the end, competitiveness and endogenous growth theory rely on the fact that the production, distribution and knowledge are the main drivers of the economic performance (Grossman and Helpman, 1994), however, out of these, knowledge creation, or innovation, plays the fundamental role both in economic growth and competitiveness.

Innovation begins at a microeconomic level, with the organisations playing a crucial role in its creation and dissemination. The innovation systems literature pinpoints the flow of knowledge across organisations as a crucial factor for effective innovation (Andersson and Karlsson, 2007; Cooke, 2004; Freeman, 1987, 1994; Harris and Moffat, 2011; Lundvall, 2010). When it comes to its relation to competitiveness at the microeconomic level, it is believed that competitiveness is nothing else than the sum of all (small) innovations that a company implements to successfully and efficiently transform inputs into goods and services. Competitiveness is translated in the end in higher market share and profit, and it is crucial to a company, its absence meaning, most of the times, a struggle to stay relevant or even disappearance. This is not the case, however, when national or even regional competitiveness is considered – a less competitive country will struggle but its disappearance is improbable.

In the context of today's globalisation, regional competitiveness is seen as an important buffer between firm competitiveness and national competitiveness, bridging the gap between the innovation driven productivity of companies, international success of the country and the prosperity of its citizens. From an economic growth perspective, regions are the key units in the wealth creation and

growth pursuing, especially in EU. Boosting their competitiveness and innovation is a vital step in acquiring social cohesion (European Commission 2004), prosperity and the much-desired convergence. Kitson et al. (2004) state that the competitiveness of regions is not only a debate of academic interest but also an issue of policy deliberation and action.

At a micro level, the regional level is the closest environment where the firms first compete among themselves, by providing goods and services to the market, attracting and paying the right human capital and having the proper macroeconomic policies to be supported with. Kitson et al. (2004) define regional competitiveness as the success with which regions and cities compete with one another in some way. This might be due to higher shares of national and especially international export markets. Begg (1999) and Huggins (2003) state that the competitiveness of regions is mainly based on the conditions that allow firm to compete in the markets, while regional competitiveness means the capability of a certain region to attract and maintain firms with rising market shares. In the same time, firms which participate in the market are maintaining stable or increasing standards of living (Storper, 1997).

Economic growth theory states that competitive regions should grow by innovation and qualitative human capital: even if the less developed regions grow at a higher rate than that of the most developed regions, if the increase it is not based on technological progress and knowledge, it will not bridge the gap. In conclusion, growth should be driven by competitiveness for regional convergence to happen, otherwise the gap between developed and developing regions may expand. Having the GCI as measure of competitiveness which comprises all factors of growth makes it easier for us to test this hypothesis.

Due to the difficulty of defining and measuring competitiveness, and its duality of being both process and outcome, introducing competitiveness in empirical studies is quite difficult. In this paper, however, we consider competitiveness to be more of a process than an outcome and we expect the outcome of it to be regional economic growth and regional convergence. We acknowledge that in the literature there are more recent efforts that go beyond the increased GDP as a final result of competitiveness and make reference to the quality of life given by happiness, life expectancy, balance between work and leisure time (see Aiginger, Barenthaler-Sieber, & Vogel, 2013).

One of the few empirical studies that test the competitiveness – growth relationship is that of Schwab et al (2014) which in the 2014 WEF competitiveness report employ national data for 132 economies. Using World Bank GDP purchasing power parity adjusted data and their own computed GCI for 2013, they estimate the relationship between what they call the ‘net–of-convergence’ growth rate and the competitiveness index, obtaining a positive and significant effect. Due to the convergence effect, described as the tendency for poor economies to grow faster, a

direct test between the growth rate and GCI would hold incorrect results.

Another relevant paper for testing the competitiveness – growth relation is that of Kordalska and Olczyk (2016). By using Granger causality, the authors aim to test not only the relationship between the two, but also the direction of the causality. By using annual data for 114 countries during the 2006-2014 period, the authors confirm that the GCI is successful in predicting economic growth for the majority of low income and OECD high income counties, but among the middle-income countries this relationship exists only for large economies such as China and India. Also, their results point towards a strong unidirectional causality i.e. GDP growth causes global competitiveness.

Although regional competitiveness and regional growth are both getting increased attention from the economists and policy makers alike, especially in the EU context, to the best of our knowledge there are no studies that look at the competitiveness-growth relationship at the regional level. We think that, in this context, our study brings a much-needed contribution.

3. Methodology and results

As we mentioned earlier, we base our methodology on Schwab et al. (2014),thus taking into consideration the effect of convergence among regions when we test for the RCI – growth relationship. This implies that the rate of convergence of each region depends on differences in the(initial) parameters that condition the progress. To control for this aspect, in the empirical equation we include the level of the initial GDP per capita. Thus, we test the following:

$$gy = a + \beta 1 lnY0 + \beta 2 \text{RCI} + \varepsilon \quad (1)$$

where:

g_y is the economic growth rate of the region

lnY_0 is the log level of the GDP from the initial year, in the region *i*

$\beta_1$measures the convergence

RCI represents the Regional Competitiveness Index

β_2 measures the effect of RCI over the rate of economic growth

a is the constant of the model, representing the cumulated effect over the increase of all other factors

ε is the error term, independent and identically distributed

Since our estimation is carried out at a regional level, we also control for spatial dependence. Allowing for spatial dependence, especially in the context of European regions, is extremely important, as growth rates are not independently and identically distributed, as many authors have shown. Abreu, DeGroot and Florax (2005) show that when the spatial dependencies are not accounted for, the estimated models of economic growth are incorrectly specified. The simple analysis of descriptive statistics proves also that indeed the level of income and the

growth rates are not randomly distributed inside the regions of Europe. Paas and Schlitte (2009) state that the highest incomes are situated along an area called "blue banana", which covers the south of England and the north of Italy, while the regions from the south of the continent seem to have lower incomes than the European average. Regarding the growth rates, the same authors prove that the peripheral regions from EU15 and also the new member states from CEE grow at much higher rates compared to the rest of the EU. This is evidence enough for us to include spatial correlation in our models.

The spatial dependence can be modelled, based on Anselin (1988, pp.34-38) via two textbook models: SEM (spatial error model) and SLM (spatial lag model). In the SEM, the spatial dependence appears in the errors of the model, which are not identically and independently distributed anymore. In the SLM, the growth rate of one region is influenced by the growth rate of the surrounding regions. In both models, the spatial dependence is given by a weighted matrix of the distances, W, that shows the spatial structure of the dependencies and their intensity. The idea of the spatial dependence is based on a gravitational model, and on a general idea that all regions are correlated between them, but the closest regions will be more correlated than the furthest ones. In our case, the matrix of distances takes the following form:

$$W = 0 \text{ if } i = (\text{ or if i=j and } d_{ij} > D) \text{ or}$$
$$W = 1/\, d_{ij2} \text{ if } i \neq j \text{ and } dij < D \qquad (2)$$

where d_{ij} represents the distance between each two regions i and j from the EU.

By simplification, it is considered that only the regions situated on a limit-distance D from one another are correlated between them. If the distance between two regions is smaller than the distance D, it is considered that the intensity/spatial correlation between the two regions takes the value $1/d_{ij2}$. Contrary, if the distance is larger than D, it is considered that there is no spatial dependence between these 2 regions.

By using the matrix W, equation (2) can be written as a model with spatially correlated errors (SEM), where λ is considered the parameter of the SEM model:

$$g_y = a + \beta_1 lnY_0 + \beta_2 ICR + \varepsilon, \text{ where } \varepsilon = \lambda W\varepsilon + u \qquad (3)$$

A model with spatial lagging (SLM), where the increase rate $g_Y$is correlated with the increase with the neighbour regions, has the following form:

$$g_y = a + \beta_1 lnY_0 + \beta_2 ICR + \rho W g_y + \varepsilon \qquad (4)$$

where ρ is considered the parameter of the model SLM.

We therefore test the relationship between economic growth and regional competitiveness, controlling for the beta convergence and spatial autocorrelation.

For this purpose, we use the following sets of data: RCI (2013 version) and the series of GDP per capita, expressed by the purchasing power parity (GDP at PPP) for the NUTS2 regions, during the period 2000-2013. For regional GDP, the source of the data is the statistical site of the European Commission (Eurostat, 2015).

To compute the rate of economic growth in the long run, we estimated the following equation:

$$lnGDP_{pcPPP} = a + g_Y T + \varepsilon \quad (5)$$

Where $g_Y$represents the growth over time (T) of the GDP per capita measured at purchasing power parity for the period 2000-2013.

In order to study the relationship between growth and competitiveness while also testing the hypothesis of the beta convergence and the spatial dependence, we first estimate a model for the RCI – growth relationship, by including a convergence factor. We check if this equation is well specified, testing for the spatial error and for spatial lag, by using the LM/Robust LM test:

$$g_Y = a + \beta_1 lnY_0 + \beta_2 RCI + \varepsilon \quad (6)$$

If the LM/Robust LM test for a spatial error is significant it means that the above equation is not well specified. This implies specifying a SEM model:

$$g_Y = a + \beta_1 lnY_0 + \beta_2 RCI + \varepsilon, \text{ where } \varepsilon = \lambda We + u \quad (7)$$

If the test LM/Robust LM for spatial lag in the case of equation (6) is significant, we specify a SLM model:

$$\boldsymbol{g_Y = a + \beta_1 lnY_0 + \beta_2 RCI + \rho W g Y + \varepsilon} \quad (8)$$

The equations (6-8) are estimated for all EU regions together and separately for EU15 and CEE regions.

4. Results

Before analysing our results, we point out to the spatial distribution of the two indicators – RCI and growth rate (Fig A2 and A3 in Appendix). We notice that the notion of "blue banana" applies to the idea of regional competitiveness as well, the most competitive regions being located, as in the case of income per capita, on the area situated between south of England and north of Italy (Fig A2 in Appendix). The south regions and those in the peripheral Europe, including CEE countries, have the lowest regional competitiveness. Figure A3 in the Appendix shows the distribution of the rates of growth in the European Union where regions with the highest growth rates are situated in the CEE countries, which seem to have the smallest values for RCI. At a first glance, disregarding any convergence or spatial dependence effect, the relationship between the two seems negative.[2]

[2] Indeed, if we leave out the convergence factor, the relationship between convergence and growth becomes negative at the Community level. These results are available upon request

Table 1. Estimating the competitiveness-growth relationship in the European regions

	EU28 (1)	EU28 (2)	EU28 (3)	EU15 (4)	EU16 (5)	EU15 (6)	CEE (7)	CEE (8)	CEE (9)
	No spatial effects	SEM	SLM	No spatial effects	SEM	SLM	No spatial effects	SEM	SLM
RCI	0.009***	0.009***	0.005***	-0.001	0.001	-0.001	0.012	0.014	0.017*
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)	(0.012)	(0.009)	(0.01)
LnY_0	-0.036***	-0.036***	-0.012***	0.007*	0.006**	0.005*	-0.030**	-0.003	-0.012
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.012)	(0.009)	(0.011)
Const	0.378***	0.375***	0.118***	-0.051	-0.04	-0.047	0.331***	0.081	0.11
	(0.032)	(0.033)	(0.033)	(0.038)	(0.028)	(0.029)	(0.119)	(0.088)	(0.11)
λ		0.01			0.897***			1.073***	
		(0.028)			(0.093)			(0.132)	
$\boldsymbol{\rho}$			0.891***			0.851***			1.198***
			(0.079)			(0.093)			(0.267)
LM(spatial error)	60.526***			151.276***			2.449		
RobustLM (spatial error)	3.482**			4.123**			8.717***		
LM(spatial lag)	105.206***			147.480***			12.033***		

Robust LM (spatial lag)	48.162***			0.327			18.301***		
No of obs	178	178	178	120	120	120	56	56	56
R^2	0.523			0.02			0.215		

Source : own estimations based on European Commission (2013) and EUROSTAT (2015) data

Table 1 shows the estimations of the competitiveness - economic growth relationship for the whole EU regions (columns 1-3) and separately for the EU15 (columns 4-6) and CEE regions (columns 7-9). Our initial equation shows that at the European Community level there is a positive and significant relationship between competitiveness and growth rate, however the LM test performed on model (1) points out that our models are better specified by using a spatial model. When we re-specify our model, by adding either spatial error or spatial lag, the relationship remains positive and highly significant in both cases. When these equations are estimated separately for EU15 and CEE, we notice that the results differ considerably. This is in a way expected, considering that the differences in technologies and economic conditions between the two blocks recommend estimating a separate model for each group. For EU15, our results point out that RCI has no effect on growth, even when spatial dependence is accounted for (columns 4-6). In the case of CEE regions, 2 out of 3 models (columns 7,8) show that there is no statistically significant effect on growth, while the spatial lag model indicates that there is a positive and significant effect on growth, on a 10% significance level (column 9). Although significant just at 10% level, the positive value of this coefficient is an encouragement for the CEE regions to follow closely the evolution of this indicator and to try, if possible, to focus on policies that could increase its value.

An initial look at the results shows that competitiveness, expressed through RCI, has a positive and significant effect on the growth of the EU regions, the effect however is reflected in a different manner at the level of the two blocks. The CEE regions seem to benefit more from the impact of this ‘productivity’ over growth, compared to the EU15 regions. These results may also be analysed through the factors that determine them: convergence and spatial dependence.

In our case, convergence is detected only at the EU level, probably also due to a big variation in the growth rates and heterogeneity among regions. In the case of Western European regions, the beta convergence is not verified. The coefficient for the initial income is positive and significant, pointing towards a divergence process. This means that initially poorer regions will have smaller growth rates while those regions with an initial higher income will grow at higher rates (columns 7-9). In this case, the process of catching up within the Western Europe regions becomes difficult.

The divergence process, especially in the case of Western Europe, is not an entirely new concept, it has been discussed in many studies, going back to mid1990s- some authors (Fagerberg &Verspagen, 1996) support the idea of a multiple speeds Europe, with at least 3 clubs of growth, characterized by different dynamics, productivities and rates of unemployment.

In the case of the CEE regions, the initial convergence result (column 7) does not stay significant when we account for the spatial dependencies (columns 8,9). In this case, we consider the results more optimistic than in the case of the Western European regions. Although the effect of convergence is not present inside the CEE block, at least results do not indicate a possible divergence process, as it is the case of Western Europe.

Our tests also suggest the existence of spatially dependent errors- this points towards the importance of other spatially correlated variables in the growth process, such as the commercial relationships between regions, the mobility/migration of the labour force. In the case the Western European regions, considering the spatial errors increases the significance of the positive coefficient β (column 5). This suggests that the divergence effect is intensified by the presence of other factors, indicating the possible existence of convergence clubs: groups of countries characterized by similar growth rates interlinked by intense relationships of capital circulation, human resources and so on. For the CEE regions, despite the lack of convergence, there is spatial dependence among the growth rates. Both in the case of CEE and UE15, it is observed that the spatial dependencies represent an important element in the competitiveness – economic growth dynamics, and our results encourage the detailed study of this phenomenon.

5. Conclusions

In this paper, we estimated an econometric model for testing the relationship between competitiveness and economic growth. Our purpose was to see to what extent the concept of competitiveness, often associated with productivity and expressed via a combination of endogenous factors, such as human capital, innovation, openness has indeed a real effect over the dynamics of the economy in the European regional space. In order to do so, we employ a static spatial model, that also accounts for convergence and we use various tests to see the validity of our results.

Our results point out that, although there is a positive and significant relationship at the Community level when both convergence and spatial effects are accounted for, this relationship is not entirely found at the level of the two blocks. Only in the case of the CEE regions, the results indicate a positive and borderline significant relationship between competitiveness and growth.

Our results also point out the difficulty in creating sustainable Community policies that are applicable in both CEE and EU15. While some studies indicate a process of economic convergence in the European Union, the existing discrepancies among the EU15 regions and the lack of real progress and convergence in the CEE regions raise questions about the validity and shape of the convergence process. Mixing altogether poorer regions from Western Europe with those from CEE might lead to the illusion that a convergence process is taking place, when in fact Europe could be heading towards a two-speed economy, with various convergence clubs coexisting.

Economic theory points towards the fact that regions should grow by competitiveness (or by the endogenous factors that make up the modern definition of competitiveness) in order for convergence to happen, however, when we cannot find evidence for a competitiveness driven growth, like it is the case in the EU15, how likely it is for convergence to actually take place? The lagging regions in EU15 could be actually worse off than those in the CEE regions. While the capital regions are hubs for innovation and development, concentrating the best human and monetary resources, the peripheral regions might be left out, as pointed out by the higher interregional differences in the RCI values for EU15 (see Appendix, Figure A1). Probably Western Europe needs to solve its own 'divergence' process by reducing disparities, before even addressing the gap between EU15 and CEE. This is however a challenge, as it takes time to foster a culture of innovation and competitiveness in regions where this does not exist. Improving education and research at a local level, supporting local businesses and encouraging competition, offering the necessary infrastructure for human capital to thrive are just some of the basic policies that need to be kept consistent for the following years.

When it comes to the CEE regions, although they have experienced higher growth rates than most of the UE15 regions, the standard of living is quite low for the majority of these regions. Providing health and primary education services, solving basic infrastructure requirements and having working institutions that address the issues that the local communities are facing, could be a first step towards fostering a more equally distributed growth.

The discrepancies and the divergence process taking place among the EU15 regions indicates that a more in-depth analysis is required: low income regions might have different requirements in terms of competitiveness than the high-income ones, and a breakdown of the RCI by sub-indices might indicate better which these requirements are. Innovation is, indeed, expected to be a huge part of the competitiveness process in the Western Europe, however this is unlikely to happen when basic requirements, such as primary education and health experience high volatility from one region to the other. In this respect, the 2020 Agenda seems further and further away, as it is clear that EU still needs to improve its internal processes before tackling any comparison with the US.

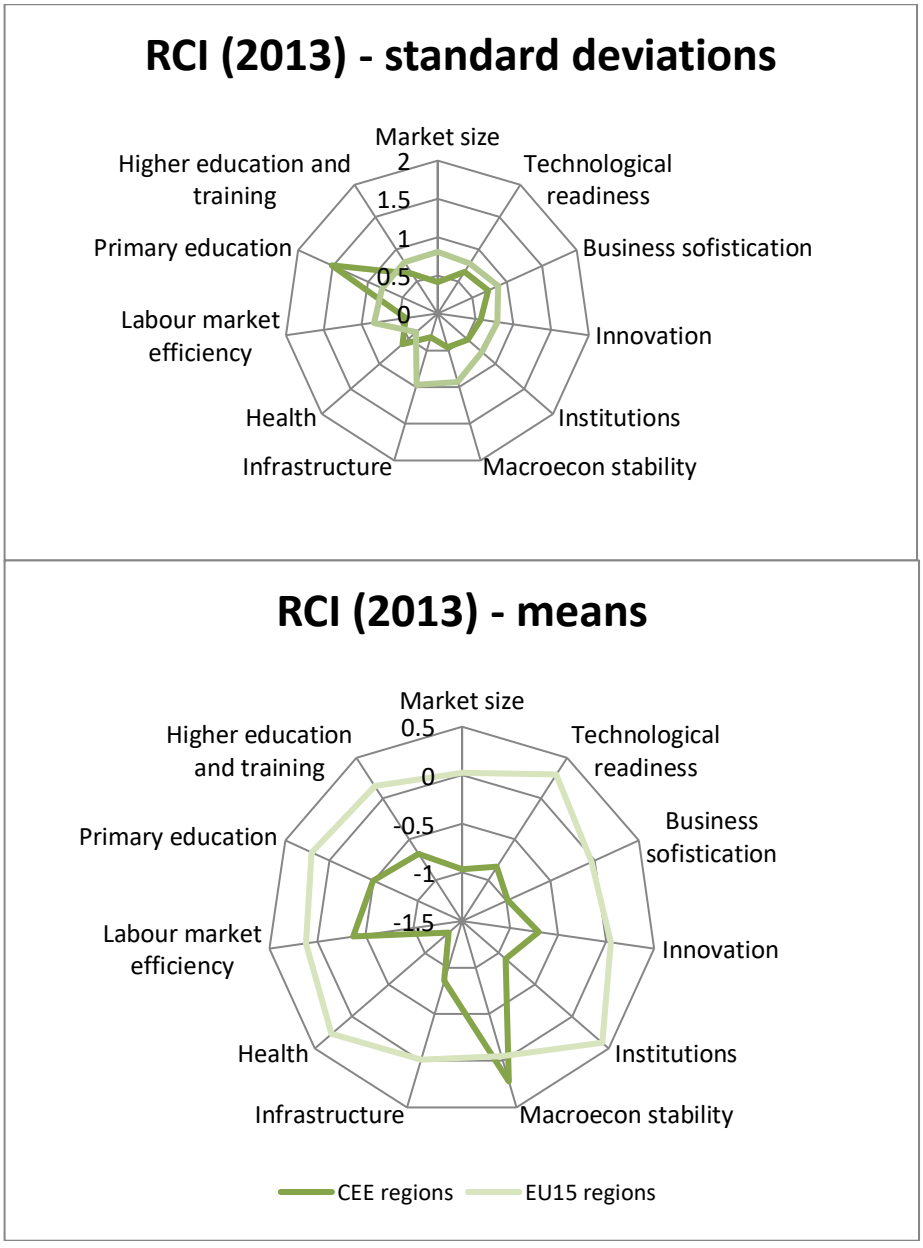
APPENDIX

Table A1. GCI averages (2006-2014) by pillars, for the CEE and EU15 countries

Pillar	Subindex /Requirement	CEE	EU15	Difference
1st pillar: Institutions	Basic	3.88	5.1	1.22
2nd pillar: Infrastructure	Basic	4.09	5.57	1.48
3rd pillar: Macroeconomic environment	Basic	5.04	5.01	-0.03
4th pillar: Health and primary education	Basic	5.95	6.32	0.37
5th pillar: Higher education and training	Efficiency	4.74	5.31	0.57
6th pillar: Goods market efficiency	Efficiency	4.35	4.91	0.56
7th pillar: Labor market efficiency	Efficiency	4.42	4.51	0.09
8th pillar: Financial market development	Efficiency	4.3	4.78	0.49
9th pillar: Technological readiness	Efficiency	4.35	5.34	1
10th pillar: Market size	Efficiency	3.91	4.82	0.91
11th pillar: Business sophistication	Innovation	4.07	5.14	1.06
12th pillar: Innovation	Innovation	3.37	4.56	1.19
Global Competitiveness Index		4.34	5.03	0.69

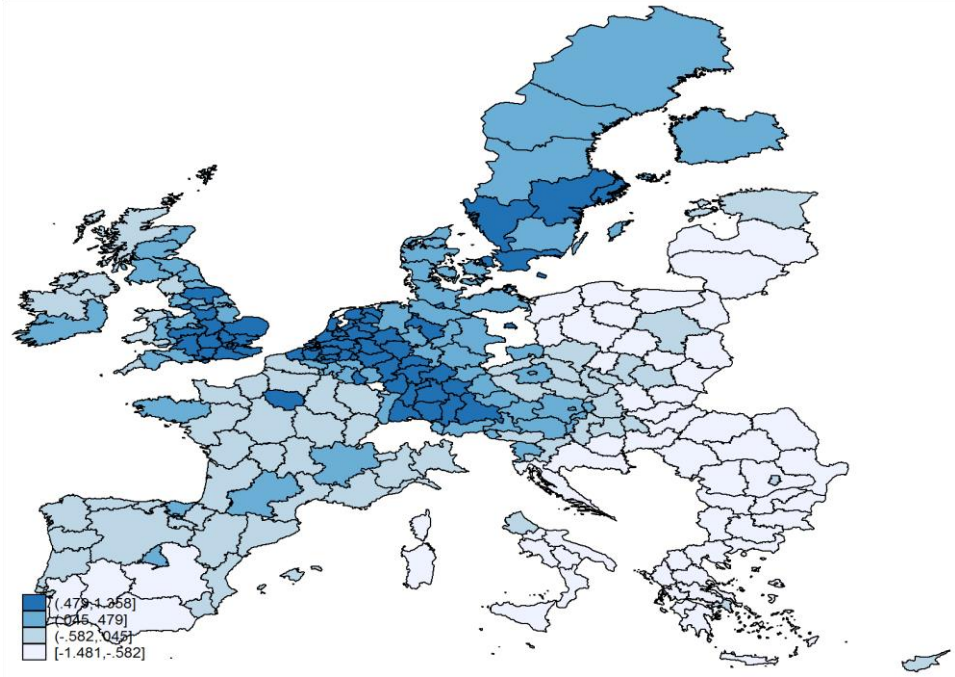
Source: own computations, based on WEF (2006-2014) data

Figure A1. Regional Competitiveness Index by pillars, standard deviations and means



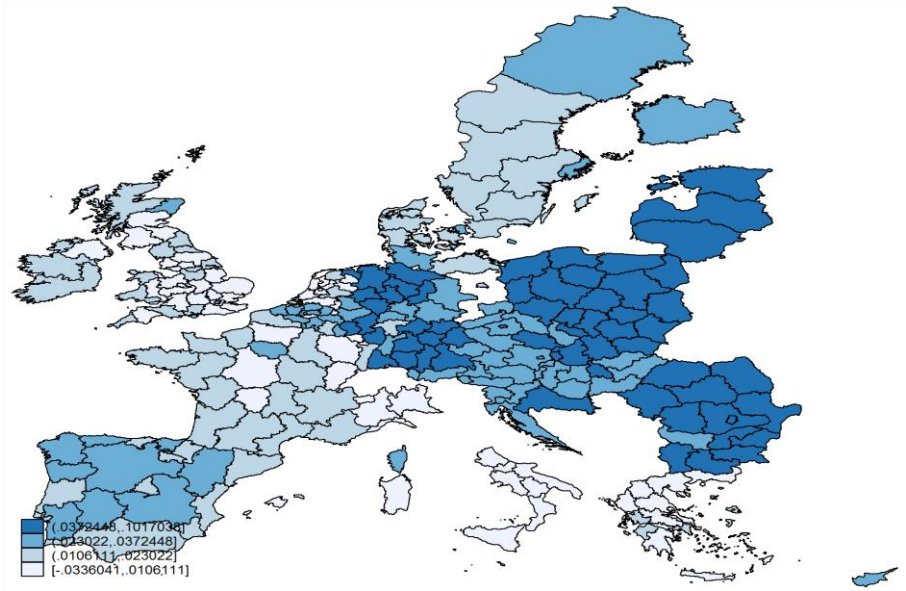
Source: own computations, based on European Commission (2013) data

Figure A2. Distribution of the RCI in the European regions



Source: own computations, based on European Commission (2013) data

Figure A3. Distribution of the GDP per capita growth rate (2000-2013)



Source: own computations, based on Eurostat (2015) data

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