

# **Regional competitiveness in the European Union: The role of individual and institutional factors**

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*Abstract: While it is generally believed that the basic unit of territorial competitiveness is the firm, existing country level and regional competitiveness measures focus on the widely interpreted institutional aspects of competitiveness and neglect individual (firm) level characteristics. The theoretical concepts are also separated. One can find institutional and individual theories, but they are not related to each other. Popular competitiveness indices are based on institutional factors. Reflecting to this contradiction, we have created a new index that combines institutional aspects and individual competencies in a systemic way to measure regional competitiveness more correctly (highlights SME sector).*

*Keywords: regional competitiveness, firm level competence*

## **1 Introduction**

Nowadays, competitiveness researching has becoming increasingly popular. Only a few focus on assessing the competitiveness of the small and medium-sized

enterprise sector and even less with its regional dimension. While Porter and Krugman debate the importance and the validity of competitiveness, they both agree at firms (individual) level competition is the basis of territorial or national competitiveness [17][13]. At the same time, existing theories and competitive measures focus on the institutional setup/context [1][8][11].

However, the links between individual and institutional components of competitiveness are still missing. At the national level, Porter's diamond model is the most widespread, that is based only on institutional factors. Similarly, institutional based factors dominate regional competitiveness concepts [11][12]. Porter's five force model is still a dominant theory of examining industry level competitiveness. However, this approach is mostly appropriate for large firms where resource constraints are not binding [17]. Finally, at the firm's level, resource-based view theory based on individual competencies is the most useful [3]. A popular tool to identify firm level individual (inside) and environmental factors is the SWOT analysis. However, SWOT is lacking a comprehensive framework and general methodology; consequently all cases are unique and non-comparable.

So realizing this incompleteness, we have created a new index, CRCI (Combined Regional Competitiveness Index), to combine the regional level (institutional data) and the individual level (firm data) to measure regional competitiveness more correctly.

## **2 The concept of regional competitiveness**

Competitiveness can be examined from many perspectives. In this study, we only focus on territorial, regional aspect.

Territorial, and thus regional competitiveness definitions are basically output-oriented. A region is more competitive than another if its regional output is higher than the other region. Output is primarily measured along the per capita GDP, growth, unemployment, productivity, and value-added indicators. In addition, the general well-being, prosperity, and sustainability of the people in the area are often included in the definitions [5][12][14]. From another dimension, a region with high-growth companies that are capable of attracting and retaining creative and highly qualified people as well as external investors [7][9][15] is also viewed as competitive.

Regional competitiveness differs from national approaches in two respects:

1. Absolute advantages/disadvantages are more important than the relative ones since at the regional level there is only limited scope for adjusting absolute cost differences [6].

2. Regional competitiveness cannot be interpreted as spatial degradation of national competitiveness or as the level of productivity of enterprises. Instead, successful regional competition is characterized by a kind of open "flow space". In order to attract and retain production factors, "sticky places" [16] are, becoming the centers of trade, investment and knowledge flow [10].

Consequently, the region's competitiveness depends to a large extent on its ability a favorable entrepreneurial, institutional, social, technological framework and infrastructure to provide "external benefits" to local firms [6][4]. In other words, regional competitiveness is a "dual concept that explains relative differences in rates of economic development across regions, as well as an understanding of the future economic growth trajectories of regions at a similar stage of economic development" [9 p. 28].

### **3 Empirical Research**

#### **3.1 Combined Regional Competitiveness Index**

While it is believed that firms (individual) level competition is the basis of territorial competitiveness, existing theories and competitive measures focus on the institutional context [1][8][11]. We have created a competitiveness index, called the Combined Regional Competitiveness Index (CRCI) that interacts the firms' individual competencies and the regional institutional factors in a systemic way. CRCI is calculated for a mix of NUTS 1 and NUTS 2 level 151 European Union regions.

Table 1 shows the structure of the index. The new index comprises four sub-indices, ten pillars and 20 variables each representing a different aspect of regional competitiveness. The intensity of competition sub-index reflects two types of competitive pressure one that is coming from existing businesses and the other is deriving from new entry. New firms can have two influence on is the increase of the number of new firms (Kirznerian entrepreneurship) and the other is to be more innovative as the existing businesses (Schumpeterian entrepreneurship). Growth and internationalization strategy includes the firms' generally interpreted growth and international aspirations. In the Human capital sub-index, we incorporate the businesses' level of education and training and the entrepreneurial abilities of the leader of the business. The Innovation sub-index reflects the firms' renewal capabilities. It measures the ability to create new technology, new product, and how firms can absorb existing technology.

Table 1 Combined Regional Competitiveness Index (CRCI)

| Institutional variables              |   | Individual competencies | Pillars                    | (Sub-index)              | Index                                   |
|--------------------------------------|---|-------------------------|----------------------------|--------------------------|-----------------------------------------|
| Business sophistication              | x | Schumpeterian e'ship    | Innovative pressure        | Intensity of competition | Combined Regional Competitiveness Index |
| Institutions                         | x | Kirznerian e'ship       | New firm creation capacity |                          |                                         |
| Competition regulation               | x | Competitors             | Competitive pressure       |                          |                                         |
| Finance                              | x | Gazelle                 | Finance and Growth         | Markets                  |                                         |
| Macroeconomic stability/employment   | x | Export                  | Internationalization       |                          |                                         |
| Higher education & lifelong learning | x | Educational Level       | Knowledge capacity         | Human capital            |                                         |
| Population ICT readiness             | x | Individual Capabilities | Entrepreneurial capital    |                          |                                         |
| Accessibility                        | x | New technology          | Technology transfer        | Innovation               |                                         |
| Innovation capacity                  | x | New product             | Product innovation         |                          |                                         |
| Technology absorption capacity       | x | High impact sectors     | Technology absorption      |                          |                                         |

### 3.1.1 Sample, variables, and methodology

The data used in this study come from three sources. First, our firm-level individual variables are from the Global Entrepreneurship Monitoring (GEM) adult population survey including young/baby businesses and established firms. Data are available for 24 European Union countries, 151 regions, a mix of NUTS 1 and NUTS 2 regions from 2010-2014. Second, institutional variables are mainly from Annoni's Regional Competitiveness Index (RCI) dataset (Annoni 2016). Third, the rest of our study variables, such as information GDP per capita, GVA per worker and population density at the regional level, was obtained from the statistical office of the EU (Eurostat).

The CRCI index, as I mentioned above, incorporates four sub-indices, 10 different pillars, 20 variables – half institutional and half individual – and 46 indicators. Indicator selection was based on:

- the theoretical and empirical literature search to be able to connect the indicator to the competitiveness phenomenon,

- their potential to assign clear benchmarks and evaluate performance in relation to this benchmark,
- their capabilities to connect to economic development, and
- the availability of data over the examined time period, 2010-2014.

In the index building methodology, we follow Acs, Autio and Szerb [2].

## 3.2 Results

### 3.2.1 Correlation table

As a first step, we examined the tightness and direction of the relationship between the pillars of the model, the pillars and the CRCI, and the pillars and GDP per capita. As can be seen in Table 2, there is a positive relationship between each pillar, indicating that they belong to the same concept. The KMO (0,87) and the Bartlett test sphericity ( $p=0,001$ ) both reinforce that our index is a proper construction. For CRCI we can see that all pillars correlate positively and significantly with the index at 1% significance level, In addition, there is a positive correlation between the pillars and the GDP per capita. The explanatory force is basically the right size.

Table 2 Correlation table of the ten pillars and of the CRCI

|                                        | 1 | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     |
|----------------------------------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 Per capita GDP average 2010-2014     | 1 | ,772** | ,603** | ,524** | ,364** | ,649** | ,338** | ,616** | ,677** | ,466** | ,674** | ,715** |
| 2 Combined Competitiveness Index Score |   | 1      | ,650** | ,830** | ,658** | ,750** | ,506** | ,801** | ,893** | ,548** | ,775** | ,783** |
| 3 Innovative pressure                  |   |        | 1      | ,465** | ,361** | ,512** | ,160*  | ,416** | ,596** | ,328** | ,339** | ,501** |
| 4 New firm creation capacity           |   |        |        | 1      | ,696** | ,529** | ,308** | ,670** | ,731** | ,360** | ,590** | ,544** |
| 5 Competitive pressure                 |   |        |        |        | 1      | ,426** | 0,11   | ,546** | ,591** | ,223** | ,439** | ,325** |
| 6 Finance and Growth                   |   |        |        |        |        | 1      | ,255** | ,562** | ,630** | ,531** | ,470** | ,636** |
| 7 Internationalization                 |   |        |        |        |        |        | 1      | ,256** | ,466** | ,174*  | ,390** | ,350** |
| 8 Education                            |   |        |        |        |        |        |        | 1      | ,736** | ,282** | ,701** | ,664** |
| 9 Entrepreneurial capital              |   |        |        |        |        |        |        |        | 1      | ,322** | ,660** | ,658** |
| 10 Technology transfer                 |   |        |        |        |        |        |        |        |        | 1      | ,399** | ,396** |
| 11 Product innovation                  |   |        |        |        |        |        |        |        |        |        | 1      | ,641** |
| 12 Technology absorption               |   |        |        |        |        |        |        |        |        |        |        | 1      |

Note: \*\* significant at 1% level, \* significant at 5% level

### 3.2.2 A map of CRCI scores

As a second step, we have created a map that shows the geographic distribution of CRCI scores across the European regions. The most competitive regions, as shown in Figure 1, are the regions of Denmark, of the United Kingdom, Sweden, France, and Germany. As expected, large mainly capital cities and surrounding areas are more competitive than less developed rural regions. The Polish, Czech, Slovak, Finnish, Baltic and Italian regions performance are about on the average. The Hungarian regions are located in the back segment of the list, on the same level as the Romanian and the Spanish regions. At the end of the list, it is not surprising there are the Greek regions.

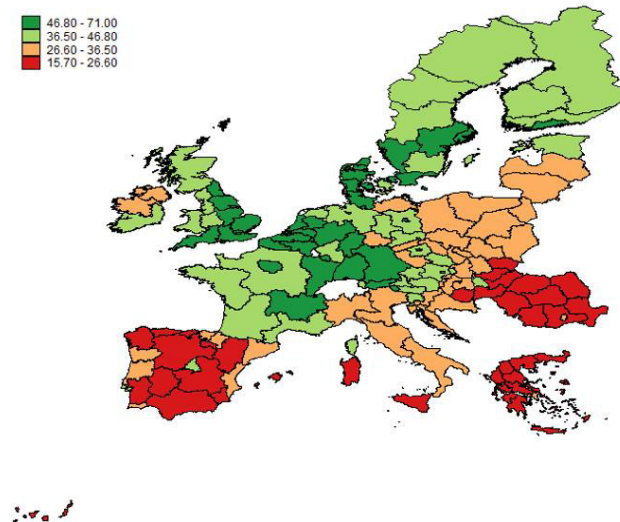


Figure 1

Geographic distribution of CRCI scores across European regions

### 3.2.3 Results of cluster analysis

The third step was to perform k-means cluster analysis to identify groups with similar characteristics. The analysis shows that three groups of the 151 EU regions prevail wide varieties of competitiveness profile based on the ten pillars of competitiveness. As can be seen in Table 3, Cluster 1 members perform best on almost every pillar. Members of Cluster 2 only rise in the pillar of export and innovation, otherwise they are average performers. Cluster 3 members perform the worst in each pillar.

Table 3 Results of cluster analysis of 10 competitiveness pillars

|                             | Cluster |      |      |
|-----------------------------|---------|------|------|
|                             | 1       | 2    | 3    |
| Innovative pressure         | ,491    | ,430 | ,257 |
| New firm creation capacity  | ,652    | ,385 | ,205 |
| Competitive pressure        | ,576    | ,376 | ,254 |
| Finance and Growth          | ,468    | ,410 | ,285 |
| Export and Innov. cap.      | ,388    | ,500 | ,258 |
| Education                   | ,546    | ,398 | ,253 |
| Entrepreneurial capital     | ,577    | ,451 | ,195 |
| New tech. and Accessibility | ,517    | ,354 | ,303 |
| Product innovation          | ,495    | ,417 | ,265 |
| Technology absorption       | ,480    | ,439 | ,256 |

In the second map (Figure 2), you can see results generated by k-means cluster analysis. The results are so similar to the previous map, but the differences are more pronounced here.

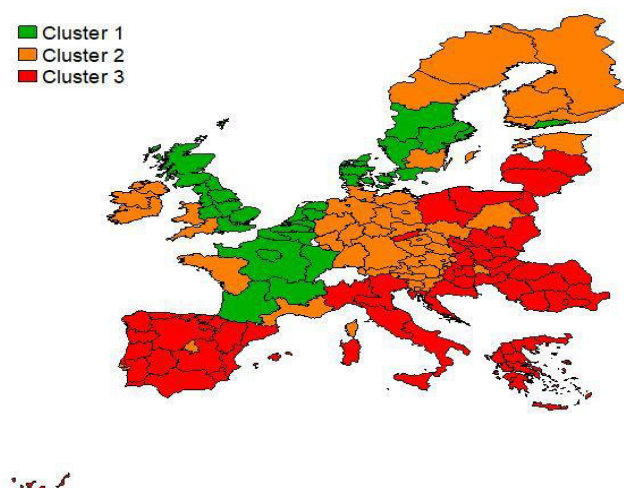


Figure 2 Clusters of European regions based on the 10 competitiveness pillars

### 3.2.4 Models, results of OLS regression analysis

In the following we are examining how the CRCI and its components explains the level of development and of growth. In particular, we are interested how the individual and institutional factors contribute to explaining the economic performance of the EU regions.

In Model 1, we examine the effect of the complex CRCI on regional performances. Our dependent variables are logarithmic GDP per capita in Model 1a, the logarithmic Gross value Added (GVA) per worker in Model 1b, and GVA per worker growth in Model 1c. Control variables are GDP per capita (average 2010-2014, in PPS), the population density, the average number of employees per company in the region, the capital dummy and the country dummies.

#### Model 1:

- a)  $\text{GDP per capita}_i = \beta_0 + \beta_1 \text{CRCI}_i + \beta_2 \text{Controls}_i + \varepsilon_i$
- b)  $\text{GVA per worker}_i = \beta_0 + \beta_1 \text{CRCI}_i + \beta_2 \text{Controls}_i + \varepsilon_i$
- c)  $\text{GVA per worker growth}_i = \beta_0 + \beta_1 \text{CRCI}_i + \beta_2 \text{Controls}_i + \varepsilon_i$

In the second model, the focus of the analysis is the impact of individual and institutional factors. Similar to the previous case, our dependent variable is the logarithmic GDP per capita in Model 2a, the logarithmic GVA per worker in Model 2b, and GVA per worker growth in Model 2c. Our control variables are the population density, the average number of employees per company in the region, the capital dummy, and the country dummies.

#### Model 2:

- a)  $\text{GDP per capita}_i = \beta_0 + \beta_1 \text{Individual variables}_i + \beta_2 \text{Institutional variables}_i + \beta_3 \text{Control variables}_i + \varepsilon_i$
- b)  $\text{GVA per worker}_i = \beta_0 + \beta_1 \text{Individual variables}_i + \beta_2 \text{Institutional variables}_i + \beta_3 \text{Control variables}_i + \varepsilon_i$
- c)  $\text{GVA per worker growth}_i = \beta_0 + \beta_1 \text{Individual variables}_i + \beta_2 \text{Institutional variables}_i + \beta_3 \text{Control variables}_i + \varepsilon_i$

The following three tables (Table 4, Table 5 and Table 6) present the results of OLS regression analysis. It shows, there is a positive, significant relationship between CRCI and regional GDP performance. The CRCI effect on the regional



GVA is also positive, and significant. It shows that the regional employment rate of CRCI has a positive effect on the GVA per employee in the given region.

The results are slightly different when we look at separately the effect of individual and institutional factors. It seems the both factors are only significant in the GVA per employee model. However, the sign of the influence is negative in the case of individual factors and positive in the case of institutional ones. For GDP per capita and the GVA per worker growth, only institutional factors have a significant positive effect. The results are slightly paradox when we view the GVA per worker growth, where CRCI negatively influence this indicator.

Table 4 Results of the OLS model, dependent variable GDP per capita

|                                              | <b>In GDP per capita PPS (2014-2016)</b> |                    |
|----------------------------------------------|------------------------------------------|--------------------|
|                                              | Model 1a                                 | Model 2a           |
| <b>Individual factors</b>                    | 0.2568 (0.2759)                          |                    |
| <b>Institutional factors</b>                 | 2.3070 (0.1802)***                       |                    |
| <b>CRCI</b>                                  |                                          | 0.0255 (0.0023)*** |
| <b>In Population density (2010-2014)</b>     | 0.0419 (0.0171)**                        | 0.0259 (0.0215)    |
| <b>Employment per local unit (2010-2014)</b> | -0.0064 (0.0030)**                       | -0.0009 (0.0029)   |
| <b>Capital dummy</b>                         | 0.1506 (0.0490)***                       | 0.1191 (0.0570)**  |
| <b>Country dummies</b>                       | Yes                                      | Yes                |
| <b>Intercept</b>                             | 8.5610 (0.1539)***                       | 9.0410 (0.0828)*** |
| <b>F – test</b>                              | 49.65***                                 | 51.01***           |
| <b>R2 (adjusted)</b>                         | 0.8458                                   | 0.8095             |
| <b>RMSE</b>                                  | 0.1454                                   | 0.1617             |
| <b>VIF (min – max)</b>                       | 1.82 (1.10-4.24)                         | 1.68 (1.09-4.69)   |
| <b>Observations</b>                          | 144                                      | 144                |

Note: \*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

Table 5 Results of the OLS model, dependent variable GVA per worker

|                           | <b>In GVA per worker (2014-2016)</b> |          |
|---------------------------|--------------------------------------|----------|
|                           | Model 1b                             | Model 2b |
| <b>Individual factors</b> | -2.0574 (0.4586)***                  |          |

|                                                      |                    |                    |
|------------------------------------------------------|--------------------|--------------------|
| <b>Institutional factors</b>                         | 2.0974 (0.3146)*** |                    |
| <b>CRCI</b>                                          |                    | 0.0141 (0.0050)*** |
| <b>ln GDP per capita (average 2010-2014, in PPS)</b> |                    |                    |
| <b>ln Population density (2010-2014)</b>             | 0.0350 (0.0217)    | 0.0124 (0.0357)    |
| <b>Employment per local unit (2010-2014)</b>         | -0.0031 (0.0040)   | 0.0053 (0.0041)    |
| <b>Capital dummy</b>                                 | 0.0306 (0.0654)    | -0.0475 (0.0925)   |
| <b>Country dummies</b>                               | Yes                | Yes                |
| <b>Intercept</b>                                     | 3.7659 (0.2918)*** | 3.2915 (0.1577)*** |
| <b>F – test</b>                                      | 123.61***          | 255.93***          |
| <b>R2 (adjusted)</b>                                 | 0.8131             | 0.7715             |
| <b>RMSE</b>                                          | 0.2050             | 0.2267             |
| <b>VIF (min – max)</b>                               | 1.82 (1.10-4.24)   | 1.68 (1.09-4.69)   |
| <b>Observations</b>                                  | 144                | 144                |

Note: \*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

Table 6 Results of the OLS model, dependent variable growth of GVA per worker

|                                                              | <b>Growth of GVA per worker (2014-2016)</b> |                  |
|--------------------------------------------------------------|---------------------------------------------|------------------|
|                                                              | Model 1c                                    | Model 2c         |
| <b>Individual factors</b>                                    | 0.0109 (0.0556)                             |                  |
| <b>Institutional factors</b>                                 | 0.1213 (0.0574)**                           |                  |
| <b>CRCI</b>                                                  |                                             | 0.0006 (0.0007)  |
| <b>ln GDP per capita<br/>(average 2010-2014, in<br/>PPS)</b> | -0.0153 (0.0203)                            | 0.0043 (0.0177)  |
| <b>ln Population density<br/>(2010-2014)</b>                 | 0.0042 (0.0031)                             | 0.0035 (0.0030)  |
| <b>Employment per local<br/>unit (2010-2014)</b>             | -0.0008 (0.0006)                            | -0.0003 (0.0005) |
| <b>Capital dummy</b>                                         | 0.0004 (0.0101)                             | -0.0021 (0.0101) |
| <b>Country dummies</b>                                       | Yes                                         | Yes              |
| <b>Intercept</b>                                             | 0.0974 (0.1715)                             | -0.0530 (0.1576) |
| <b>F – test</b>                                              | 3.21***                                     | 2.55***          |
| <b>R2 (adjusted)</b>                                         | 0.3230                                      | 0.3058           |
| <b>RMSE</b>                                                  | 0.0332                                      | 0.0336           |
| <b>VIF (min – max)</b>                                       | 2.46 (1.13-9.41)                            | 2.15 (1.12-8.25) |
| <b>Observations</b>                                          | 144                                         | 144              |

Note: \*\*\* significant at 1% level, \*\* significant at 5% level, \* significant at 10% level

### Conclusions, further research opportunities

Our study presents a new index, called Combined Regional Competitiveness Index (CRCI), measuring the competitiveness of 151 European Union regions.

The aim of the new index is to explain differences in economic growth. The cluster analysis shows that the three groups of the 151 EU regions prevail a wide varieties of competitiveness profile based on the ten pillars of competitiveness. The regression analysis shows that the regional employment rate of CRCI has a positive effect on the gross added value per employee in the given region. Overall, we can conclude that the new index is quite accurate in measuring regional competitiveness. We can find that CRCI scores explain regional growth both in terms of value added and employment. The outcomes of institutional aspect are consistent, but the individual results are not convincing. There are some potential explanations about the reason of this finding. Maybe some regions have specific features that condition the studied relationship. In the future, it is worth examining whether there is a structural break in the data. It is also worth paying attention to spatial diagnostics.

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