European Commission

THE EU REGIONAL COMPETITIVENESS INDEX 2019

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Regional and Urban Policy

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1. INTRODUCTION

This, the fourth edition of the European Commission's Regional Competitiveness Index (RCI), is to be published some 10 years after the global financial crisis, with the world economy showing signs of recovery. The European Union (EU) is enjoying its seventh consecutive year of economic growth, even if expected to slow from a 2.0% in 2018 to 1.4% in 2019 for the EU-28 (European Commission, 2019).

Although a wide range of policy actions have been taken, both at European and national level, to improve the economic resilience of EU economies, many challenges still remain. Not all the countries, regions and citizens have benefited from economic growth in the same way. Some countries are still experiencing high unemployment and an insecure job market, household disposable income below pre-crisis levels, and poor access to infrastructure, especially digital infrastructure. Significant regional differences remain and, more importantly, are not declining in some Member States. The uneven distribution of the benefits of economic progress and increasing income inequality have heightened the perception that not all EU citizens have been well served by recent socio-economic policies. Major technological and innovation disruptions and political uncertainties are challenging the capacity of decision-makers to find adequate solutions to sustainable growth. These conditions have brought regional inequalities to the attention of both policymakers and the general public. As a result, the 2019 European Semester: country-specific recommendations[1] include a stronger focus on identifying and prioritising investment needs at the national level, with special attention being paid to regional and territorial disparities.

Against this background, territorial competitiveness is an important element of human-centric and sustainable economic progress. According to the World Economic Forum (WEF), competitiveness at the national level is the 'set of institutions, policies and factors that determine the level of productivity of a country' (Schwab, 2012; Schwab and Porter, 2007). This definition led to its Global Competitiveness Index (GCI), a measure of national competitiveness that links firms to the country they operate in. Applying the same concept to regions has given rise to a lively debate as a region is neither a simple aggregation of firms nor a scaled version of nations (Gardiner et al., 2004). According to Meyer-Stamer (2008), 'we can define (systemic) competitiveness of a territory as the ability of a locality or region to generate high and rising incomes and improve the livelihoods of the people living there'. This definition, however, is based entirely on the benefits to people living in a region and does not assess firms' strengths or weaknesses. Our definition of regional competitiveness is therefore slightly different as it integrates the perspective of both businesses and residents (Dijkstra et al., 2011):

Regional competitiveness is the ability of a region to offer an attractive and sustainable environment for firms and residents to live and work.

This definition balances the goals of business success with those of societal well-being and responds, at least partially, to the 'beyond GDP' discussion. In our definition, the concept of sustainability relates to the region's capacity to provide an attractive environment in both the short and long term. For example, by including numerous indicators on human capital and the quality of institutions, the RCI is meant to measure a region's long-term potential.

RCI 2019 tracks the performance of 268 regions at NUTS-2 level[2] across 28 EU Member States[3]. It measures 11 dimensions of competitiveness capturing concepts that are relevant to productivity and long-term development. Like the previous three editions of the Index (Annoni and Kozovska, 2010; Annoni and Dijkstra, 2013; Annoni et al., 2017), the RCI provides a comparable and multifaceted picture of the level of competitiveness for all EU regions. The sub-national level described by the RCI allows for assessing inequalities and monitoring performance across time at a disaggregated spatial level which, in most cases, is much more suitable than the national one. For all these reasons, the RCI should be considered as an instrument to assist with the design of better policies and monitoring their effectiveness.

The 2019 edition includes 74 indicators selected from a set of 84 candidate indicators, most spanning the period 2015-2017, with some as recent as 2018 while a few others go back to 2014. RCI 2019 follows the same framework as previous editions: the indicators are grouped into 11 pillars which, in turn, are organised into three sub-indexes: basic, efficiency and innovation factors of competitiveness. Being a multidimensional and intertwined concept, improving competitiveness requires the coordinated effort of many different actors. The analysis of the RCI, its three sub-indexes and 11 dimensions help to highlight the strengths and weaknesses of each region with the possibility to benchmark each one to the EU average or its peers. The RCI is a unique, comparable and transparent tool for national and local decision-makers responsible for regional development strategies, in particular in the context of cohesion policy.

This paper shows the spatial variation of regional competitiveness in the EU, as revealed by the latest 2019 edition of the RCI, together with the most relevant changes over the four editions of the Index. The RCI trend analysis reveals how various regions reacted differently to the 2008 crisis. The first edition of the RCI, published in 2010, captured the situation immediately before the crisis, due to the structural delay in the publication of regional indicators by official statistical sources. This sheds light on what made individual regions more able to recover and bounce back from an economic shock: in other words, what makes one region more resilient than another.

1. COM/2019/500 final. 2019 European Semester: country-specific recommendations.
2. NUTS = Nomenclature of Units for Territorial Statistics. The RCI follows the NUTS 2016 revision (https://ec.europa.eu/eurostat/web/nuts/background).
3. RCI 2019 was computed including the United Kingdom as a member of the EU because the reference period of all the indicators included in the Index is prior to the country's official departure date from the Union (31 March 2019). Consequently, all the EU averages include 28 Member States.

2. KEY FINDINGS OF RCI 2019

2.1. CAPITAL/METROPOLITAN REGIONS STILL LEADING THE WAY

Ten years after the crisis and the north-west, south-east divide across the EU is still clear and visible (Map 1). Results confirm a polycentric pattern, with capital and metropolitan regions performing particularly strongly in many parts of the EU. The so-called 'blue banana', a highly urbanised and industrialised corridor was defined in 1989 by a group of French geographers led by Roger Brunet. It can be seen linking the Greater London region all the way to Lombardia in Italy, passing through the Benelux countries and Bayern in Germany, but is incomplete due to the missing southern part (northern Italy), as was also observed in previous RCI editions.

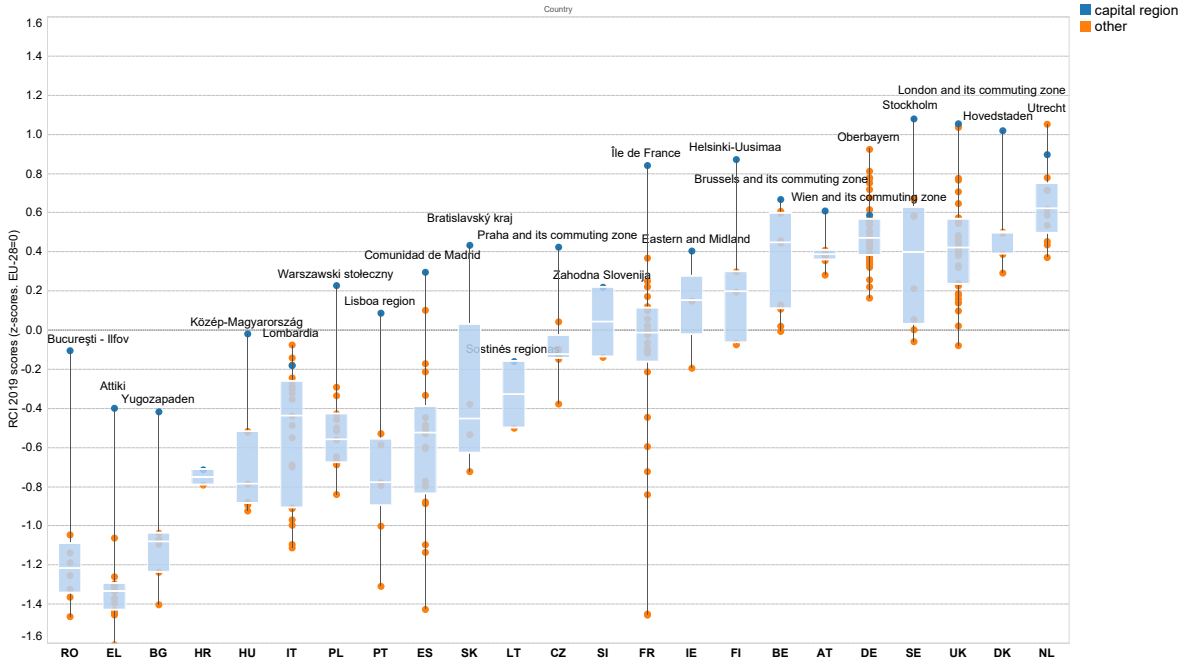
Wide-ranging variations characterise both countries and regions within the same country (Figure 1). Capital regions tend to be the most competitive in their country, with the usual exceptions of the Netherlands, Italy and Germany. In the Netherlands, Utrecht remains the best-performing region followed by Amsterdam. In Italy, Lombardia, historically a highly productive region, continues to be the best-performing Italian region, while in Germany the best-performing region is still Oberbayern (Munich region) with many other German regions outperforming Berlin. In Italy, Spain and Belgium, regional competitiveness levels span a wide range but are almost evenly spread across all the regions in each country, as shown by the height of the boxes in Figure 1 which include 50 % of the regions' scores in each country.

Other countries also show a very high variability, although this is due to the significantly higher performance of the capital region with respect to other regions in the country: for example, in France, Portugal and most of the Eastern and Nordic countries where the regions neighbouring the capital are far less competitive. A key question with important policy implications is whether the gap between the capital region and the rest of the country has widened or narrowed over the past 10 or so years. The RCI's temporal analysis provides some interesting insights, as discussed in the next section.

2.1. WIDE AND STABLE GAPS

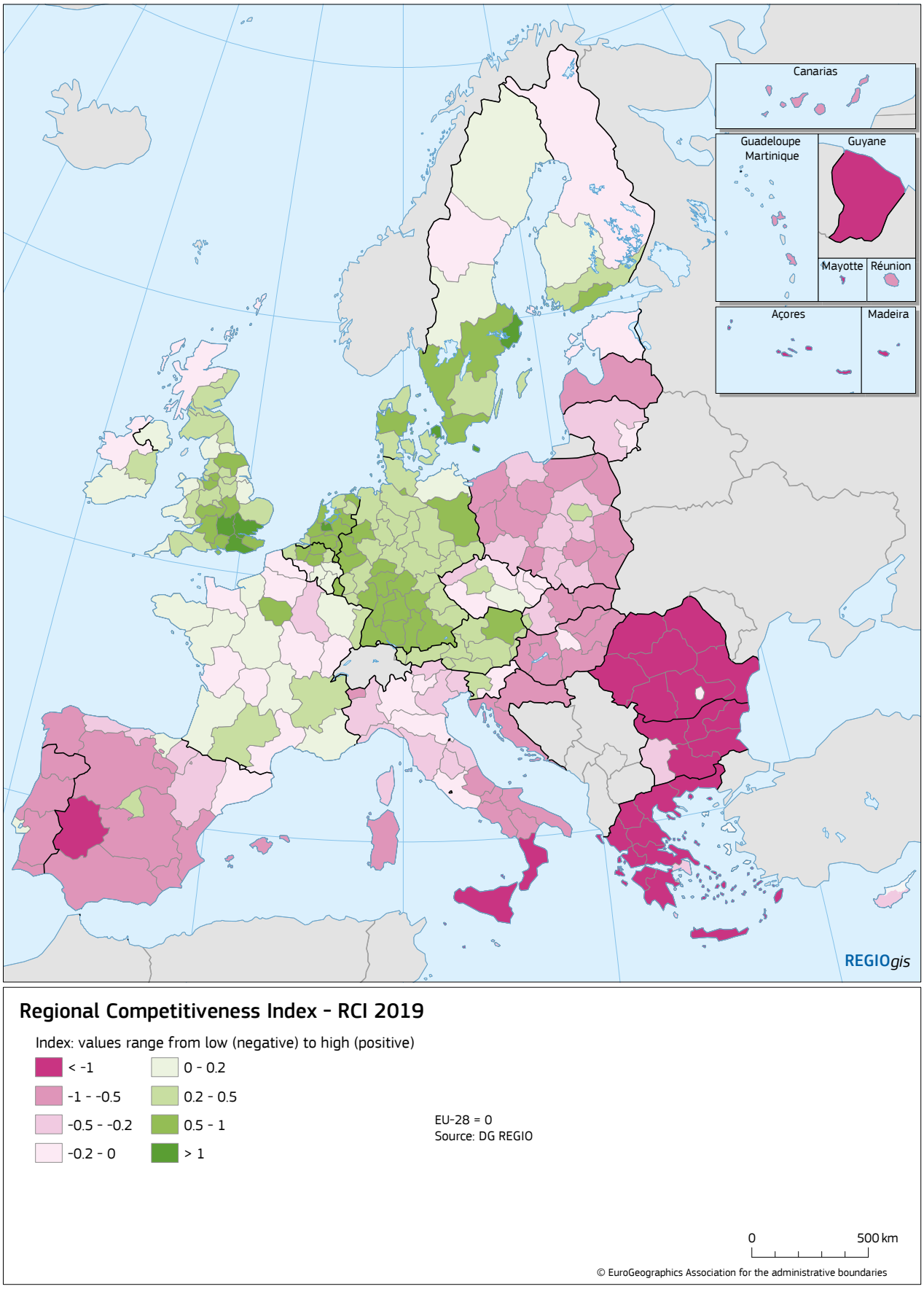
Comparing the RCI over time is complicated because each edition of the Index incorporates slight modifications. There are many reasons for this: new indicators may become available at the regional level, while others are no longer available, and revisions of NUTS-2 boundaries can cause breaks in the series. When developing the Index, we always try to keep changes to a minimum so as not to affect its overall structure and to maintain a high degree of comparability across the editions (see Table A.1 in the Appendix for an overview of the indicators included in RCI 2019). Nevertheless, minor changes in the scores are not to be considered as informative because they can be due to minor differences between RCI editions. Similarly, changes in a region's ranking over time are not meaningful either as it may be that a change in ranking is due to a small, insignificant difference in the scores or to changes in the total

FIGURE 1: Distribution of RCI 2019 scores within countries. The name of the best region in the country is shown. Shadowed boxes include 50 % of the regions within each country.



Only countries with more than one region are displayed in Figure 1.

MAP 1: RCI 2019 scores (z-scores, EU-28=0)



number of NUTS-2 regions following administrative border revisions. Conversely, analysing significant time changes in the scores, as opposed to the rankings, can be highly informative. An individual region is defined here as significantly improving (or deteriorating) between two RCI editions if its score increases (or decreases) by more than 5% of the overall score range[4]. Table A.2 in the Appendix shows significant changes for all the regions since 2010.

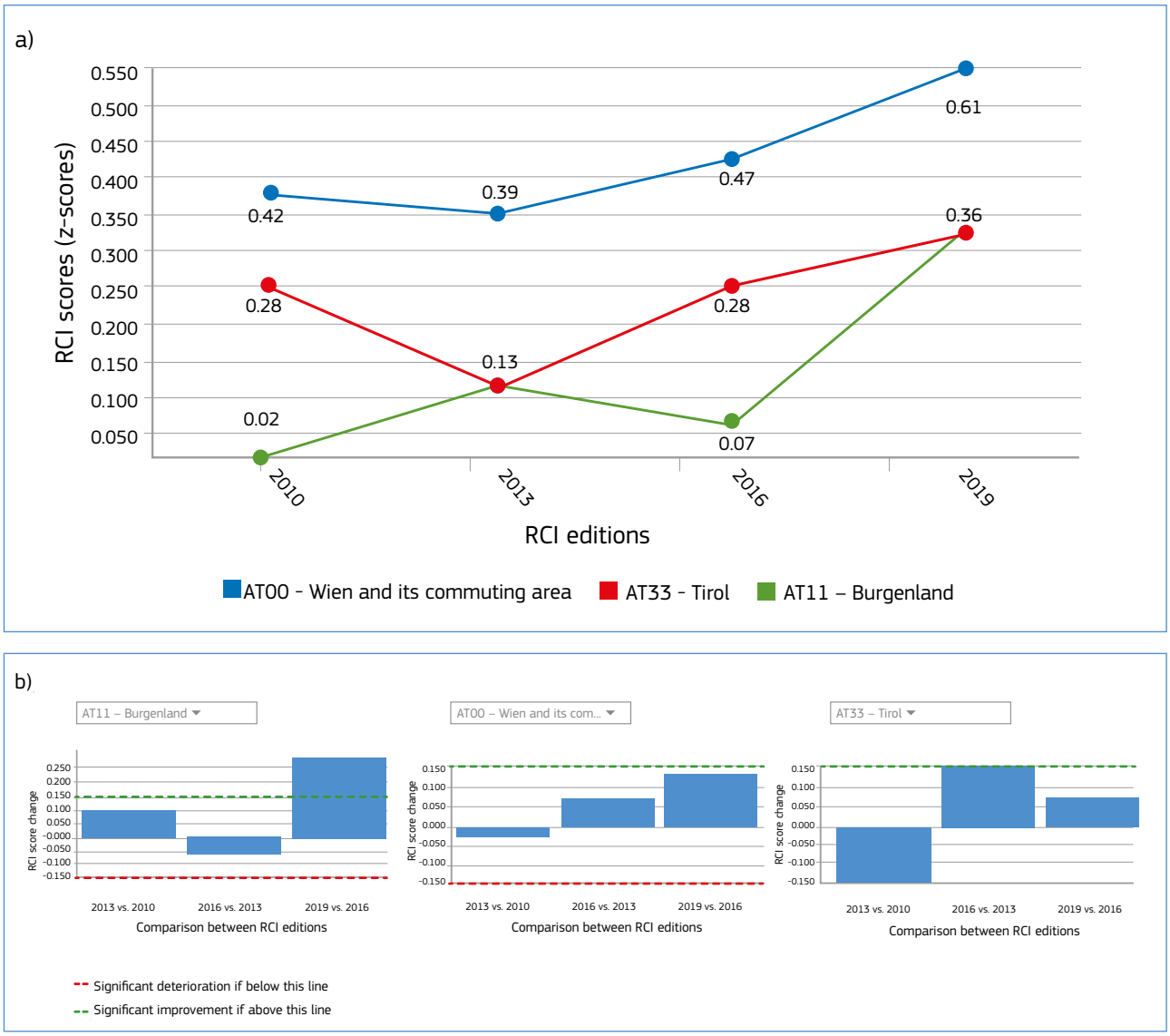
As an example of time comparison analysis, Figure 2 shows the top four performers in France, Sweden, Romania and Czechia, together with the country value and the EU-28 average for the years 2010, 2013, 2016 and 2019. In all these countries, the capital region consistently remained the top performer with a wide gap compared to the other regions in the country. But is this gap expanding or contracting? In general, rapid and wide movements are not common across the four RCI editions. Regional performances are quite stable across time, even if a slight convergence can be observed in some cases. In France, the gap is narrowing slightly due to the combined effect of better performances by the *chasing* regions and the relative lower performance of the capital region Île-de-France. In Sweden, Stockholm, with a stable high score, has been slowly caught up by the other three top regions in the country since 2016. In contrast, the gap between the region of Bucharest and the rest of Romania has remained strikingly wide over the past decade even though the next three regions have recently improved. In Czechia, Praha is the only region registering above the EU average (positive scores) with steadily increasing scores over the years. The gap with the rest of the country is wide and increased in 2013 compared to 2010 but has fallen slightly more recently with the top non-capital regions showing signs of improvement.

New online tools have been added to compare RCI scores across different editions: RCI webpage. For example, time comparison analysis is facilitated by the interactive graph like that shown in Figure 3_a, where the user can select the regions of interest. Time comparison analysis will always be accompanied by an analysis of significant changes, significant here meaning changes above or below the 5% score-range thresholds, as described above. Plots such as those in Figure 3_b enable the user to easily identify relevant changes between two consecutive RCI editions. For example, the RCI time series for the Austrian western region of Burgenland is compared with the capital region Wien (including its commuting area) and Tirol, in the east (Figure 3). Apart from 2013, a critical year as RCI 2013 captured the regional socio-economic conditions right after the inception of the Great

FIGURE 2: Evolution of the scores of the capital region and the three other best-performing regions in France, Sweden, Czechia and Romania (clockwise from top-left). The red line shows the EU-28 average that has been set to zero. The black line shows the country trend

4. The 'overall score range' is computed as the difference between the maximum and the minimum RCI score across all the regions and the four editions of the Index.

FIGURE 3: Comparison of RCI scores across the four editions for three regions in Austria (box a) and plots of significant changes (box b).



Recession, the trend is a slight rise for all three regions (Figure 3_a). However, the improvement in competitiveness levels can only be considered significant for Burgenland in the most recent years, 2019 vs. 2016 (Figure 3_b).

2.2. ANNA KARENINA'S RECIPE FOR COMPETITIVENESS

The top performer in this edition of the RCI is the region of Stockholm, followed by Utrecht and London with its wide commuting zone, sharing the second position (Table 1)[5].

As in all previous RCI editions, most of the top regions host either capitals or large metropolitan areas whose agglomeration and connectivity of economic activities and human capital make them engines of growth and competitiveness. At the other end of the scale, we find five Greek regions, one Romanian, one Bulgarian region and the Spanish autonomous city of Melilla on the north coast of Africa plus the French outermost regions of Mayotte and Guyane.

As noted in Article 174 of the Treaty on the Functioning of the European Union, the outermost regions have specific characteristics, such as their location far from the European mainland. These are not properly captured by the RCI which provides a general framework for measuring competitiveness across all the EU regions. This should be taken into account when analysing RCI results for the outermost regions and benchmarking them against other regions.

5. To avoid assigning different ranks to regions whose scores are not significantly different, equal ranking is assigned if the difference in scores on the 0-100 scale is either equal or below 0.1.

TABLE 1: Top-10 and bottom-10 regions

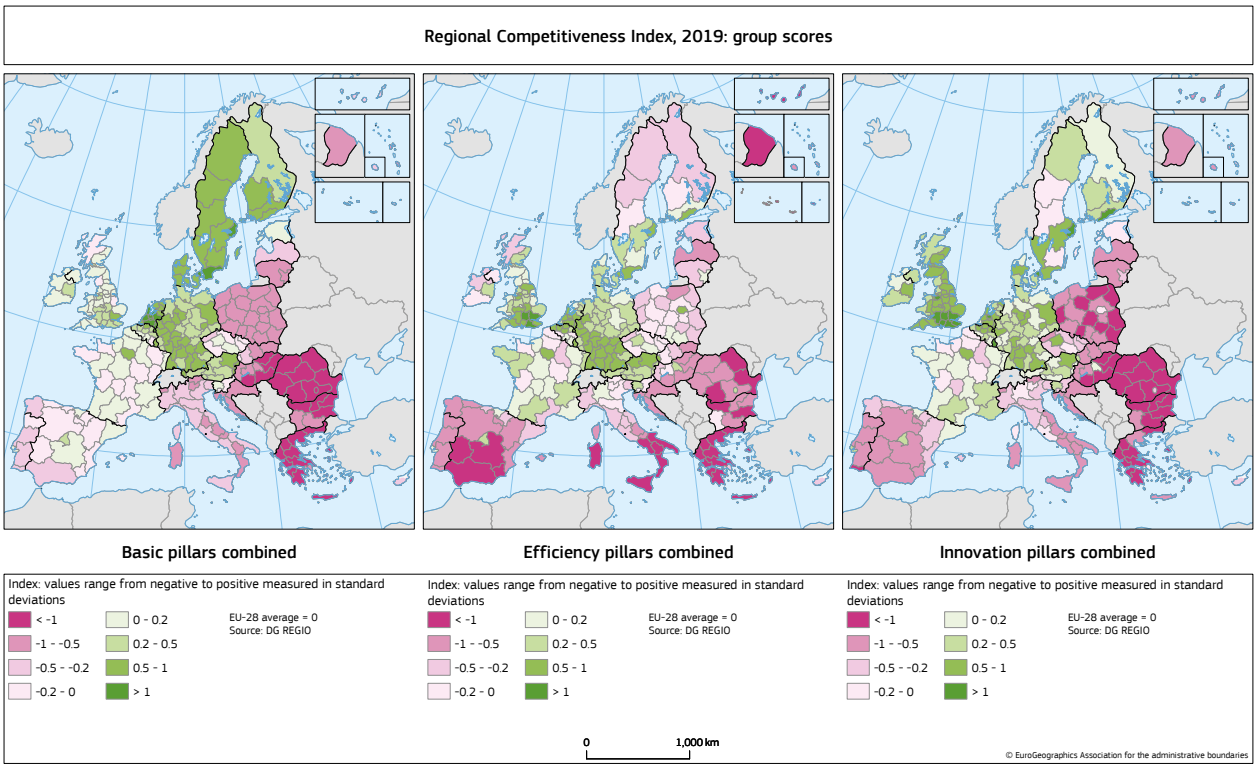
TOP 10					BOTTOM 10				
country	region code	region name	RCI 2019 score (0-100)	rank*	country	region code	region name	RCI 2019 score (0-100)	rank*
SE	SE11	Stockholm	100.0	1	EL	EL42	Notio Aigaio	7.9	259
UK	UK00	Inner London West & Inner London East & Outer London East-North-East & Outer London South & Outer London West North West & Bedfordshire/ Hertfordshire & Essex	99.1	2	BG	BG31	Severozapaden	7.6	260
NL	NL31	Utrecht	99.0	2	ES	ES64	Ciudad Autónoma de Melilla	6.7	261
UK	UKJ1	Berkshire, Buckinghamshire and Oxfordshire	98.6	4	EL	EL63	Dytiki Ellada	6.5	262
UK	UKJ2	Surrey, East and West Sussex	98.4	5	EL	EL53	Dytiki Makedonia	6.1	263
DK	DK01	Hovedstaden	97.8	6	FR	FRY5	Mayotte	5.8	264
LU	LU00	Luxembourg	94.4	7	EL	EL51	Anatoliki Makedonia, Thraki	5.7	265
DE	DE21	Oberbayern	94.2	8	FR	FRY3	Guyane	5.6	265
NL	NL00	Flevoland & Noord-Holland	93.2	9	RO	RO22	Sud-Est	5.3	267
FI	FI1B	Helsinki-Uusimaa	92.3	10	EL	EL41	Voreio Aigaio	0.0	268

* Equal rank is assigned to regions whose score difference on the 0-100 scale is below or equal to 0.1

Despite the attention that regions' rankings invariably attract when a league table of this type is published, the ranking derived from the final RCI scores does not give the complete picture. To allow for a more in-depth analysis of regional competitiveness across the EU, the whole set of regional scores for each RCI component and sub-index is also published online, as for all previous editions. Map 2 shows the spatial distribution of the Basic, Efficiency and Innovation sub-indices. In line with past editions, the Basic group features the least within-country variability, while the Efficiency and, to a greater extent, the Innovation group vary more. There are two reasons for the relatively higher homogeneity of the Basic group: first, two of the five pillars in the Basic group are measured at national level only. Second, as the group includes basic enablers of competitiveness, such as infrastructure, health and basic education, a certain level of homogeneity across the EU is expected. Instead, the higher variability evident in the Innovation group suggests substantial differences in the innovative capacity of regional economies both across and within countries.

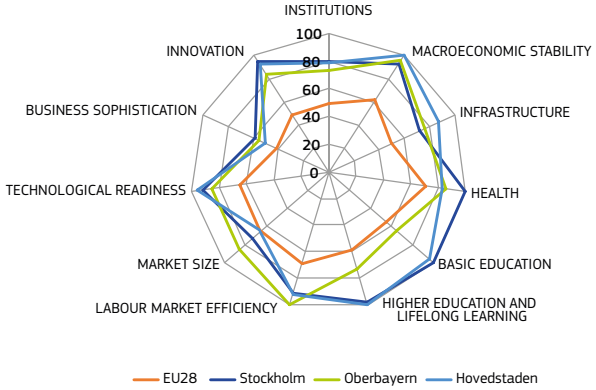
RCI results, data tables and interactive maps are all available at the RCI webpage.

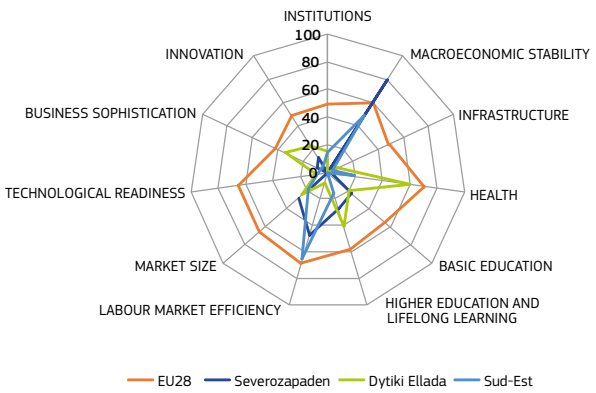
MAP 2: RCI 2019 sub-indices (z-scores)



An even deeper perspective can be obtained by considering a region's performance across the 11 pillars. For example, Figure 4 compares 3 out of the top 10 regions: Stockholm (SE), Oberbayern (DE) and Hovedstaden (DK) (left-hand spider graph), all with a GDP per capita index above 160 (EU-28=100), and three regions from the bottom 10: Severozapaden (BG), Dytiki Ellada (EL) and Sud-Est (RO) (right-hand spider graph), with GDP per capita not higher than 50% of the EU average. First, it is worth noting the regular, almost spherical shape of the spider graph showing the top performers in contrast to the highly irregular pattern of the graph showing the bottom performers. As an aggregate measure of different factors of competitiveness, high RCI levels can only be achieved if above-average levels are reached across all 11 pillars. In other words, good performances correspond to a group of factors acting in unison. Recent analyses of key factors of regional economic growth (OECD, 2012; Annoni et al., 2019) highlighted that simultaneous gains in several areas, rather than being excellent in just one or a few of them, is a good recipe for economic success. This reminds us of what can be called the Anna Karenina principle: 'All happy families are alike; each unhappy family is unhappy in its own way' (*Anna Karenina* by L.N. Tolstoy). In other words, deficiency in any one factor leads to a broader weakness.

FIGURE 4: Comparison of the performance across the 11 RCI pillars (0-100 normalised scores) among 3 top performers (left-hand side) and 3 bottom performers (right-hand side).





But what are the most important factors for good levels of competitiveness? Although a simple comparison of the pillar scores is not sufficient to understand a complex phenomenon such as regional competitiveness, the analysis of Figure 4 still provides some interesting insights. Stockholm, Oberbayern (Munich's region) and Hovedstaden (Copenhagen's region) have similar, above-EU-average scores on quality of institutions, macroeconomic stability, infrastructure, health and the three components of the RCI Innovation sub-index, technological readiness, business sophistication and innovation. Oberbayern, the most populous of the three regions, compensates for a relatively weaker performance in human capital (basic and higher education pillars) with a bigger market size[6]. However, interpreting the graph of the bottom performers (Figure 4, right-hand side) is less easy, as scores are more irregular across pillars. Severozapaden and Sud-Est share a relatively good performance in macroeconomic stability (measured at the country level) and labour market efficiency, while Dytiki Ellada, an inland Greek region adjacent to the capital region, achieves higher scores in health and business sophistication. However, these relatively good performances in a few competitiveness factors are not enough to lift these regions from a bottom-10 position.

2.3. COMPARATIVE STRENGTHS AND WEAKNESSES

Regions can use RCI scores to make a comparison with any other region in the EU or with the EU average. It is also helpful to compare a region with regions at a similar level of economic development. For example, a less-developed region may have an overall low score but outperform regions with similar GDP per capita. Conversely, a highly developed region may have a high score but still fall short of what is typical for comparably wealthy regions.

RCI scorecards facilitate the comparison of each region with its peers. Scorecards are factsheets – one for each region – presenting a region's scores and rankings in the RCI, the three sub-indices and the 11 pillars. In addition, a region's performance is compared with that of a group of its economic peers, defined as the 15 regions closest to the one under analysis in terms of average 2015-2017 GDP per capita index (PPS, EU-28 = 100). The region's performance on each RCI component can then be compared with the average score of the regions within the peer group. The standard deviation of the peer region scores is taken as a measure of the score variability within the group. If the region's score deviates from the group average by less than one standard deviation, then the region is considered to have neither strengths nor weaknesses with respect to its peers. If the region's score is more than one standard deviation above (or below) the average, it is considered as overperforming (or underperforming) with respect to its peers. Cross lights indicate on which pillar the region is overperforming (green), underperforming (red) or performing equally with respect to its peers (yellow).

Scorecards can, for example, be used to provide a detailed comparison between two of the top-10 regions, Stockholm (1st) and Île-de-France (10th), which are in the same peer group and are among the wealthiest regions in the EU (Figure 5). Stockholm's strong points are health and human capital and innovation. Île-de-France typically features the strengths of a highly agglomerated economy, infrastructure and market size, but shows some weaknesses with respect to its peers on macroeconomic stability (measured at the country level) and labour market efficiency.

Equally interesting is the comparison between two bottom performers, Dytiki Ellada and Severozapaden (Figure 6). Despite both regions scoring in the negative range for all the RCI components[7], Dytiki Ellada shows a relatively better business environment, while macroeconomic stability (measured at the national level) and labour market efficiency are weaker. The Bulgarian north-western region of Severozapaden is very poor, with GDP per head reaching only 29% of the EU average. Its only strong point compared to its peers is due to the overall better macroeconomic stability of Bulgaria as a whole, although Severozapaden is particularly weak in infrastructure, health and technological readiness.

Interactive scorecards are available at the RCI webpage where the user can interactively select the region of interest.

6. The RCI is computed as a weighted arithmetic mean of pillar scores, therefore allowing for compensation across its components.
7. RCI scores are z-scores which means the EU-28 average is always set at 0. Thus, negative values are below the EU-28 average and positive values are above.

FIGURE 5: Scorecards for Stockholm and Île-de-France.

Sweden	*Stockholm*								*SE11*
RCI 2019	**Score**	**Score 0-100**	**Rank***	**GDP per head PPS - EU28=100**	**Value**	**Rank**	**Stage of development (1 = Lowest; 5 = Highest)**	**5**	
	1.08	**100.00**	**1/268**		**172**	**8/268**			

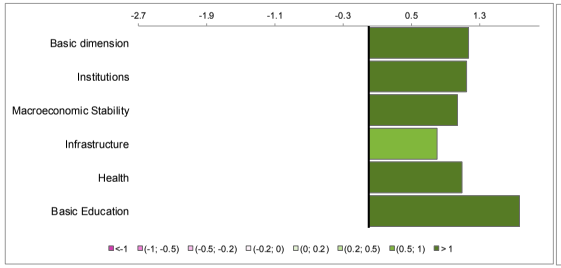
Peer Regions: Île de France; Oberbayern; Hovedstaden; London and its commuting zone; Stuttgart; Bratislavský kraj; Bruxelles and its commuting zone; Eastern and Midland; Amsterdam and its commuting zone; Darmstadt; Utrecht; Bremen; Salzburg; North Eastern Scotland and Warszawski stołeczny

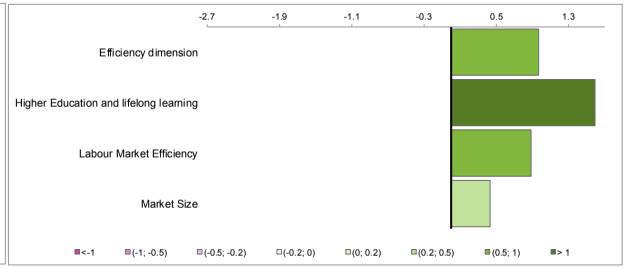
	score (EU28=0)	peers comparison
Basic dimension	**1.17**	
Institutions	1.14	
Macroeconomic Stability	1.04	
Infrastructure	0.80	
Health	1.09	
Basic Education	1.77	

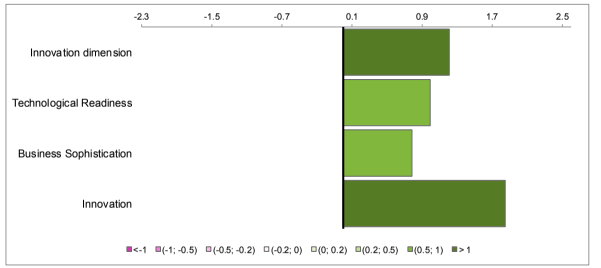
	score (EU28=0)	peers comparison
Efficiency dimension	**0.97**	
Higher Education and lifelong learning	1.59	
Labour Market Efficiency	0.88	
Market Size	0.43	

	score (EU28=0)	peers comparison
Innovation dimension	**1.21**	
Technological Readiness	0.99	
Business Sophistication	0.78	
Innovation	1.85	

Overperforming with respect to its peers
Similar to peers
Underperforming with respect to its peers







* Equal ranking is assigned if the difference in score is equal or below 0.1 on the 0-100 scale

Note: Macroeconomic Stability and Basic Education at the country level

France	*Île de France*	*FR10*

RCI 2019	Score	Score 0-100	Rank*	GDP per head PPS - EU28=100	Value	Rank	Stage of development (1 = Lowest; 5 = Highest)	5
	0.84	91.14	11/268		177	7/268		

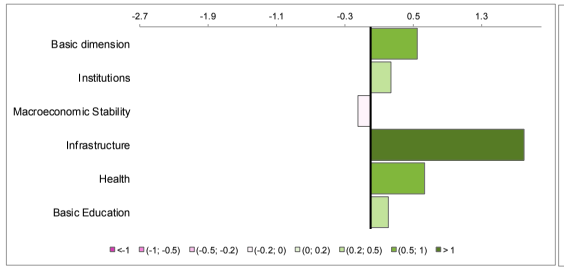
Peer Regions: Oberbayern; Stockholm; Bratislavský kraj; Eastern and Midland; Hovedstaden; London and its commuting zone; Stuttgart; Bruxelles and its commuting zone; Amsterdam and its commuting zone; Darmstadt; Utrecht; Bremen; Salzburg; North Eastern Scotland and Warszawski stołeczny

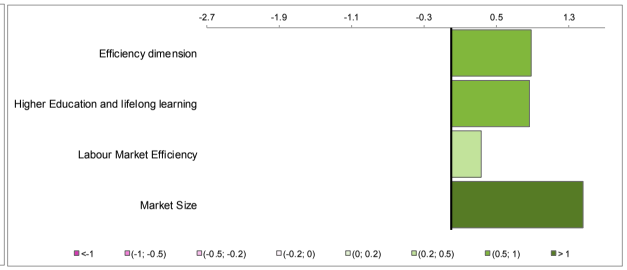
	score (EU28=0)	peers comparison
Basic dimension	0.55	
Institutions	0.24	
Macroeconomic Stability	-0.15	
Infrastructure	1.80	
Health	0.63	
Basic Education	0.21	

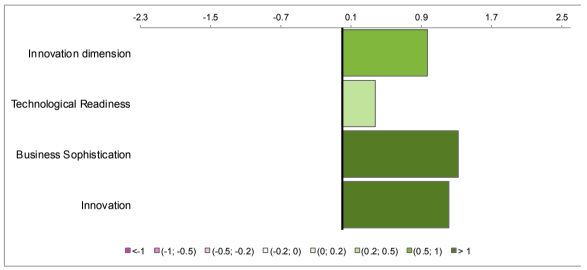
	score (EU28=0)	peers comparison
Efficiency dimension	0.88	
Higher Education and lifelong learning	0.86	
Labour Market Efficiency	0.33	
Market Size	1.46	

	score (EU28=0)	peers comparison
Innovation dimension	0.97	
Technological Readiness	0.38	
Business Sophistication	1.32	
Innovation	1.22	

Overperforming with respect to its peers
Similar to peers
Underperforming with respect to its peers







* Equal ranking is assigned if the difference in score is equal or below 0.1 on the 0-100 scale

Note: Macroeconomic Stability and Basic Education at the country level

FIGURE 6: Scorecards for Dytiki Ellada and Severozapaden.

Greece	*Dytiki Ellada*							*EL63*
RCI 2019	**Score**	**Score 0-100**	**Rank***	**GDP per head PPS - EU28=100**	**Value**	**Rank**	**Stage of development (1 = Lowest; 5 = Highest)**	**2**
	-1.43	**6.53**	**262/268**		**50**	**248/268**		

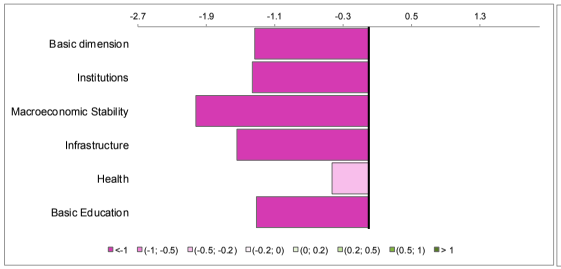
Peer Regions: Podlaskie; Sud-Est; Świętokrzyskie; Warmińsko-mazurskie; Podkarpackie; Voreio Aigaio; Ipeiros; Dél-Alföld; Thessalia; Lubelskie; Nord-Vest; Guyane; Anatoliki Makedonia, Thraki; Sud - Muntenia and Kentriki Makedonia

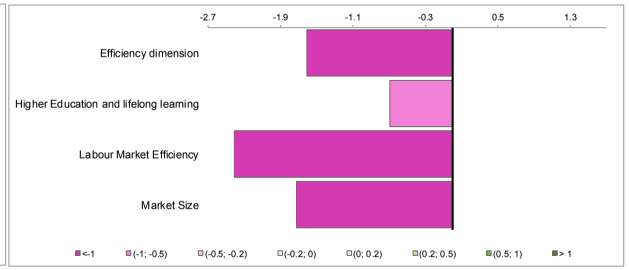
	score (EU28=0)	peers comparison
Basic dimension	**-1.33**	
Institutions	-1.36	
Macroeconomic Stability	-2.02	
Infrastructure	-1.54	
Health	-0.43	
Basic Education	-1.31	

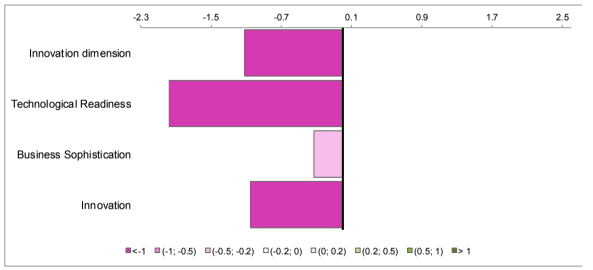
	score (EU28=0)	peers comparison
Efficiency dimension	**-1.61**	
Higher Education and lifelong learning	-0.69	
Labour Market Efficiency	-2.41	
Market Size	-1.72	

	score (EU28=0)	peers comparison
Innovation dimension	**-1.12**	
Technological Readiness	-1.98	
Business Sophistication	-0.33	
Innovation	-1.05	

Overperforming with respect to its peers
Similar to peers
Underperforming with respect to its peers







* Equal ranking is assigned if the difference in score is equal or below 0.1 on the 0-100 scale

Note: Macroeconomic Stability and Basic Education at the country level

Bulgaria	*Severozapaden*	*BG31*

RCI 2019	Score	Score 0-100	Rank*	GDP per head PPS - EU28=100	Value	Rank	Stage of development (1 = Lowest; 5 = Highest)	1
	-1.40	7.60	260/268		29	268/268		

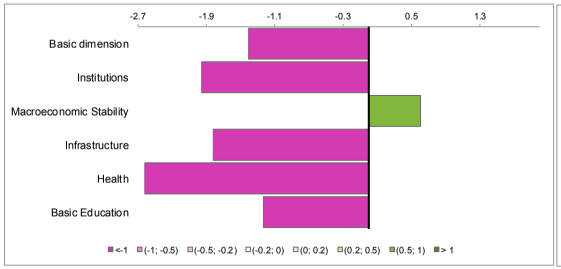
Peer Regions: Severen tsentralen; Mayotte; Yuzhen tsentralen; Nord-Est; Severoiztochen; Yugoiztochen; Sud-Vest Oltenia; Észak-Alföld; Dél-Dunántúl; Észak-Magyarország; Sud - Muntenia; Anatoliki Makedonia, Thraki; Lubelskie; Dél-Alföld and Ipeiros

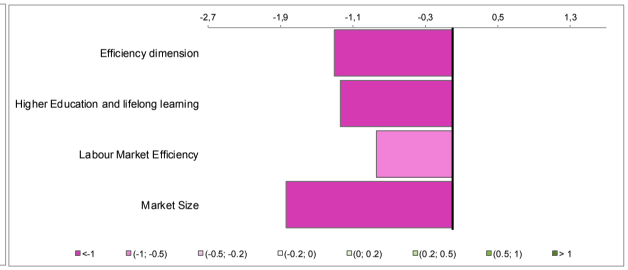
	score (EU28=0)	peers comparison
Basic dimension	**-1.40**	
Institutions	-1.95	
Macroeconomic Stability	0.61	
Infrastructure	-1.82	
Health	-2.62	
Basic Education	-1.23	

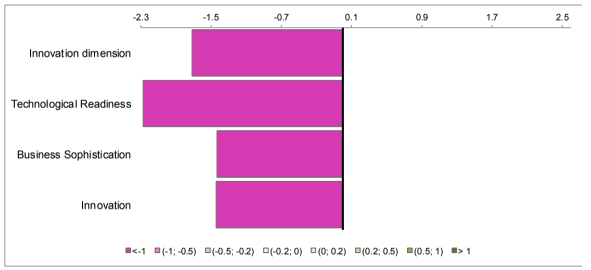
	score (EU28=0)	peers comparison
Efficiency dimension	**-1.31**	
Higher Education and lifelong learning	-1.24	
Labour Market Efficiency	-0.84	
Market Size	-1.84	

	score (EU28=0)	peers comparison
Innovation dimension	**-1.72**	
Technological Readiness	-2.27	
Business Sophistication	-1.43	
Innovation	-1.44	

Overperforming with respect to its peers
Similar to peers
Underperforming with respect to its peers







* Equal ranking is assigned if the difference in score is equal or below 0.1 on the 0-100 scale

Note: Macroeconomic Stability and Basic Education at the country level

3. WHAT HAS IMPROVED AND WHAT HAS REMAINED UNCHANGED

3.1. A STABLE FRAMEWORK AND METHODOLOGY

The RCI follows the framework adopted by the World Economic Forum for its Global Competitiveness Index (WEF-GCI) up to their 2017-2018 edition[8]. The latest edition of the WEF-GCI edition has been substantially modified with the elimination of the three sub-indices structure and the differential weighting scheme. Given the specific characteristics of EU regions and in order to keep as much comparability as possible with previous RCI editions, the RCI framework and weighting scheme are unchanged. Below, we briefly describe the methodology adopted for the RCI which has remained unchanged throughout the four editions[9].

The RCI is composed of 11 pillars that describe the different aspects of competitiveness and are classified into three groups: Basic, Efficiency and Innovation. The Basic group includes five pillars: (1) Institutions; (2) Macroeconomic Stability; (3) Infrastructures; (4) Health; and (5) Basic Education. These represent the key basic drivers of all types of economies and constitute the set of factors enabling regional competitiveness. As a regional economy develops, factors related to a more skilled labour force and a more efficient labour market come into play and are grouped into the Efficiency group which includes: (6) Higher Education, Training and Lifelong Learning; (7) Labour Market Efficiency; and (8) Market Size. At the most advanced stage of economic development, drivers of improvement are part of the Innovation group, which consists of three pillars: (9) Technological Readiness; (10) Business Sophistication; and (11) Innovation. Of these 11 pillars, Macroeconomic stability and Basic Education are measured at the national level, whilst Institutions and Technological Readiness pillars comprise two sub-pillars each, one at the national and the other at the regional level.

In total, 84 indicators have been statistically tested for inclusion in RCI 2019, 10 of which are new to this edition. 74 indicators were eventually included in the index. Table A.1 in the Appendix describes all the indicators in the RCI dimensions and sub-dimensions. As followed since the first edition of the RCI, the statistical test consists of two subsequent steps: one to assess the statistical quality of each single indicator included – univariate analysis – and the other to verify whether the set of indicators within each dimension is internally consistent – multivariate analysis (Annoni and Kozovska, 2010). The univariate analysis first checks for missing values. The maximum share of missing values allowed is set at around 10-15% but no indicator is excluded from this edition for this reason. In a few cases, the NUTS-1 level only is available, in which case the NUTS-1 value is imputed to all the NUTS-2 regions within the parent NUTS-1 region.

Box-Cox transformations are adopted when outliers are detected for one indicator, through the simultaneous analysis of skewness and kurtosis of the indicator's distribution. Box-Cox transformations are a set of continuous, monotonically increasing, power transformations which include the logarithmic one as a particular case (Box and Cox, 1964). They depend on a power parameter λ contracting (expanding) higher values for $\lambda < 1$ ($\lambda > 1$). In total, only nine indicators required outlier correction. They are listed in Table A.3, together with the corresponding λ value adopted for the transformation. Due to the high level of skewness observed for two indicators measuring potential market size in the respective pillar, a different value of the parameter λ has been used for them in this RCI edition (Table A.3).

To correct for different range and measurement units, weighted z-scores are adopted using the regions' population sizes as weights.

The internal consistency within each pillar is verified by the Principal Component Analysis (PCA), a multivariate explorative technique (Morrison, 2005). The PCA is used in composite index construction when each pillar in a composite index is meant to describe a particular aspect of the latent phenomenon to be measured, in this case regional competitiveness. As they are not directly observable, these aspects can only be measured by observable indicators, or proxies, assumed to be related to the aspect they describe and, consequently, to each other.

These two conditions should ideally be verified:

- each pillar shows a unique, most relevant PCA component accounting for a large amount of variance, assessed by checking that the first PCA component is the only one with eigenvalue above 1;
- all the indicators contribute to roughly the same extent and with the same orientation to the most relevant PCA component, assessed by checking the value of the indicator's loadings.

Full details of the method adopted for the statistical assessment are described in Annoni and Kozovska (2010) and remained unchanged throughout all the Index editions. The PCA is then used to check the internal consistency of each RCI pillar to detect non-influencing indicators or indicators that describe something different from what is described by the other indicators in the pillar. Being a data-driven technique, the PCA is repeated every time the indicator set is updated. All the RCI 2019 pillars show a clear, unique, underlying dimension with a well-balanced contribution from each indicator. Two indicators, both in the Higher Education and lifelong-learning pillar, have been discarded following an internal consistency check: Accessibility to university, a newly updated indicator computed by DG REGIO, measuring the share of population in a region able to access a university main campus within a 45-minute drive; and Gender balance on tertiary education, computed as the absolute value of the difference between women's and men's share. This latter indicator also showed misfit in the previous RCI editions.

8. https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018
9. The only modification to the methodology was implemented between the first and second editions when the number of regional development stages increased from 3 to 5.

The three RCI sub-indices – Basic, Efficiency and Innovation – are conceptually nested. A good performer in the Innovation sub-index is expected to be a good performer in the Basic and Efficiency indices as well as they are considered to be instrumental for a marginal increase in the level of competitiveness. In other words, Basic and Efficiency aspects are seen as enabling factors of competitiveness. Conversely, regions with poor or insufficient levels in the Basic group cannot be expected to perform well in the other two groups. It is assumed that as regions move along the development path, their socio-economic conditions change and different determinants become more and more important for their competitiveness. As a result, improving the competitiveness of more-developed regions will require other priorities than for a less-developed region. In the index computation, this is reflected by a weighting system that takes into account the stage of development. As in the 2013 and 2016 editions, EU regions are divided into five development stages based on their average 2015-2017 GDP per head in purchasing power standard (PPS) expressed as an index with the EU-28 average set to 100 (Map 3), and weighting the RCI sub-indices differently for the different development stages, as shown in Table 2.

MAP 3: Average GDP per head (PPS) in the period 2015-2017

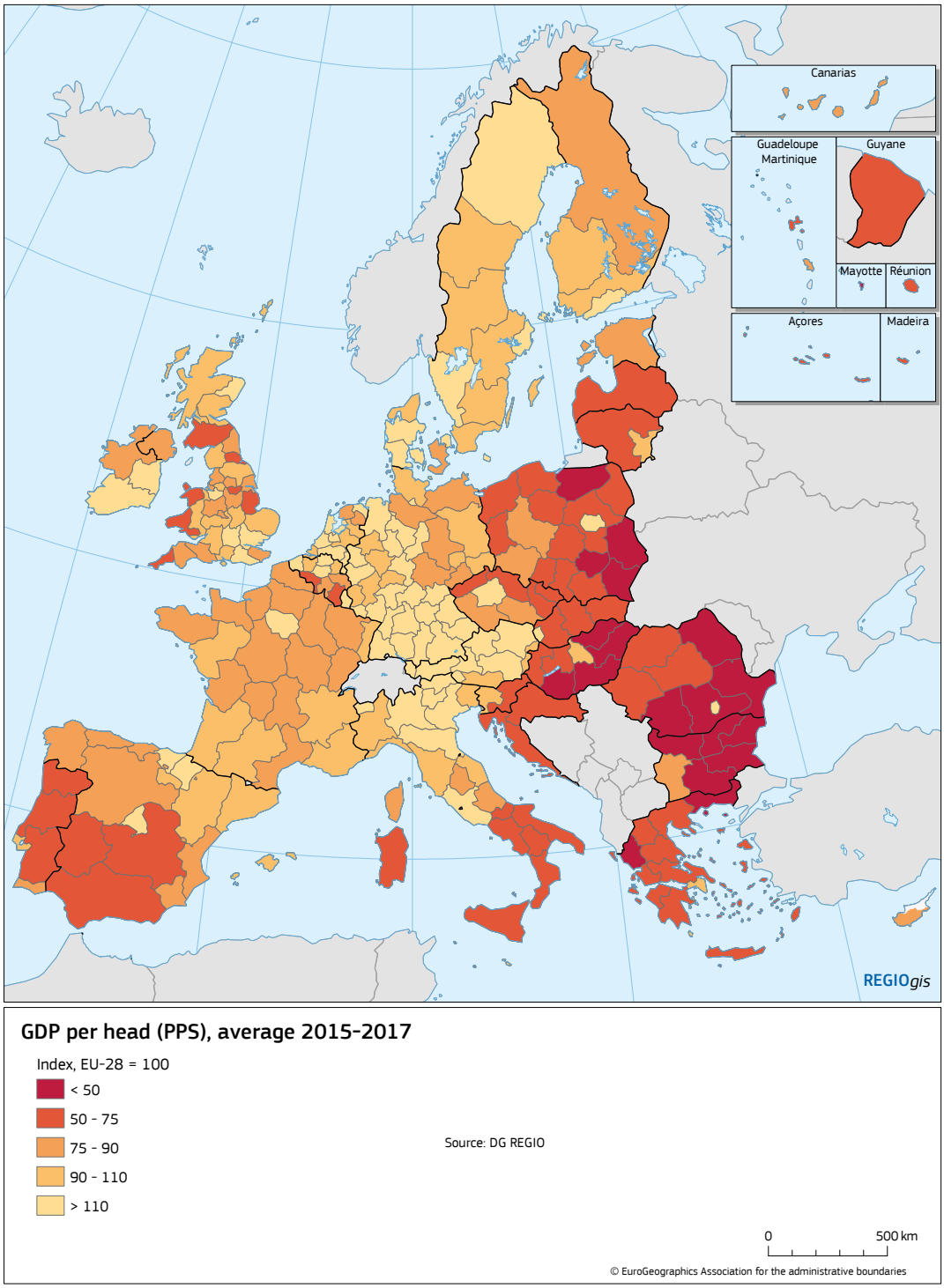


TABLE 2: The differential weighting scheme used for the three RCI sub-indices for each development stage

Stage of development	Basic sub-index weight	Efficiency sub-index weight	Innovation sub-index weight
Stage 1: GDP index < 50	35.00%	50.00%	15.00%
Stage 2: GDP index [50-75)	31.25%	50.00%	18.75%
Stage 3: GDP index [75-90)	27.50%	50.00%	22.50%
Stage 4: GDP index [90-110)	23.75%	50.00%	26.25%
Stage 5: GDP index >= 110	20.00%	50.00%	30.00%

3.2. REGIONS' BORDER REVISION AND METROPOLITAN AREAS

The RCI is based on the NUTS-2 level but those which are part of the same metropolitan area are combined. This ensures that the RCI is a more appropriate measure when the indicators are affected by important commuting patterns, such as, for example, when they measure volumes relative to the resident population. Employment or unemployment rates are affected by this phenomenon: for instance, the labour force in the Brussels Capital region can draw on people living in the region as well as in the adjacent regions of Brabant Wallon and Vlaams-Brabant. These problems arise for a small number of EU capital cities, including Amsterdam, Berlin, Brussels, London, Prague and Vienna, as in the previous RCI editions, and Budapest, due to the recent NUTS-2 revision that splits the region of Buda from the region of Pest. These capital regions are merged with one or more adjacent regions, as shown in Table 3. A region adjacent to a capital region is considered to be part of its commuting belt if at least 40% of its population live in the same functional urban area, defined according to the EU-OECD approach (Dijkstra and Poelman, 2012). This classification should be kept in mind when analysing and comparing the performance of these regions.

TABLE 3: Capital regions combined with their commuting belt in RCI 2019

Country	NUTS-2 CODE 2016	NUTS-2 NAME	Code in RCI 2019	RCI 2019 name	Notes
Austria	AT12 AT13	Niederösterreich Wien	AT00	Wien and its commuting belt	no change with respect to RCI 2016
Belgium	BE10 BE24 BE31	Région de Bruxelles Capitale Prov. Vlaams-Brabant Prov. Brabant Wallon	BE00	Bruxelles and its commuting belt	no change with respect to RCI 2016
Czechia	CZ01 CZ02	Praha Střední Čechy	CZ00	Praha and its commuting belt	no change with respect to RCI 2016
Germany	DE30 DE40	Berlin Brandenburg	DE00	Berlin and its commuting belt	no change with respect to RCI 2016
Hungary	HU11 HU12	Budapest Pest	HU10	"Közép-Magyarország (Budapest and its commuting belt)"	RCI 2019 keeps Budapest and its surrounding region as a single region as it is in previous RCI editions
Netherlands	NL23 NL32	Flevoland Noord Holland	NL00	Amsterdam and its commuting belt	no change with respect to RCI 2016
United Kingdom	UKH2 UKH3 UKI3 UKI4 UKI5 UKI6 UKI7	Bedfordshire and Hertfordshire Essex Inner London - West Inner London - East Outer London - East and North East Outer London - South Outer London - West and North West	UK00	London and its commuting belt	no change with respect to RCI 2016

It is also important to note that the NUTS boundary revisions regularly implemented by the Member States every three/four years usually affect the RCI. In the 2019 edition, not all the indicators follow the most recent NUTS-2 revision that was adopted by Eurostat in January 2018. A number of indicators included in the Index follow the previous NUTS classification, as noted in Table A.1 in the Annex. Where feasible, we computed estimates for these indicators according to the new NUTS classification using population-based weights. It is important to note that these are DG REGIO estimates and not observed values.

3.3. IMPROVEMENTS AND ADJUSTMENTS

Each RCI edition includes more than 70 indicators at the NUTS-2 level across the EU. A composite index of this complexity is always subject to modifications and adjustments. The reasons for such changes include the revisions of NUTS classification, the availability of new and better indicators at the regional level, or the fact that indicators previously included are no longer updated or reliable (for example, if they are affected by high rates of missing values). Fortunately, NUTS revision and changes in indicators usually only affect a small number of regions and indicators. In the economy of scale of the Index, these changes never substantially modify its overall structure. Nevertheless, a limited set of refinements are usually necessary. A brief overview of the main changes implemented for RCI 2019 is given below.

MACROECONOMIC STABILITY PILLAR (NATIONAL LEVEL)

The inflation indicator (annual average rate of change in harmonised indices of consumer prices) has been permanently discarded as it does not fit in all RCI editions.

A new indicator, Net International Investment Position (NIIP), has been tested and successfully added to the 2019 edition. It is available in the Eurostat database at the national level as the difference between a country's national assets and liabilities compared to the rest of the world, expressed as a percentage of national GDP. NIIP is frequently used in economic analysis and research focusing on the external vulnerability of countries and the risk of crises (DG ECFIN, 2012) and is highly correlated with the level of indebtedness of households and the financial sector. Highly negative values of net foreign position usually result from persistently high current-account deficits.

Two other indicators – Export market shares and Private sector debt – have also been tested but failed to pass the PCA test.

INFRASTRUCTURE PILLAR

The accessibility indicators, Access to motorways and Access to railways, have been replaced with a new transport performance measure. Transport performance compares the population that can be reached within 90 minutes with the population within a 120-km radius. In simpler terms, it compares the accessible population to the nearby population. If transport infrastructure is highly developed, a high share of the population within that radius will be accessible within 90 minutes of travel.

If transport infrastructure is less well developed, a low share of the nearby population can be reached within 90 minutes of travel. The road transport performance indicator takes into account observed speeds on each of the road segments, but not congestion (Dijkstra et al., 2019). The rail transport performance indicator considers the location of the stations and what other stations can be reached within 90 minutes (including using transfers) based on comprehensive timetable information (Poelman et al., 2019). This new measure of transport performance captures the impact of transport infrastructure investments, whereas the road and railways accessibility indicators included in previous RCI editions were mainly influenced by the spatial distribution of population. For this reason, the RCI 2019 Infrastructure pillar is not completely comparable with previous ones. The Accessibility to passenger flights indicator remained the same but has been updated with the latest available figures. Since the indicator on fast railways, included in the 2016 edition, has not been updated since then it has been excluded.

BASIC EDUCATION PILLAR (NATIONAL LEVEL)

This pillar underwent a complete revision with respect to previous RCI editions as the OECD's Programme for International Student Assessment (PISA) indicators, usually included in this pillar, have raised a series of concerns about their reliability and comparability across countries and time in recent years (Goldstein, 2004; Fernandez-Cano, 2016; Araujo et al., 2017). In fact, in the previous RCI edition it was necessary to adjust proficiency levels in science and reading to improve the comparability of PISA scores with previous editions (Annoni et al., 2017). Furthermore, at the time of publication of RCI 2019, PISA indicators had not been updated since the previous RCI edition.

We then decided to modify the pillar conceptually and searched for indicators measuring basic skills with a direct link to labour market needs. Three indicators from the Adult Education Survey (AES)[10], which has been published by Eurostat since 2007, have been selected and successfully tested to this end. AES is a national-level survey covering adult participation in education and training (formal, non-formal and informal learning) for resident populations aged 25-64. The reference period for participation in education and training is 12 months prior to the interview. Among other aspects, it covers job-related non-formal education and training at least partially paid by the employer, and therefore can be considered a better proxy of training activities matching labour market needs. AES also includes the self-reported knowledge level of a foreign language, which is considered to be an important basic skill to be fostered at the EU level.

The 2018 Council Recommendation on a comprehensive approach to the teaching and learning of languages proposes, among other goals, an action plan aimed at boosting language learning by focusing on reaching specific competence levels, based on the Council of Europe's Common European Framework of Reference for Languages, by the end of compulsory education. Accessibility to learning information was also tested and added to the pillar.

10. https://ec.europa.eu/eurostat/cache/metadata/en/trng_aes_12m0_esms.htm

The three indicators from the AES newly included in the basic education pillar of RCI 2019 are:

1. Employer-sponsored training: Participation rate in job-related, non-formal education and training paid at least partially by the employer and/or done during paid working hours (age cohort 25-64). Courses, workshops/ seminars, guided on-the-job training and lessons are all examples of non-formal training.
2. No foreign language: Share of people who self-reported that they do not know any foreign language (age cohort 25-64).
3. Access to learning information: Access to information on education and training during the last 12 months.

Therefore, the Basic education pillar has been revised to better measure basic skills with a direct link to labour market needs. It remains at the national level.

HIGHER EDUCATION PILLAR

Human capital is undoubtedly a key factor of growth and competitiveness in all types of economies, although the detrimental effect of high shares of poorly educated workforce has not always been highlighted. However, recent contributions in the literature found that higher shares of poorly educated people can be more of an impediment to growth than lower shares of highly educated ones (OECD, 2012; Annoni and Catalina Rubianes, 2016). To describe the share of people with relatively lower levels of education, the percentage of people aged 25 to 64 who have successfully completed at most lower secondary education (ISCED 0-2) has been added to this pillar.

LABOUR MARKET EFFICIENCY PILLAR

Part-time work is relatively popular in the EU. According to Eurostat, in 2017, almost one in five people with a job in the EU worked part-time. If part-time arrangements are voluntary, for example to reach a better work-life balance, they are welcome. In contrast, if part-time work is not a choice, then this is a signal of a lack of full-time job opportunities. Temporary contracts are also quite common in the EU, with the share of temporary employees rising from 11.2% in 2002 to 13.2% in 2018. To provide a proxy of these two phenomena, a new indicator called involuntary part-time/temporary employment has been tested and added to this edition of the RCI. It was derived from an ad-hoc extraction from the Eurostat Labour Force Survey and computed as the share of population aged 20-64 involuntarily in part-time or temporary jobs. This new indicator is meant to complement typical measures of job quantity with a measure of job quality.

BUSINESS SOPHISTICATION

Another indicator on Marketing or organisational innovators from the Regional Innovation Scoreboard (RIS) 2017 has been added to the business sophistication pillar. It stands together with the other RIS indicator on Innovative SMEs collaborating with others, introduced in the previous edition and confirmed for RCI 2019. The newly added indicator measures the percentage of small and medium-sized enterprises (SMEs) introducing marketing or organisational innovations (Hollanders and Es-Sadki, 2017). A marketing innovation is the implementation of a new marketing concept or strategy that differs significantly from the enterprise's existing marketing methods and has not been used before. An organisational innovation is a new organisational method in the enterprise's business practices, workplace organisation or external relations that has not been used previously by that enterprise (from the Eurostat Community Innovation Survey questionnaire). The inclusion of this new indicator is meant to provide a proxy for SMEs whose business practice is innovative and, consequently, more sophisticated.

INNOVATION

This pillar experienced the highest share of discontinued indicators at the regional level. Specifically, the indicator on Total European Patent Office (EPO) patents and the three Eurostat indicators on High-tech, ICT and Biotechnology patents are no longer published at the regional level. Thus, these four indicators have been excluded.

Two Regional Innovation Scoreboard 2017 indicators, 'Exports in medium-high/high-tech manufacturing' and 'Sales of new to market and new to firm innovation' (Hollanders and Es-Sadki, 2017), have been tested and are both included in RCI 2019. They were also tested for inclusion in RCI 2016 but the 'Sales of innovations' indicator did not pass the internal consistency statistical test and was then discarded from the Index computation. The Sales of innovations indicator is therefore a new addition in this edition. The export-based indicator is meant to complement simple patent application measures by capturing the economic value of patented inventions and their potential impact on technological developments. The underlying assumption is that the quality of new patents, which result from R&D and innovation investment, is reflected by their actual use (Squicciardini, Dernis and Criscuolo, 2013). 'Sales of new to market and new to firm innovation' represents a proxy for the degree of diffusion of state-of-the-art technology and is also meant to provide more qualitative information on patent use and usefulness than the number of applications with a more qualitative one.

The list of indicators included in RCI 2019 is provided in Table A.1 in the Appendix. Eight of the 74 indicators are new to this edition. The complete list and a short description of all candidate indicators is available on the RCI webpage.

4. REMARKABLE RELATIONSHIPS

4.1. RCI IS NOT GDP BUT CAN HELP IT GROW

Comparing the RCI to GDP per head, which is not directly included in the Index, indicates a clear and positive non-linear relationship that is typical across all the RCI editions (Figure 7). Nevertheless, many regions still lie around the main curve which implies that at every level of economic performance there are opportunities for more competitiveness, as well as risks for less. Higher GDP levels correspond to higher levels of competitiveness but this relationship gets looser as GDP increases, with richer regions broadly scattered around their expected competitiveness. For less-developed regions, the relationship is strong: a slight increase in GDP per head is linked to a clear increase in competitiveness. In more-developed regions, each extra euro of GDP per capita buys less and less competitiveness, and the range of variation in competitiveness for a fixed GDP value is wider than for less-developed regions. For example, the German region of Karlsruhe and the Romanian capital region Bucureşti-Ilfov perform remarkably differently in RCI despite having similar levels of GDP per capita (Karlsruhe RCI is more than 50% higher than Bucureşti-Ilfov's RCI). As can be seen from its scorecard (Figure 8), the Romanian capital region underperforms in most RCI components compared to its peer group which includes Karlsruhe. The quality of institutions, macroeconomic stability, health, basic education, labour market efficiency, technological readiness and business sophistication are all aspects where the region could act to improve its competitiveness.

Under the assumption, albeit simplistic, that high levels of GDP per head can facilitate more investments to boost competitiveness, we can identify over- and under-performing regions by comparing RCI to the level of GDP per capita. If a region is located above the estimated RCI-GDP curve in Figure 7, we can assume that it outperforms its economic potential; the contrary can be said for regions below the curve. Of the top-10 regions, Stockholm, Utrecht, the three British regions and the Helsinki region outperform their economic level as they score significantly higher than their GDP per head would imply, with the exception of Luxembourg. However, in Greece, Spain, Italy and Ireland, most of the regions are underperforming.

While economic growth, as measured by real GDP per capita growth, is not an end in itself, it remains an important enabler of human welfare by providing the necessary resources for improving infrastructure, health, education and social integration. It is therefore important for countries and regions to closely monitor the factors that enhance economic development. The RCI includes most of the potential factors for growth. A recent study shows that, in the years following the 2008/2009 crisis, some RCI components have a clear and strong effect in explaining economic growth at the regional level in the EU (Annoni et al., 2019). The analysis uses spatial econometric modelling to assess causal effects on economic growth, including spill-over effects. The model includes a selection of RCI components among other more classical potential determinants of growth. Results show that the quality of institutions, human capital, technological readiness and business sophistication are all important growth enablers, some with significant spill-over effects.

FIGURE 7: Relation between RCI 2019 and average 2015-2017 GDP per capita index (PPS, EU-28 = 100). The different colours correspond to the region's development stage. The estimated RCI-GDP logarithmic curve is shown together with its statistical confidence bands.

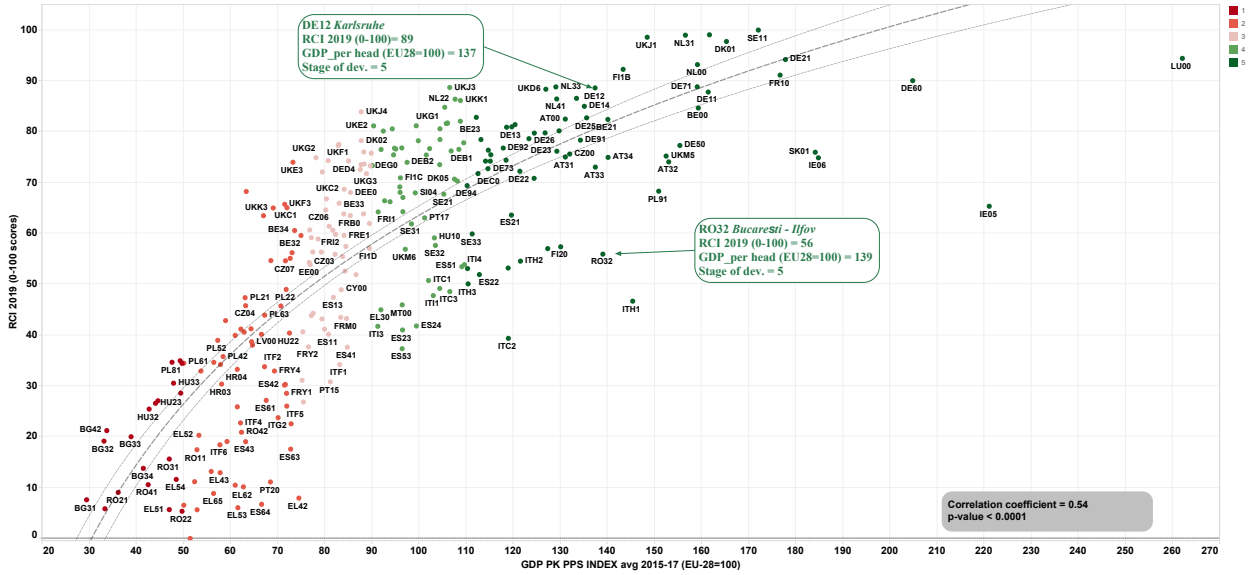


FIGURE 8: Weaknesses of Bucureşti-Ilfov compared to its 15 peers.

Romania	*Bucureşti - Ilfov*							*RO32*
RCI 2019	Score	Score 0-100	Rank*	GDP per head PPS - EU28=100	Value	Rank	Stage of development (1 = Lowest; 5 = Highest)	5
	-0.10	55.92	151/268		139	25/268		

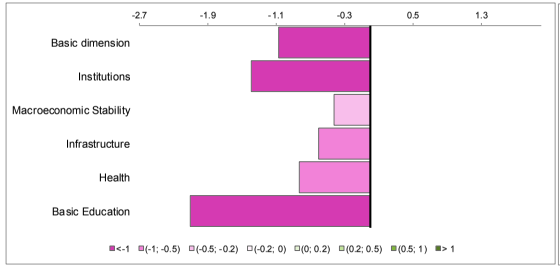
Peer Regions: Antwerpen; Vorarlberg; Tirol; Karlsruhe; Mittelfranken; Tübingen; Helsinki-Uusimaa; Braunschweig; Köln; Prov. Autonoma di Bolzano/Bozen; Praha and its commuting zone ; Oberösterreich; Wien and its commuting zone; Åland and Düsseldorf

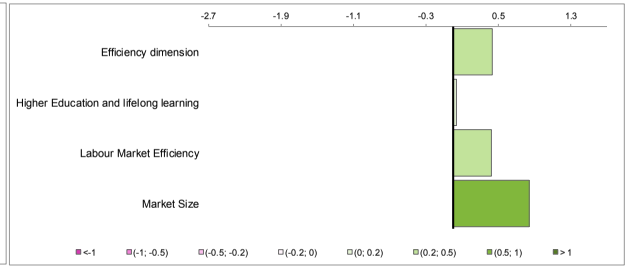
	score (EU28=0)	peers comparison
Basic dimension	-1.07	
Institutions	-1.39	
Macroeconomic Stability	-0.42	
Infrastructure	-0.60	
Health	-0.83	
Basic Education	-2.11	

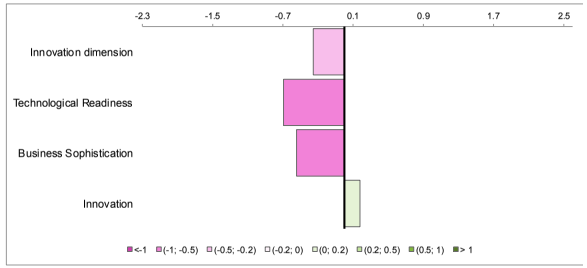
	score (EU28=0)	peers comparison
Efficiency dimension	0.43	
Higher Education and lifelong learning	0.04	
Labour Market Efficiency	0.42	
Market Size	0.84	

	score (EU28=0)	peers comparison
Innovation dimension	-0.35	
Technological Readiness	-0.69	
Business Sophistication	-0.54	
Innovation	0.18	

Overperforming with respect to its peers
Similar to peers
Underperforming with respect to its peers



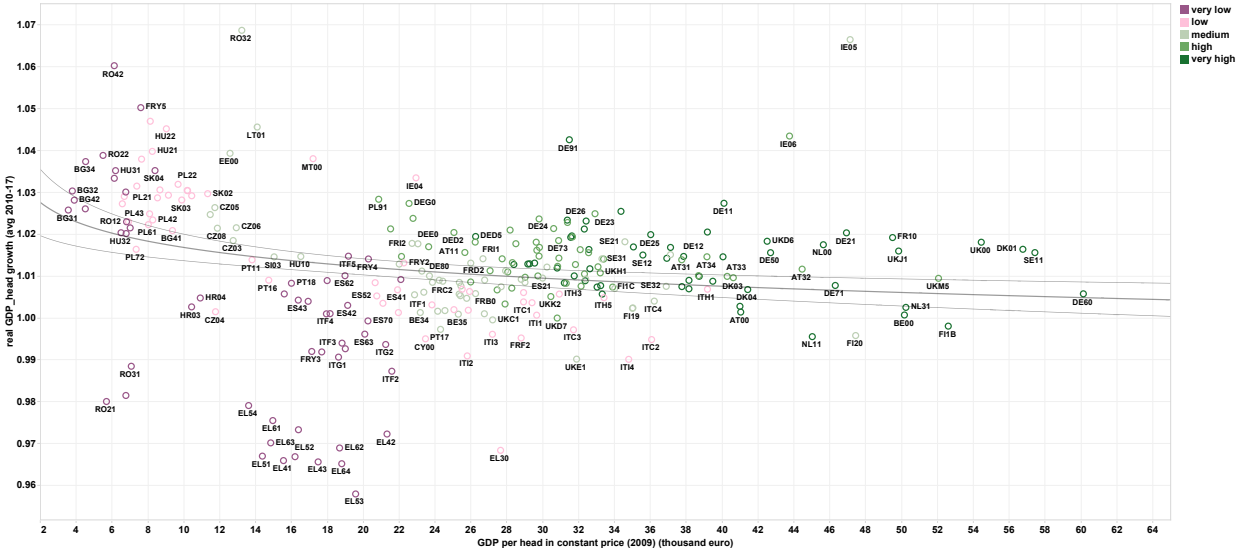




* Equal ranking is assigned if the difference in score is equal or below 0.1 on the 0-100 scale

Note: Macroeconomic Stability and Basic Education at the country level

FIGURE 9: Unconditional growth curve for the period 2010-2017. Different colours correspond to different value classes of RCI 2019 (quantiles). The estimated logarithmic curve is shown together with its statistical confidence bands. Luxembourg is not shown in the graph but is included in the curve estimation.



Given the complexity of the phenomenon, proper econometric analyses of the kind mentioned previously are necessary to assess the importance of the different aspects of a region's competitiveness for its growth – a task that goes beyond the scope of this paper. Figure 9 shows the unconditional growth curve for the period 2010-2017. The shape of the curve is in agreement with the conventional empirical literature on convergence, with the negative effect of the initial level of GDP indicating the typical 'catching-up' process in which poorer economies grow faster than richer ones (Solow, 1956). Different levels of RCI scores, computed according to percentiles, are shown in the figure by different colours, where green shades indicate higher competitiveness and purple shades lower competitiveness. It can be noted that regions with higher than expected growth tend to be more competitive (green regions), while regions that have grown less than expected tend to be less competitive (purple regions). Despite showing a simple relationship spanning a short period, Figure 9 clearly indicates that territorial competitiveness, as measured by the RCI, is undoubtedly important for a region's economic development.

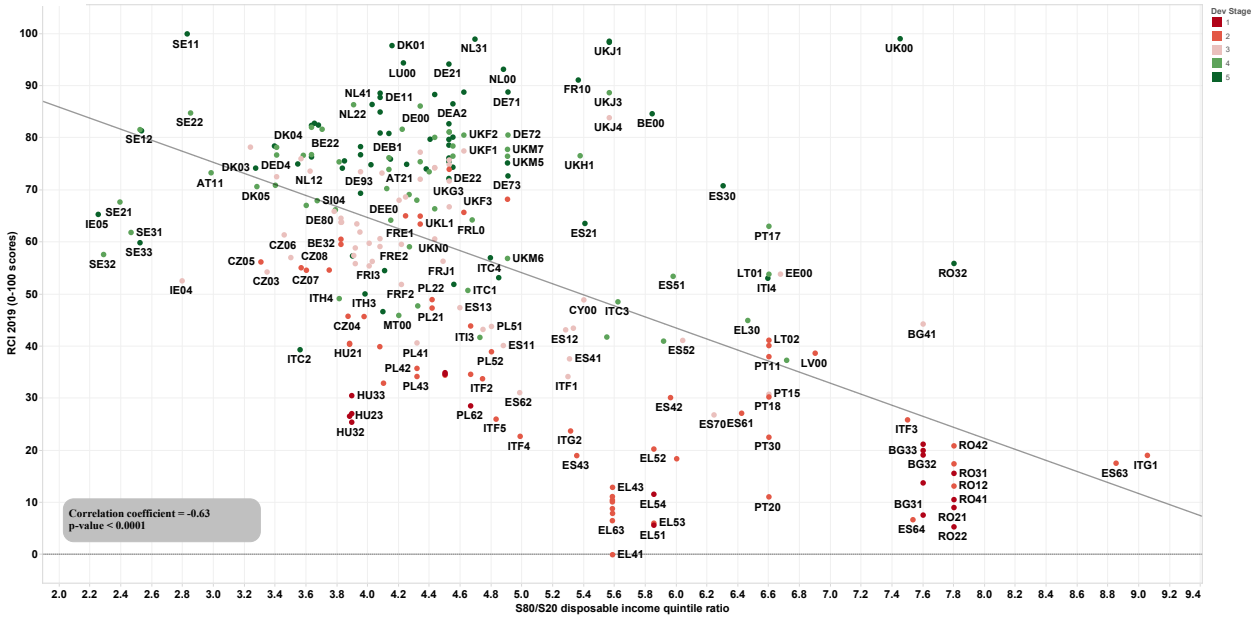
4.2. LOW REGIONAL COMPETITIVENESS TRANSLATES INTO HIGHER INCOME INEQUALITY

Although RCI is meant to measure territorial competitiveness, it extends the traditional analysis of competitiveness from a purely economic measure to incorporate social elements (Annoni and Dijkstra, 2017). In this way, it goes beyond the perspective of businesses to integrate residents' concerns and responds to the discussion that progress cannot be captured by economic and monetary-related measures alone but should be complemented by a broader range of measures. It is therefore interesting to see how much the final index is affected by its 'social component'.

Income inequality has become more and more a prominent indication of social integration and fairness in the EU and worldwide. The income quintile share ratio, computed as the proportion of the total equivalised disposable income received by the 20% of the population with the highest income to that received by the 20% of the population with the lowest income, is part of the key indicators of the European Pillar of Social Rights.[11]

11. https://ec.europa.eu/eurostat/web/european-pillar-of-social-rights/overview

FIGURE 10: RCI 2019 and income inequality; different colours correspond to the regions' development stages.



Data from 2016 show wide inequalities in the distribution of income across EU countries where the top 20% of the population (with the highest income) received 5.2 times as much income as the bottom 20%.

Regional data on the income quintile share ratio is rarer and updated less often than country-level data. For our purposes, we have used OECD data that refer to the year 2013 for most of the countries complemented by 2014 Eurostat data at the country level for those EU Member States not in the OECD group[12].

The link between the level of competitiveness and income inequality is remarkably strong and negative (Figure 10). Regions with a low RCI tend to have a more uneven distribution of income. It is also interesting to note that Swedish regions generally feature high levels of competitiveness with low levels of inequality, the best of both worlds. For example, the region of Stockholm – labelled SE11 – is highly competitive (indeed, the most competitive in 2019) and highly fair at the same time; while London and its commuting area – labelled UK00 – is highly competitive but highly unequal. At the other end of the scale, Bulgarian, Romanian and some Italian regions combine low competitiveness with high income inequality.

12. Please note that regional data are not available for all the countries. More information can be found here: http://www.oecd.org/social/income-distribution-database.htm.

5. CONCLUSIONS

Since 2010, the RCI has provided a unique and comparable measure of competitiveness of all NUTS-2 regions in the EU. Through its 11 pillars, it assesses not only aggregate competitiveness but also the strengths and weaknesses of the regions in all its different components. The aggregated and the more detailed disaggregated pictures that RCI provides are equally important, although it is not just a dashboard of single indicators because it helps to identify bottlenecks and margins of improvement in the key determinants of regional competitiveness. Each individual indicator reflects important yet single levers to boost competitiveness, while RCI pillars and dimensions provide the bigger picture which results from the combination of different yet intertwined aspects of competitiveness. As advocated by the WEF's GCI team (Schwab and Sala-i-Martin, 2017), it is critical not to lose sight of the bigger picture as captured by the different components of an aggregate measure. Real progress can be achieved if policies are designed to target overall improvement in the various components of regional competitiveness, rather than a single aspect as described by one indicator. For instance, increasing a region's employment rate maybe not sufficient alone to improve the labour market efficiency RCI component if it is not accompanied by the simultaneous improvement, or at least the non-deterioration, of the other indicators included in that component.

The index is meant to help policymakers and stakeholders assess what a region's strongest/weakest assets are while identifying objectives and targets to converge at national and EU level. With its scorecards and time-comparison analysis, it can be used by a region to compare itself to others, to find regions with a similar level of competitiveness, and to identify regions it could learn from. RCI can therefore be considered as an instrument for identifying bottlenecks in competitiveness. Regional benchmarking enhances regional diagnosis and helps to design the necessary reforms to boost a region's competitiveness. The RCI can also be used to fine-tune interventions in regional development programmes.

The RCI takes a broad approach to competitiveness, looking at numerous relevant dimensions, not all strictly related to enterprises' productivity and efficiency but also covering societal well-being and long-term regional potential. In so doing, it departs from the traditional approach which maintains that regional economic performance depends only on the business environment and competitiveness. Since its first appearance, the RCI has measured the factors that drive both long- and short-term growth and societal prosperity, allowing policymakers to identify challenges that need to be addressed and strengths to build on when designing regional economic growth strategies.

By applying a differentiated weighting scheme to regions at different stages of development and, consequently, with different potential, the Index does not measure all the territories with the same yardstick. Recognising that not all of the regions start from the same point, it assigns more relevance to those aspects that are more relevant for that region at its particular stage of development.

RCI 2019 results are in line with the previous editions. High levels of within-country variation are observed in many cases. Apart from a few exceptions, once again capital regions are found to be ivory towers of competitiveness with rather stable gaps over time that can be tracked across the four points in time that are now available. A polycentric pattern can still be observed with strong capital and metropolitan areas as the main drivers of competitiveness. Spill-over effects can be seen throughout most of north-western Europe, but this is much less obvious in the EU regions to the east and south.

This paper presents the key results of RCI 2019. The Index is a complex, aggregate measure that requires transparency to be properly understood and used. To this aim, the RCI webpage provides all the datasets for the Index construction and the visualisation of results. Interactive web tools and infographics have been updated and improved to provide easy access to a wide range of comparable information across both space and time.

REFERENCES

Annoni, P., De Dominicis, L., Khabirpour, N. (2019) Location matters: a spatial econometric analysis of regional resilience in the European Union. *Growth and Change: A Journal of Urban and Regional Policy, 50, 824-855*.

Annoni, P., Dijkstra, L. (2017) Measuring and monitoring regional competitiveness in the European Union. In Huggins, R. and Thompson P. (Eds.): Handbook of Regions and Competitiveness - Contemporary Theories and Perspectives on Economic Development, Edward Elgar Publishing.

Annoni, P., Dijkstra, L., Gargano, N. (2017) *The EU Regional Competitiveness Index 2016*. European Union Regional Policy Working Papers, no. 02/2017. DOI: 10.1787/9789264266490

Annoni, P., Catalina Rubianes, A. (2016) Tree-based approaches for understanding growth patterns in the European regions. REGION Vol. 3, No. 2: http://dx.doi.org/10.18335/region.v3i2.115

Annoni, P. and Kozovska, K. (2010), E*U Regional Competitiveness Index 2010*, EUR 24346, Luxembourg: Publications Office of the European Union.

Araujo, L., Saltelli, A., Schnepf, S.V. (2017) Do PISA data justify PISA-based education policy?, *International Journal of Comparative Education and Development*, 19(1), 20-34.

Box, G.E.P. and Cox, D.R., An analysis of transformations, Journal of the Royal Statistical Society, Series B, 1964, 26, 211-252.

DG ECFIN (2012), *Scoreboard for the surveillance of macroeconomic imbalances*. Technical Report 92, European Economy Occasional Papers.

Dijkstra, L., Poelman, H., Ackermans, L. (2019) Road transport performance. European Union Regional Policy Working Papers, n. 01/2019. DOI:10.2776/046835.

Dijkstra, L. and Poelman, H. (2012), *Cities in Europe: the new OECD-EC definition*. DG Regional Policy Working papers WP01/2012.

European Commission (2019) *European Economic Forecast: Spring 2019*. DG-ECFIN Institutional Paper 102, Luxembourg: Publications Office of the European Union.

Fernandez-Cano, A. (2016) A Methodological Critique of the PISA Evaluations. RELIEVE, 22(1), 1-16.

Hollanders, H., Es-Sadki, N. (2017) Regional Innovation Scoreboard 2017. European Union.

Gardiner, B., Martin, R. and Tyler, P. (2004), Competitiveness, productivity and economic growth across the European Regions. *Regional Studies*, 38 (9), 1045-67.

Goldstein, H. 2004. International comparisons of student attainment: some issues arising from the PISA study. *Assessment in Education*, 11(3), 319-330.

Meyer-Stamer, J. (2008), *Systematic competitiveness and local economic development Discussion Paper*, Duisberg, Germany: Mesopartner.

Morrison, D.F. (2005), *Multivariate Statistical Methods*, New York, NY, USA: McGraw-Hill.

OECD (2012), Promoting Growth in All Regions, OECD Publishing, Paris, https://doi.org/10.1787/9789264174634-en

Poelman, H., Dijkstra, L., Ackermans, L. (2019) *Rail passenger transport performance*. European Union Regional Policy Working Papers (forthcoming).

Schwab, K. (ed.) (2012), *The Global Competitiveness Report 2012-2013*, Geneva, Switzerland: World Economic Forum.

Schwab, K. and Porter, M.E. (2007), The Global Competitiveness Report 2007-2008, Geneva, Switzerland: World Economic Forum.

Schwab, K. and Sala-i-Martin, X. (2017), *The Global Competitiveness Report 2017-2018*, Geneva, Switzerland: World Economic Forum.

Solow, R.M. (1956) A Contribution to the Theory of Economic Growth, *The Quarterly Journal of Economics*, 70 (1): 65-94.

APPENDIX

TABLE A.1: Indicators included in RCI 2019

Pillar name	Indicators	Source	Geographical level	Unit of measurement and description	Reference year
Institutions regional	Corruption	Quality of Government Index by the Quality of Government Institute (University of Gothenburg)*	*NUTS0: IE, LT NUTS1: BE, DE, EL, SE, UK NUTS2 all the other countries (2013 rev)*	z-scores (the higher the better)	2017
Institutions regional	Quality and accountability	Quality of Government Index by the Quality of Government Institute (University of Gothenburg)*	*NUTS0: IE, LT	z-scores (the higher the better)	2017
Institutions regional	Impartiality	Quality of Government Index by the Quality of Government Institute (University of Gothenburg)*	*NUTS0: IE, LT	z-scores (the higher the better)	2017
Institutions national	There is corruption in the national public institutions in (OUR COUNTRY)	Special Eurobarometer 470	country	Survey data - % of respondents who agree	2018
Institutions national	There is corruption in the local or regional public institutions in (OUR COUNTRY)	Special Eurobarometer 470	country	Survey data - % of respondents who agree	2018
Institutions national	Voice and accountability	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Political stability	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Government effectiveness	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Regulatory quality	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Rule of law	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Control of corruption	Worldbank Worldwide Governance Indicators	country	Score ranging from -2.5 to 2.5 & % rank (0-100)	2017
Institutions national	Ease of doing business	Worldbank - Doing Business	country	Score ranging from 0 (worst) to 100 (best)	2019
Institutions national	Property rights	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Intellectual property protection	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Efficiency of legal framework in settling disputes	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Efficiency of legal framework in challenging regulations	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Transparency of government policymaking	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Business costs of crime and violence	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Organised crime	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Institutions national	Reliability of police services	World Economic Forum - Global Competitiveness Index	country	1-7 (best)	2017
Macroeconomic stability	General government deficit/surplus	Eurostat: gov_10dd_edpt1	country	% of GDP	average 2016-2018

Pillar name	Indicators	Source	Geographical level	Unit of measurement and description	Reference year
Macroeconomic stability	National savings	Eurostat: nasa_10_nf_tr, nama_10_gdp	country	% of GDP	average 2015-2017
Macroeconomic stability	Government bond yields	Eurostat: irt_lt_mcby_a	country	EMU convergence criterion bond yields	average 2016-2018
Macroeconomic stability	Government debt	Eurostat: gov_10dd_edpt1	country	% of GDP	average 2016-2018
Macroeconomic stability	Net international investment position NIIP	Eurostat: tipsii10	country	% of GDP	average 2016-2018
Infrastructure	Population accessible by road	DG REGIO	NUTS 2	Population accessible within 1h30 by road, as share of the population in a neighbourhood of 120 km radius	2016
Infrastructure	Population accessible by railway	DG REGIO	NUTS 2	Population accessible within 1h30 by rail (using optimal connections), as share of the population in a neighbourhood of 120 km radius	2014
Infrastructure	Number of passenger flights (accessible within 90' drive)	Eurostat/EuroGeographics/ National Statistical Institutes	NUTS 2	Daily no. of passenger flights	2016
Health	Road fatalities	Eurostat: tran_r_acci	NUTS 2 (2013 rev)	Number of deaths in road accidents per million inhabitants	average 2014-2016
Health	Healthy life expectancy	Eurostat demo_r_mlifexp & hlth_silc_17, DG Regio calculations	NUTS 2	Number of years of healthy life expected	average 2014-2016
Health	Infant mortality	Eurostat Regional Statistics: demo_r_minfind	NUTS 2	Number of deaths of children under 1 year of age during the year to the number of live births in that year (per 1 000 live births)	average 2015-2017
Health	Cancer disease death rate	Eurostat: hlth_cd_ysdr2	NUTS 2 (2013 rev)	Standardised cancer death rate for population under 65 (neoplasm C00-D48)	2015 (3-year average)
Health	Heart disease death rate	Eurostat: hlth_cd_ysdr2	NUTS 2 (2013 rev)	Standardised heart diseases death rate for population under 65 (diseases of the circulatory system I00-I99)	2015 (3-year average)
Health	Suicide death rate	Eurostat: hlth_cd_ysdr2	NUTS 2 (2013 rev)	Standardised death rate for suicide for population under 65 (intentional self-harm X60-X84)	2015 (3-year average)
Basic Education Country	Employer-sponsored training	Eurostat Adult Education Survey	country	Participation rate in job-related non-formal education and training sposored by the employer (12 months prior to the interview)	2016
Basic Education Country	Access to learning information	Eurostat Adult Education Survey	country	% of people with access to information on education and training (age cohort 25-64)	2016
Basic Education Country	No foreign language	Eurostat Adult Education Survey	country	Share of people who self-reported that they do not know any foreign language (age cohort 25-64)	2016
Higher education & lifelong learning	Higher education attainment	Eurostat : EDAT_LFSE_04 & LFST_R_LFSD2POP	NUTS 2	% of total population of age group	average 2015-2017
Higher education & lifelong learning	Lifelong learning	Eurostat: TRNG_LFSE_04 & LFST_R_LFSD2POP	NUTS 2	% of population aged 25-64 participating in education and training (last four weeks)	average 2015-2017
Higher education & lifelong learning	Early school leavers	Eurostat: EDAT_LFSE_16 & DEMO_R_D2JAN	NUTS 2	% of the population aged 18-24 having attained at most lower secondary school and not going further	average 2015-2017
Higher education & lifelong learning	Lower-secondary completion only	Eurostat: edat_lfse_04	NUTS 2	Percentage of people aged 25 to 64 who have successfully completed at most lower secondary education (ISCED 0-2)	average 2015-2017
Labour market efficiency	Employment rate (excluding agriculture)	Eurostat Regional Labour Force Statistics (LFS): LFST_R_LFE2EN2 & LFST_R_LFSD-2POP	NUTS 2	Persons employed aged 15-64 (excl. agriculture) as % of population same age cohort	average 2015-2017
Labour market efficiency	Long-term unemployment	Eurostat Regional Labour Force Statistics (LFS): LFST_R_LFU2LTU & LFST_R_LFP2ACT	NUTS 2	Percentage of labour force unemployed for 12 months or more	average 2015-2017
Labour market efficiency	Unemployment rate	Eurostat Regional Labour Force Statistics (LFS): LFST_R_LFU3PERS & LFST_R_LFP2ACT	NUTS 2	% of active population	average 2015-2017

Pillar name	Indicators	Source	Geographical level	Unit of measurement and description	Reference year
Labour market efficiency	Labour productivity	Eurostat and DG REGIO: nama_10r_2emhrw & NAMA_10R_2GDP	NUTS 2	GDP (ml euro pps)/hours worked (thousand) - EU-28=100	2015
Labour market efficiency	Gender balance unemployment	Eurostat and DG REGIO: LFST_R_LFU3PERS & LFST_R_LFP2ACT	NUTS 2	Distance to equilibrium: absolute value of (rate women - rate men)	average 2015-2017
Labour market efficiency	Gender balance employment	Eurostat and DG REGIO: LFST_R_LFE2EMP & LFST_R_LFSD2POP	NUTS 2	Distance to equilibrium: absolute value of (rate women - rate men)	average 2015-2017
Labour market efficiency	Female unemployment	Eurostat Regional Labour Force Statistics (LFS): LFST_R_LFU3PERS & LFST_R_LFP2ACT	NUTS 2	% of female unemployed	average 2015-2017
Labour market efficiency	NEET	Eurostat and DG REGIO: EDAT_LFSE_22 & LFST_R_LFSD2POP	NUTS 2	% of population aged 15-24 not in education, employment or training	average 2015-2017
Labour market efficiency	"Involuntary part-time /temporary employment»	«Eurostat Regional Labour Force Statistics (LFS) (ad-hoc extraction)»	NUTS 2	Share of population aged 20-64 in involuntary part-time or temporary job	average 2015-2017
Market size	Disposable income per capita	Eurostat: nama_10r_2hhinc & nama_10r_3popgdp	NUTS 2 (2013 rev)	Net adjusted disposable household income in PPCS per capita (index EU-28=100)	2014
Market size	Potential market size expressed in GDP	Eurostat, DG Regio estimates	NUTS 2 (2013 rev)	Index GDP (pps) EU-28=100 - EU-28 average computed as population weighted average of the NUTS2 values	2016
Market size	Potential market size expressed in population	Eurostat, DG Regio estimates	NUTS 2 (2013 rev)	Index population EU-28=100	2018
Technological readiness regional	Households with access to broadband	Eurostat Regional Information Statistics: isoc_r_broad_h	NUTS 2	% of total households	2018
Technological readiness regional	Individuals buying over internet	Eurostat Regional Information Statistics: isoc_r_blt12_i	NUTS 2	% of individuals	2018
Technological readiness regional	Household access to internet	Eurostat Regional Information Statistics: isoc_r_iacc_h	NUTS 2	% of total households	2018
Technological readiness national	Availability of latest technologies	World Economic Forum Global Competitiveness Index	country	1-7 (best)	2017
Technological readiness national	Firm-level technology absorption	World Economic Forum Global Competitiveness Index	country	1-7 (best)	2017
Technological readiness national	FDI and technology transfer	World Economic Forum Global Competitiveness Index	country	1-7 (best)	2017
Technological readiness national	Enterprises having purchased online (at least 1%)	Eurostat Community Survey on ICT usage and e-commerce: tin00112	country	% of enterprises with at least 10 persons employed in the given NACE sectors, by size class. NACE Rev 2 since 2009	average 2016-2018
Technological readiness national	Enterprises having received orders online (at least 1%)	Eurostat Community Survey on ICT usage and e-commerce: tin00111	country	% of enterprises with at least 10 persons employed in the given NACE sectors, by size class. NACE Rev 2 since 2009	average 2016-2018
Technological readiness national	Enterprises with fixed broadband access	Eurostat Community Survey on ICT usage and e-commerce: tin00090	country	% of enterprises with at least 10 persons employed in the given NACE sectors. NACE Rev 2 since 2009	average 2015-2016
Business sophistication	Employment (K-N sectors)	Eurostat Regional Statistics: ESTAT_NAMA_10R_3GVA	NUTS 2 (2013 rev)	Employment in the "Financial and insurance activities; real estate activities; professional, scientific and technical activities; administrative and support service activities" sectors (K-N) as % of total employment	average 2014-2016
Business sophistication	GVA (K-N sectors)	Eurostat Regional Statistics: ESTAT_NAMA_10R_3GVA	NUTS 2 (2013 rev)	GVA in the "Financial and insurance activities; real estate activities; professional, scientific and technical activities; administrative and support service activities" sectors (K-N) as % of total GVA	average 2014-2016

Pillar name	Indicators	Source	Geographical level	Unit of measurement and description	Reference year
Business sophistication	Innovative SMEs collaborating with others	Regional Innovation Scoreboard, DG Grow - Based on the Community Innovation Survey	"NUTS 2 (2013 rev) NUTS 1 level: AT, BE, BG, FR, UK Not available: EE, CY, MT, LT, LV, LU»	SMEs with innovation cooperation activities as share of total number of SMEs	2017
Business sophistication	Marketing or organisational innovators	Regional Innovation Scoreboard, DG Grow - based on the Community Innovation Survey	"NUTS 2 (2013 rev) NUTS 1 level: AT, BE, BG, FR, UK Not available: EE, CY, MT, LT, LV, LU»	SMEs introducing marketing or organisational innovation as share of total number of SMEs	2017
Innovation	Core Creativity Class employment	Eurostat (LFS): ad-hoc extraction	NUTS 2	% of population aged 15-64	average 2015-2017
Innovation	Knowledge workers	Eurostat (LFS): ad-hoc extraction	NUTS 2	% of total employment	average 2015-2017
Innovation	Scientific publications	Centre for Science and Technology Studies (CWTS) - Leiden University - based on in-house version of Web of Science	"NUTS 2 (2013 rev) NUTS 1 level for AT, BE, BG, FR and UK»	Number of publications per million inhabitants	average 2015-2017
Innovation	Total intramural R&D expenditure	Eurostat Regional Science and Technology Statistics	NUTS 2 (2013 rev)	% of GDP	2015
Innovation	Human Resources in Science and Technology (HRST)	Eurostat Regional Science and Technology Statistics	NUTS 2	% of active population	average 2015-2017
Innovation	Employment in technology and knowledge-intensive	Eurostat Regional Science and Technology Statistics	NUTS 2	% of total employment	average 2015-2017
Innovation	Exports in medium-high/high-tech manufacturing	Regional Innovation Scoreboard, DG Grow - based on the Community Innovation Survey	"NUTS 2 (2013 rev) NUTS 1 level: AT, BE, BG, FR, UK Not available: EE, CY, MT, LT, LV, LU»	Exports in medium-/high-technology products as a share of total product exports: measures the technological competitiveness of the EU, the ability to commercialise the results of research and development (R&D)	2017
Innovation	Sales of new-to-market and new-to-firms innovation	Regional Innovation Scoreboard, DG Grow - based on the Community Innovation Survey	"NUTS 2 (2013 rev) NUTS 1 level: AT, BE, BG, FR, UK Not available: EE, CY, MT, LT, LV, LU»	Sales of new-to-market and new-to-firm innovations as % of turnover: it captures both the creation of state-of-the-art technologies (new-to-market products) and the diffusion of these technologies (new-to-firm products)	2017

Number of indicators included: **74**
Number of NEW indicators eventually included: **8**

* Charron, N., Lapuente, V., Annoni, P. (2019) Measuring quality of government in EU regions across space and time. Papers in Regional Science: 1-29

TABLE A.2: Time comparison of RCI scores since 2010

Country code	Country name	NUTS CODE 2016	Merged regions code	Capital region	NUTS NAME	2019 vs 2016	2016 vs 2013	2013 vs 2010	2019 vs 2010
AT	Austria	AT			Austria	–	–	–	▲
AT	Austria	AT11			Burgenland	▲	–	–	▲
AT	Austria	AT12	AT00	yes	Wien and its commuting area	–	–	–	▲
AT	Austria	AT13	AT00	yes	Wien and its commuting area	–	–	–	▲
AT	Austria	AT21			Kärnten	–	–	–	▲
AT	Austria	AT22			Steiermark	–	–	–	–
AT	Austria	AT31			Oberösterreich	▲	–	▼	–
AT	Austria	AT32			Salzburg	–	–	–	–
AT	Austria	AT33			Tirol	–	–	–	–
AT	Austria	AT34			Vorarlberg	–	–	–	▲
BE	Belgium	BE			Belgium	–	–	▲	–
BE	Belgium	BE10	BE00	yes	Rég. de Bruxelles-Cap. and its commuting area	–	▼	▲	–
BE	Belgium	BE21			Antwerpen	–	–	–	–
BE	Belgium	BE22			Limburg	–	–	▲	–
BE	Belgium	BE23			Oost-Vlaanderen	–	–	▲	–
BE	Belgium	BE24	BE00	yes	Rég. de Bruxelles-Cap. and its commuting area	–	▼	▲	–
BE	Belgium	BE25			West-Vlaanderen	–	–	–	–
BE	Belgium	BE31	BE00	yes	Rég. de Bruxelles-Cap. and its commuting area	–	▼	▲	–
BE	Belgium	BE32			Hainaut	–	▼	▲	–
BE	Belgium	BE33			Liège	–	▼	▲	–
BE	Belgium	BE34			Luxembourg	–	–	▲	▲
BE	Belgium	BE35			Namur	–	▼	▲	▲
BG	Bulgaria	BG			Bulgaria	–	–	–	–
BG	Bulgaria	BG31			Severozapaden	–	–	–	–
BG	Bulgaria	BG32			Severen tsentralen	▲	–	–	▲
BG	Bulgaria	BG33			Severoiztochen	–	▲	–	▲
BG	Bulgaria	BG34			Yugoiztochen	–	–	–	–
BG	Bulgaria	BG41		yes	Yugozapaden	▲	–	–	–
BG	Bulgaria	BG42			Yuzhen tsentralen	▲	–	▼	–
CY	Kýpros	CY00			Kýpros	▲	▼	–	–
CZ	Czechia	CZ			Czechia	▲	–	–	▲
CZ	Czechia	CZ01	CZ00	yes	Praha and its commuting area	▲	–	–	▲
CZ	Czechia	CZ02	CZ00	yes	Praha and its commuting area	▲	–	–	▲
CZ	Czechia	CZ03			Jihozápad	▲	–	–	–
CZ	Czechia	CZ04			Severozápad	▲	–	–	–
CZ	Czechia	CZ05			Severovýchod	–	–	–	▲
CZ	Czechia	CZ06			Jihovýchod	▲	▲	–	▲
CZ	Czechia	CZ07			Střední Morava	▲	–	–	▲
CZ	Czechia	CZ08			Moravskoslezsko	▲	–	–	▲
DE	Germany	DE			Germany	–	–	▲	▲
DE	Germany	DE11			Stuttgart	–	–	▲	–
DE	Germany	DE12			Karlsruhe	–	–	▲	–
DE	Germany	DE13			Freiburg	–	–	–	–
DE	Germany	DE14			Tübingen	–	–	▲	▲
DE	Germany	DE21			Oberbayern	–	–	–	–
DE	Germany	DE22			Niederbayern	–	–	▲	▲
DE	Germany	DE23			Oberpfalz	–	–	–	–
DE	Germany	DE24			Oberfranken	–	–	▲	▲
DE	Germany	DE25			Mittelfranken	–	–	▲	–
DE	Germany	DE26			Unterfranken	–	–	▲	▲
DE	Germany	DE27			Schwaben	–	–	▲	▲
DE	Germany	DE30	DE00	yes	Berlin and its commuting area	–	–	▲	▲
DE	Germany	DE40	DE00	yes	Berlin and its commuting area	–	–	▲	▲
DE	Germany	DE50			Bremen	–	▼	▲	▲
DE	Germany	DE60			Hamburg	–	▼	▲	–
DE	Germany	DE71			Darmstadt	–	▼	▲	–
DE	Germany	DE72			Gießen	–	–	▲	▲
DE	Germany	DE73			Kassel	–	–	▲	▲
DE	Germany	DE80			Mecklenburg-Vorpommern	–	–	–	▲
DE	Germany	DE91			Braunschweig	–	–	▲	▲
DE	Germany	DE92			Hannover	–	–	▲	–
DE	Germany	DE93			Lüneburg	–	–	▲	▲
DE	Germany	DE94			Weser-Ems	–	–	▲	▲
DE	Germany	DEA1			Düsseldorf	–	–	▲	–
DE	Germany	DEA2			Köln	–	–	▲	–
DE	Germany	DEA3			Münster	–	–	▲	–
DE	Germany	DEA4			Detmold	–	–	▲	–
DE	Germany	DEA5			Arnsberg	–	–	▲	–
DE	Germany	DEB1			Koblenz	–	–	▲	▲
DE	Germany	DEB2			Trier	–	▼	▲	▲
DE	Germany	DEB3			Rheinhessen-Pfalz	–	–	▲	▲
DE	Germany	DEC0			Saarland	–	–	▲	▲
DE	Germany	DED2			Dresden	–	–	▲	▲
DE	Germany	DED4			Chemnitz	–	–	▲	▲
DE	Germany	DED5			Leipzig	–	–	▲	▲
DE	Germany	DEE0			Sachsen-Anhalt	–	–	▲	▲
DE	Germany	DEF0			Schleswig-Holstein	–	–	–	▲
DE	Germany	DEG0			Thüringen	–	–	▲	▲

Country code	Country name	NUTS CODE 2016	Merged regions code	Capital region	NUTS NAME	2019 vs 2016	2016 vs 2013	2013 vs 2010	2019 vs 2010
DK	Denmark	DK			Denmark	–	–	▼	–
DK	Denmark	DK01		yes	Hovedstaden	–	–	–	–
DK	Denmark	DK02			Sjælland	–	–	–	–
DK	Denmark	DK03			Syddanmark	–	–	▼	▼
DK	Denmark	DK04			Midtjylland	–	–	▼	–
DK	Denmark	DK05			Nordjylland	–	–	–	▼
EE	Eesti	EE00			Eesti	–	–	–	–
EL	Greece	EL			Greece	–	–	▼	▼
EL	Greece	EL30		yes	Attiki	▲	▼	▼	▼
EL	Greece	EL41			Voreio Aigaio	▼	–	▲	–
EL	Greece	EL42			Notio Aigaio	–	–	–	–
EL	Greece	EL43			Kriti	–	–	–	–
EL	Greece	EL51			Anatoliki Makedonia, Thraki	–	–	▼	▼
EL	Greece	EL52			Kentriki Makedonia	–	–	▼	▼
EL	Greece	EL53			Dytiki Makedonia	–	–	▼	▼
EL	Greece	EL54			Ipeiros	–	–	–	–
EL	Greece	EL61			Thessalia	–	–	▼	▼
EL	Greece	EL62			Ionia Nisia	–	–	▲	–
EL	Greece	EL63			Dytiki Ellada	–	–	▼	▼
EL	Greece	EL64			Sterea Ellada	–	–	▼	▼
EL	Greece	EL65			Peloponnisos	–	–	▼	▼
ES	Spain	ES			Spain	–	–	–	▼
ES	Spain	ES11			Galicia	–	–	–	–
ES	Spain	ES12			Principado de Asturias	–	–	–	–
ES	Spain	ES13			Cantabria	–	–	▲	–
ES	Spain	ES21			País Vasco	–	–	–	–
ES	Spain	ES22			Comunidad Foral de Navarra	–	–	–	–
ES	Spain	ES23			La Rioja	–	–	▲	–
ES	Spain	ES24			Aragón	–	–	–	–
ES	Spain	ES30		yes	Comunidad de Madrid	–	–	–	–
ES	Spain	ES41			Castilla y León	–	–	–	–
ES	Spain	ES42			Castilla-La Mancha	–	–	–	▼
ES	Spain	ES43			Extremadura	▼	–	–	▼
ES	Spain	ES51			Cataluña	–	–	▼	▼
ES	Spain	ES52			Comunidad Valenciana	–	–	–	▼
ES	Spain	ES53			Illes Balears	–	–	–	–
ES	Spain	ES61			Andalucía	–	–	▼	▼
ES	Spain	ES62			Región de Murcia	–	▼	–	▼
ES	Spain	ES63			Ciudad Autónoma de Ceuta	–	–	▲	▲
ES	Spain	ES64			Ciudad Autónoma de Melilla	▼	–	▲	▲
ES	Spain	ES70			Canarias	–	–	–	–
FI	Finland	FI			Finland	▼	–	–	▼
FI	Finland	FI19			Länsi-Suomi	▼	–	–	▼
FI	Finland	FI1B		yes	Helsinki-Uusimaa	–			
FI	Finland	FI1C			Etelä-Suomi	–			
FI	Finland	FI1D			Pohjois- ja Itä-Suomi	▼	–	–	▼
FI	Finland	FI20			Åland	▼	–	▲	–
FR	France	FR			France	–	–	–	–
FR	France	FR10		yes	Île de France	–	–	–	▼
FR	France	FRB0			Centre - Val de Loire	–	▲	–	–
FR	France	FRC1			Bourgogne	–	▲	–	–
FR	France	FRC2			Franche-Comté	–	–	–	–
FR	France	FRD1			Basse-Normandie	–	▲	–	–
FR	France	FRD2			Haute-Normandie	–	–	–	–
FR	France	FRE1			Nord-Pas de Calais	–	–	–	–
FR	France	FRE2			Picardie	–	–	–	–
FR	France	FRF1			Alsace	–	–	–	–
FR	France	FRF2			Champagne-Ardenne	▼	▲	–	–
FR	France	FRF3			Lorraine	–	–	–	–
FR	France	FRG0			Pays de la Loire	–	▲	–	–
FR	France	FRH0			Bretagne	–	▲	–	–
FR	France	FRI1			Aquitaine	–	–	–	▲
FR	France	FRI2			Limousin	–	–	–	▲
FR	France	FRI3			Poitou-Charentes	–	–	–	–
FR	France	FRJ1			Languedoc-Roussillon	–	▲	–	–
FR	France	FRJ2			Midi-Pyrénées	–	▲	–	–
FR	France	FRK1			Auvergne	–	▲	–	–
FR	France	FRK2			Rhône-Alpes	–	▲	▼	–
FR	France	FRL0			Provence-Alpes-Côte d'Azur	–	–	–	–
FR	France	FRM0			Corse	–	–	▲	–
FR	France	FRY1			Guadeloupe	–	–	▲	▲
FR	France	FRY2			Martinique	▼	▲	▲	▲
FR	France	FRY3			Guyane	–	▼	▲	▲
FR	France	FRY4			La Réunion	–	▲	–	▲
FR	France	FRY5			Mayotte				

Country code	Country name	NUTS CODE 2016	Merged regions code	Capital region	NUTS NAME	2019 vs 2016	2016 vs 2013	2013 vs 2010	2019 vs 2010
HR	Croatia	HR			Croatia	–	–		
HR	Croatia	HR03			Jadranska Hrvatska	–	–		
HR	Croatia	HR04		yes	Kontinentalna Hrvatska	–	–		
HU	Hungary	HU			Hungary	–	–	–	–
HU	Hungary	HU10	HU11& HU12	yes	Közép-Magyarország	–	–	–	–
HU	Hungary	HU21	Merged		Közép-Dunántúl	–	–	–	–
HU	Hungary	HU22			Nyugat-Dunántúl	–	–	–	–
HU	Hungary	HU23			Dél-Dunántúl	–	–	–	–
HU	Hungary	HU31			Észak-Magyarország	–	▼	–	–
HU	Hungary	HU32			Észak-Alföld	–	–	–	–
HU	Hungary	HU33			Dél-Alföld	–	–	–	–
IE	Ireland	IE			Ireland	–	–	▼	▼
IE	Ireland	IE04			Northern and Western				
IE	Ireland	IE05			Southern				
IE	Ireland	IE06		yes	Eastern and Midland				
IT	Italy	IT			Italy	–	–	–	▼
IT	Italy	ITC1			Piemonte	–	–	–	▼
IT	Italy	ITC2			Valle d'Aosta/Vallée d'Aoste	–	–	▲	–
IT	Italy	ITC3			Liguria	–	–	–	–
IT	Italy	ITC4			Lombardia	–	–	▼	▼
IT	Italy	ITF1			Abruzzo	–	–	–	▼
IT	Italy	ITF2			Molise	–	–	–	–
IT	Italy	ITF3			Campania	–	–	▼	▼
IT	Italy	ITF4			Puglia	–	–	▼	▼
IT	Italy	ITF5			Basilicata	–	–	–	–
IT	Italy	ITF6			Calabria	–	–	–	▼
IT	Italy	ITG1			Sicilia	–	–	▼	▼
IT	Italy	ITG2			Sardegna	–	–	–	–
IT	Italy	ITH1			Prov. Autonoma di Bolzano/Bozen	–	–	–	–
IT	Italy	ITH2			Provincia Autonoma di Trento	–	–	▲	▲
IT	Italy	ITH3			Veneto	–	–	▼	▼
IT	Italy	ITH4			Friuli-Venezia Giulia	–	–	–	–
IT	Italy	ITH5			Emilia-Romagna	–	–	–	▼
IT	Italy	ITI1			Toscana	–	–	–	▼
IT	Italy	ITI2			Umbria	–	–	–	–
IT	Italy	ITI3			Marche	–	–	–	–
IT	Italy	ITI4		yes	Lazio	–	–	–	▼
LT	Lithuania	LT			Lithuania	▲	▲	▼	–
LT	Lithuania	LT01		yes	Sostinės regionas				
LT	Lithuania	LT02			Vidurio ir vakarų Lietuvos regionas		–	–	
LU	Luxembourg	LU00			Luxembourg	–	–	▲	▲
LV	Latvija	LV00			Latvija	–	▲	–	–
MT	Malta	MT00			Malta	–	–	▲	▲
NL	Netherlands	NL			Netherlands	–	▼	–	▼
NL	Netherlands	NL11			Groningen	–	▼	–	–
NL	Netherlands	NL12			Friesland	–	–	–	–
NL	Netherlands	NL13			Drenthe	–	–	▲	–
NL	Netherlands	NL21			Overijssel	–	–	–	–
NL	Netherlands	NL22			Gelderland	–	▼	–	–
NL	Netherlands	NL23	NL00	yes	Flevoland & Noord-Holland	–	▼	–	–
NL	Netherlands	NL31			Utrecht	–	▼	–	▼
NL	Netherlands	NL32	NL00	yes	Flevoland & Noord-Holland	–	▼	–	–
NL	Netherlands	NL33			Zuid-Holland	–	▼	–	▼
NL	Netherlands	NL34			Zeeland	–	▼	–	–
NL	Netherlands	NL41			Noord-Brabant	–	▼	–	▼
NL	Netherlands	NL42			Limburg	–	▼	–	–
PL	Poland	PL			Poland	–	–	–	–
PL	Poland	PL21			Małopolskie	–	–	–	–
PL	Poland	PL22			Śląskie	–	–	▼	–
PL	Poland	PL41			Wielkopolskie	–	▲	▼	–
PL	Poland	PL42			Zachodniopomorskie	–	–	–	–
PL	Poland	PL43			Lubuskie	–	–	–	–
PL	Poland	PL51			Dolnośląskie	–	–	–	–
PL	Poland	PL52			Opolskie	–	–	–	–
PL	Poland	PL61			Kujawsko-pomorskie	–	–	–	–
PL	Poland	PL62			Warmińsko-mazurskie	–	▲	–	–
PL	Poland	PL63			Pomorskie	–	–	–	–
PL	Poland	PL71			Łódzkie	–	–	–	–
PL	Poland	PL72			Świętokrzyskie	–	▲	–	–
PL	Poland	PL81			Lubelskie	–	–	–	–
PL	Poland	PL82			Podkarpackie	–	–	–	–
PL	Poland	PL84			Podlaskie	–	–	–	–
PL	Poland	PL91&PL92	Merged macro region		Warszawski stołeczny and Mazowiecki regionalny	–	– –	– –	–
PL	Poland	PL91		yes	Warszawski stołeczny				
PL	Poland	PL92			Mazowiecki regionalny				

Country code	Country name	NUTS CODE 2016	Merged regions code	Capital region	NUTS NAME	2019 vs 2016	2016 vs 2013	2013 vs 2010	2019 vs 2010
PT	Portugal	PT			Portugal	–	–	–	–
PT	Portugal	PT11			Norte	–	–	–	–
PT	Portugal	PT15			Algarve	–	–	▲	–
PT	Portugal	PT16			Centro	–	–	–	–
PT	Portugal	PT17		yes	Área Metr. de Lisboa	–	–	–	–
PT	Portugal	PT18			Alentejo	–	–	–	–
PT	Portugal	PT20			Região Autónoma dos Açores	▼	▼	▲	▲
PT	Portugal	PT30			Região Autónoma da Madeira	▼	–	▲	▲
RO	Romania	RO			Romania	–	–	–	–
RO	Romania	RO11			Nord-Vest	–	–	–	–
RO	Romania	RO12			Centru	–	–	–	–
RO	Romania	RO21			Nord-Est	–	–	–	–
RO	Romania	RO22			Sud-Est	–	–	–	–
RO	Romania	RO31			Sud - Muntenia	–	–	–	–
RO	Romania	RO32		yes	București - Ilfov	▲	–	–	▲
RO	Romania	RO41			Sud-Vest Oltenia	–	–	–	–
RO	Romania	RO42			Vest	–	–	–	–
SE	Sweden	SE			Sweden	–	–	–	–
SE	Sweden	SE11		yes	Stockholm	–	–	–	–
SE	Sweden	SE12			Östra Mellansverige	–	–	–	–
SE	Sweden	SE21			Småland med öarna	–	▲	–	–
SE	Sweden	SE22			Sydsverige	–	–	–	–
SE	Sweden	SE23			Västsverige	–	–	–	–
SE	Sweden	SE31			Norra Mellansverige	–	–	–	–
SE	Sweden	SE32			Mellersta Norrland	▼	▲	–	–
SE	Sweden	SE33			Övre Norrland	▼	▲	–	–
SI	Slovenia	SI			Slovenia	–	–	▼	–
SI	Slovenia	SI03			Vzhodna Slovenija	–	–	▼	–
SI	Slovenia	SI04		yes	Zahodna Slovenija	–	–	–	–
SK	Slovakia	SK			Slovakia	▲	–	–	–
SK	Slovakia	SK01		yes	Bratislavský kraj	▲	–	–	–
SK	Slovakia	SK02			Západné Slovensko	▲	–	▼	–
SK	Slovakia	SK03			Stredné Slovensko	▲	–	–	▲
SK	Slovakia	SK04			Východné Slovensko	–	–	–	–
UK	United Kingdom	UK			United Kingdom	–	–	–	–
UK	United Kingdom	UKC1			Tees Valley and Durham	–	–	–	–
UK	United Kingdom	UKC2			Northumberland and Tyne and Wear	–	–	–	–
UK	United Kingdom	UKD1			Cumbria	–	▲	–	▲
UK	United Kingdom	UKD3			Greater Manchester	–	–	–	–
UK	United Kingdom	UKD4			Lancashire	–	–	–	–
UK	United Kingdom	UKD6			Cheshire	–	▲	–	▲
UK	United Kingdom	UKD7			Merseyside	–	▲	–	▲
UK	United Kingdom	UKE1			East Yorkshire and Northern Lincolnshire	–	–	–	–
UK	United Kingdom	UKE2			North Yorkshire	–	–	–	–
UK	United Kingdom	UKE3			South Yorkshire	–	–	–	▲
UK	United Kingdom	UKE4			West Yorkshire	–	–	–	–
UK	United Kingdom	UKF1			Derbyshire and Nottinghamshire	–	–	–	–
UK	United Kingdom	UKF2			Leicestershire, Rutland and Northamptonshire	–	–	–	–
UK	United Kingdom	UKF3			Lincolnshire	–	–	▲	▲
UK	United Kingdom	UKG1			Herefordshire, Worcestershire and Warwickshire	–	–	–	–
UK	United Kingdom	UKG2			Shropshire and Staffordshire	–	–	–	–
UK	United Kingdom	UKG3			West Midlands	–	–	–	–
UK	United Kingdom	UKH1			East Anglia	–	–	–	–
UK	United Kingdom	UKH2	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKH3	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKI3	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKI4	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKI5	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKI6	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKI7	UK00	yes	London and its commuting area	▼	–	▲	–
UK	United Kingdom	UKJ1			Berkshire, Buckinghamshire and Oxfordshire	–	–	▲	–
UK	United Kingdom	UKJ2			Surrey, East and West Sussex	–	–	▲	▲
UK	United Kingdom	UKJ3			Hampshire and Isle of Wight	–	–	–	–
UK	United Kingdom	UKJ4			Kent	–	–	▲	▲
UK	United Kingdom	UKK1			Gloucestershire, Wiltshire and Bristol/Bath area	–	–	–	–
UK	United Kingdom	UKK2			Dorset and Somerset	–	–	–	–
UK	United Kingdom	UKK3			Cornwall and Isles of Scilly	–	–	▲	▲
UK	United Kingdom	UKK4			Devon	–	–	–	–
UK	United Kingdom	UKL1			West Wales and The Valleys	–	–	–	–
UK	United Kingdom	UKL2			East Wales	–	–	–	–
UK	United Kingdom	UKM5			North Eastern Scotland	–	–	–	–
UK	United Kingdom	UKM6			Highlands and Islands	▼	▲	–	–
UK	United Kingdom	UKM7			Eastern Scotland	–	–	–	–
UK	United Kingdom	UKM8			West Central Scotland				
UK	United Kingdom	UKM9			Southern Scotland				
UK	United Kingdom	UKN0			Northern Ireland	–	–	▼	–

NOTE 1: Due to subsequent NUTS revisions (https://ec.europa.eu/eurostat/web/nuts/background) there are breaks in the time series for some or all regions in: Finland, France (Mayotte), Ireland, Lithuania, United Kingdom (West-Central and Souther Scotland).

NOTE 2: For the comparison of commuting areas around capital regions, their aggregate score weighted by the regional population is used for all the RCI editions.

NOTE 3: The regions Niederösterreich and Wien are merged into a single urban area. The regions Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest, Prov. Vlaams-Brabant and Pov. Brabant Wallon are merged into a single urban area. The regions Praha and Střední Čechy are merged into a single urban area. The regions Berlin, Brandenburg - Nordost and Brandenburg - Südwest are merged into a single urban area. The regions Buda and Pest are considered as a single region capital region including its commuting area (Közép-Magyarország = HU10). The regions Flevoland and Noord-Holland, are merged into a single urban area. The regions Inner London (West and East), Outer London (East and North East, South, West and North West), Bedfordshire, Hertfordshire and Essex, are merged into a single urban area.

TABLE A.3: Indicators transformed to correct for outliers

Pillar	Indicator	Indicator description	Parameter of the Box-Cox transformation
Infrastructure	Railway accessibility	Share of population in a 120 km radius accessible by rail within 1h30'	$\lambda = 0.5$
Infrastructure	Passenger flights	Daily number of passenger flights	$\lambda = 0.5$
Labour market efficiency	Long-term unemployment	% of labour force unemployed for 12 months or more	$\lambda = 0.5$
Labour market efficiency	Gender balance unemployment	distance to equilibrium: absolute value of (rate women - rate men)	$\lambda = 0.5$
Labour market efficiency	Female unemployment	% of females unemployed	$\lambda = 0.5$
Market size	Potential market size GDP	Potential market size expressed in GDP	$\lambda = -0.1$
Market size	Potential market size POP	Potential market size expressed in population	$\lambda = -0.1$
Innovation	Scientific publications	Publications per million inhabitants	$\lambda = 0.5$
Innovation	Total intramural R&D expenditure	Expenditure as a % of GDP	$\lambda = 0.5$

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