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JRC Statistical audit of the ICT Regulatory Tracker

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Contents

Abstract

The ICT Regulatory Tracker, developed by International Telecommunication Union, is an evidence-based tool that helps decision-makers and regulators monitor the rapid evolution of ICT regulation. It also helps identify the gaps in existing regulatory frameworks, making the case for further regulatory reform.

The statistical assessment of the ICT Regulatory Tracker presented herein delves into two main issues. First, we analyse the statistical coherence of the conceptual framework, and second, the impact of key modelling assumptions on the final country scores and ranks. In addition, we discuss briefly some outstanding trends in the scores of regions and countries over the period 2007-2018.

All in all, the results of the statistical assessment suggest that the Tracker is a conceptually sound, statistically coherent and robust monitoring tool. Notwithstanding, throughout the report we also present and discuss some alternative approaches for calculating the final scores and presenting the results. These suggestions might be taken on board by the developers of the Tracker in future releases of the tool.

1   Introduction

The ICT Regulatory Tracker is an evidence-based tool to help decision-makers and regulators make sense of the rapid evolution of ICT regulation. The Tracker is developed by the International Telecommunication Union (ITU), which is the United Nations specialized agency for information and communication technologies. Using both quantitative and qualitative data, the Tracker makes possible to pinpoint the changes taking place in the ICT regulatory environment, enabling benchmarking and the identification of trends in ICT legal and regulatory frameworks. It likewise helps identify the gaps in existing regulatory frameworks, making the case for further regulatory reform towards achieving a vibrant and inclusive ICT sector.

In May 2018, the developers of the Tracker invited the European Commission's Competence Centre on Composite Indicators and Scoreboards at the Joint Research Centre to undertake a statistical assessment of the tool and to make suggestions for improvement. Since then, the ITU team and the JRC have engaged in an iterative process to discuss potential refinements to the monitoring framework.

The third edition of the Tracker has been launched in 2019. The statistical assessment of the current edition of the ICT Regulatory Tracker presented herein is based on two main issues: the statistical soundness of its conceptual framework, and the impact of key modelling assumptions on the country results. In this report we also include a brief analysis of outstanding trends in regions and countries' scores over the period 2007-2018.

In the following sections, we will present the different stages of the statistical assessment carried out for the ICT Regulatory Tracker. All in all, the results of the analysis suggest that the Tracker is a conceptually sound, statistically coherent and robust monitoring tool. Notwithstanding, some potential alternatives to the current methodological choices have also been discussed in the framework and, as a result, some proposals for improvement have been laid out for the developers to consider in future editions of the Tracker.

2   Conceptual and statistical coherence

2.1   Index framework

The ICT Regulatory Tracker looks at the changes taking place in the ICT regulatory environment using both quantitative and qualitative data. The Tracker does not measure the quality, the level of implementation or the performance of regulatory frameworks in place, but records their existence and features. The Tracker is based on self-reported information collected through two surveys[1], desktop research and direct outreach to national telecom/ICT regulatory authorities.

Overall, the Tracker is composed of 50 indicators grouped into four pillars: 1) the regulatory authority (focusing on the functioning of the separate regulator), 2) regulatory mandates (who regulates what), 2) the regulatory regime (what regulation exists in major areas), and 4) the level of competition in the ICT sector main market segments. The distribution of indicators and maximum scores by pillars is presented in Table 1.

Table 1. ICT Regulatory Tracker pillars

Pillar	Name	Number of Indicators	Max Score
1	Regulatory Authority	10	20
2	Regulatory Mandates	11	22
3	Regulatory Regime	15	30
4	Competition Framework	14	28
	ICT Regulatory Tracker	**50**	**100**

Source: ITU, 2019

The overall score is the sum of the four pillar scores. Hence, every pillar contributes to the score proportionally to the number of indicators it contains. The sum of the maximum pillar scores equals 100, which is the maximum theoretical score any country could achieve. The economies are classified in different generations of regulation (from G1 to G4), which showcase progress within the same country over time and for comparing different countries. Countries with a Tracker score below 40 are considered to belong to the first generation of regulation (G1), a score between 40 and 69 to the second (G2), a score between 70 and 84 to the third (G3) and finally, a score above 85 belong to the fourth (G4).

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[1] ITU World Telecommunication Regulatory Survey and ITU Tariff Policies Survey.

2.2 Data availability and missing values

Since the first edition of the Tracker, the developers have defined the thresholds for exclusion/inclusion of countries in view of including the highest number of countries possible. Inclusion is decided on the basis of the available data while providing a reasonable depiction of the situation in a given area (corresponding to the pillars). For the 2018 edition, those thresholds have been increased to cover at least 50 per cent of data for each pillar. The ITU team is confident that such a threshold provides for a robust metric for the regulatory maturity of ICT frameworks.

As explained by the ITU developers, both in the past and in the current edition they have used "reasonable extrapolation" to fill in gaps in some cases. This is the case, for example, when a country skips an annual survey. Therefore, if in year X they reported "Yes" on having a broadband plan, skipped the survey in year X+1, and then reported "Yes" to the same question in year+2, the ITU team extrapolates "Yes" for the middle year (X+1). So in that sense, extrapolated data is treated as real data, not as an estimate. The current 2019 edition is augmented with additional data research, and some of the parameters have been enhanced. Concretely, the data points that were missing in the 2018 Tracker but are now filled in the 2019 edition are hard data based on either desk research or direct outreach. They are not extrapolated but verified by research.

Missing values which cannot be filled using extrapolation have been left intentionally blank in the data set. However, it is worth noting that, when adding up the indicators to calculate the pillar scores, those cells with missing values will be implicitly treated as if a zero value had been imputed. On a related note, the developers agree that it is probably correct to assume that missing values are equal to zero, since for example some survey respondents may prefer leaving blanks rather than stating that their country does not comply with international best practices.

As shown in Table 2, among the included economies, most of the missing values in the data set are concentrated in indicators 43, 45, 46, 47, 48, 49 and 50.

Table 2. Quantity of missing data for every indicator of the ICT Regulatory Tracker

Pillar 1: Regulatory authority			Pillar 2: Regulatory mandate			Pillar 3: Regulatory regime			Pillar 4: Competition framework		
Ind	Nr missing	% missing	Ind	Nr missing	% missing	Ind	Nr missing	% missing	Ind	Nr missing	% missing
1	0	0%	11	0	0%	22	0	0%	37	0	0%
2	0	0%	12	0	0%	23	0	0%	38	1	1%
3	0	0%	13	0	0%	24	0	0%	39	0	0%
4	0	0%	14	0	0%	25	0	0%	40	2	1%
5	0	0%	15	0	0%	26	0	0%	41	3	2%
6	0	0%	16	1	1%	27	1	1%	42	0	0%
7	0	0%	17	0	0%	28	0	0%	43	5	3%
8	0	0%	18	0	0%	29	0	0%	44	0	0%
9	0	0%	19	1	1%	30	0	0%	45	7	4%
10	0	0%	20	1	1%	31	0	0%	46	5	3%
			21	1	1%	32	1	1%	47	10	5%
						33	0	0%	48	17	9%
						34	0	0%	49	19	10%
						35	0	0%	50	24	12%
						36	0	0%			

2.3 Normalisation

The ICT Regulatory Tracker has been conceived both as a scoring tool and an analysis tool. Each indicator provides a score, and scores are added up first at pillar level and then at the overall score level. Therefore, no normalisation has been deemed necessary at indicator or pillar level.

As an alternative to improve the readability of the results, pillar scores could be normalised. For example, a min-max normalisation formula could be applied to the pillar scores. Accordingly, the raw pillar score for any given country $\tilde{x}_i$, can be scaled onto a normalised pillar score x_i by subtracting from the raw pillar the theoretical minimum score for that pillar (zero) and dividing by the difference between the theoretical maximum and the theoretical minimum value for the pillar:

$$x_{i,c} = \frac{\tilde{x}_{i,c} - \min(\tilde{x}_i)}{\max(\tilde{x}_i) - \min(\tilde{x}_i)} \times 100$$

The result of this operation is that each of the four pillars in the Tracker would now have a minimum of zero, and a maximum of 100. The main advantage of this alternative approach to building pillar scores from the underlying indicators is that it would render those pillar scores directly comparable across pillars. As we will discuss in the following sections, including a normalisation stage would also allow us to introduce more flexibility when it comes to calculating the final index scores. For instance, we could envisage

setting alternative weights for the pillars (e.g. equal weights) or even implementing not-fully compensatory aggregation formulas, such as geometric averaging. In particular, we will discuss how the same overall index can be obtained starting from the normalised pillars and assigning weights to each pillar based on their theoretical maximum scores.

2.4 Weighting and aggregation

As discussed in the previous section, we could normalize the pillar scores prior to aggregation, and then calculate the overall score as the weighted average of those normalised pillar scores. The weights to be used for this calculation would be given by the maximum theoretical scores achievable at pillar level. For example, since the maximum score for the first pillar (Regulatory authority) is 20, we would assign a weight of 20 per cent (maximum pillar score divided by maximum overall score in the Tracker) to the first pillar. Accordingly, the weights for the four pillars in the weighted average formula would be set equal to 0.20, 0.22, 0.30 and 0.28, respectively. As shown in Figure 1, the overall scores following this approach are identical to those initially calculated for the developers.[2]

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[2] Annex IV presents a table with the default pillar scores and the normalised pillar scores for each country.

Figure 1 - Comparison of the values of the default regulatory tracker with the weighted mean of the pillars
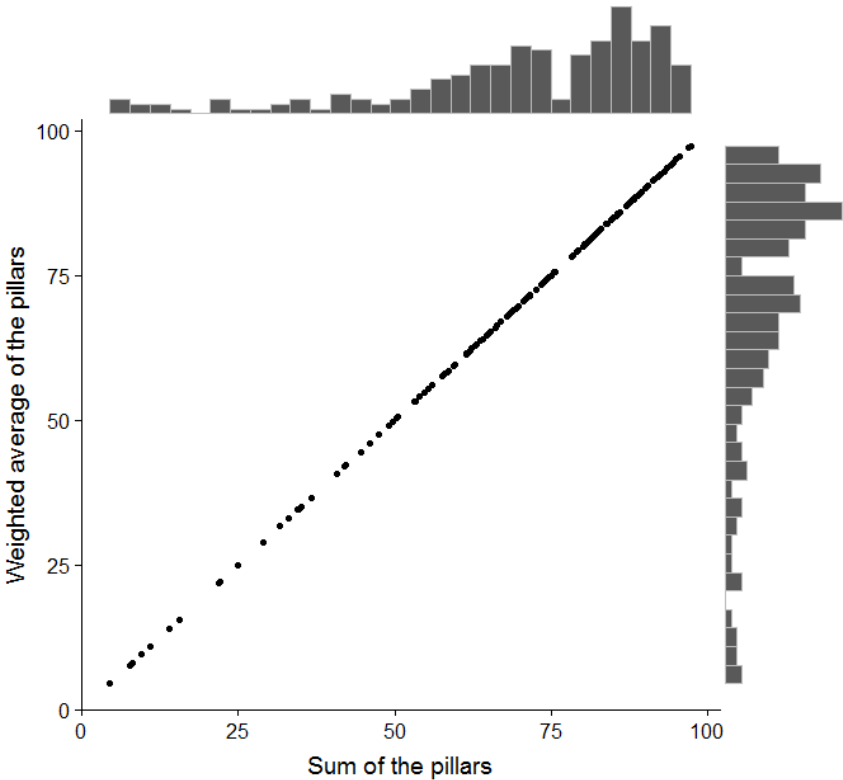
2.5 Statistical coherence

In this section we assess to what extent the conceptual framework is confirmed by statistical approaches. We use correlation analysis and Principal Component Analysis to evaluate whether the indicators fit statistically in their respective pillar and to what extent the pillars and the overall index are able to summarise the information contained in the underlying data [7].

As expected, results in Table 3 confirm that the grouping of indicators into pillars is statistically coherent, since individual indicators tend to be more correlated to their own pillar than to any other.[3] The four pillars are also strongly correlated to each other and to the overall index, which suggests that the index is well balanced in its four pillars [1]. The latter result is also confirmed by the PCA carried out at the overall index level. PCA reveals the presence of a single latent dimension (i.e. one component with eigenvalue greater than 1.0) which captures 72% of the variance in the four underlying pillars.

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[3] Annex II presents the full correlation matrix between individual indicators.

Table 3: Correlations between indicators, pillars and overall scores

	Pillar 1	Pillar 2	Pillar 3	Pillar 4	Overall
I1	0.50	0.46	0.33	0.27	0.42
I2	0.60	0.43	0.40	0.28	0.47
I3	0.58	0.33	0.31	0.21	0.37
I4	0.56	0.39	0.27	0.23	0.37
I5	0.42	0.20	0.30	0.25	0.32
I6	0.57	0.50	0.39	0.31	0.48
I7	0.55	0.42	0.35	0.31	0.45
I8	0.42	0.37	0.40	0.34	0.41
I9	0.40	0.33	0.34	0.30	0.37
I10	0.50	0.15	0.37	0.38	0.42
I11	0.46	0.57	0.36	0.28	0.44
I12	0.42	0.54	0.31	0.19	0.38
I13	0.48	0.47	0.39	0.29	0.45
I14	0.34	0.53	0.23	0.14	0.31
I15	0.42	0.57	0.25	0.20	0.35
I16	0.32	0.50	0.27	0.17	0.33
I17	0.36	0.48	0.38	0.33	0.44
I18	0.30	0.46	0.28	0.28	0.36
I19	0.16	0.49	0.12	0.08	0.18
I20	0.20	0.52	0.11	0.11	0.19
I21	0.23	0.36	0.19	0.12	0.21
I22	0.32	0.24	0.49	0.30	0.43
I23	0.20	0.07	0.43	0.30	0.36
I24	0.31	0.21	0.54	0.36	0.46
I25	0.33	0.24	0.49	0.31	0.43
I26	0.28	0.33	0.29	0.21	0.28
I27	0.40	0.30	0.41	0.32	0.39
I28	0.27	0.19	0.42	0.22	0.35
I29	0.27	0.17	0.46	0.27	0.37
I30	0.33	0.26	0.60	0.36	0.51
I31	0.31	0.15	0.56	0.40	0.50
I32	0.40	0.33	0.46	0.33	0.44
I33	0.36	0.18	0.63	0.48	0.58
I34	0.43	0.27	0.63	0.44	0.58
I35	0.22	0.17	0.40	0.34	0.36
I36	0.32	0.20	0.40	0.31	0.36
I37	0.33	0.24	0.49	0.65	0.58
I38	0.19	0.18	0.24	0.38	0.30
I39	0.31	0.15	0.43	0.61	0.51
I40	0.34	0.19	0.43	0.62	0.52
I41	0.27	0.19	0.43	0.60	0.50
I42	0.17	0.08	0.28	0.49	0.34
I43	0.43	0.25	0.47	0.44	0.47

I44	0.42	0.26	0.51	0.47	0.52
I45	0.21	0.22	0.31	0.58	0.44
I46	0.12	0.10	0.19	0.47	0.32
I47	0.32	0.24	0.47	0.70	0.58
I48	0.26	0.21	0.33	0.62	0.47
I49	0.25	0.26	0.30	0.55	0.43
I50	0.23	0.22	0.27	0.48	0.38
Pillar 1	1.00	0.78	0.68	0.57	0.85
Pillar 2	0.78	1.00	0.58	0.48	0.77
Pillar 3	0.68	0.58	1.00	0.71	0.90
Pillar 4	0.57	0.48	0.71	1.00	0.86
Overall	0.85	0.77	0.90	0.86	1.00

Note: Kendall's Tau is used to measure the correlation between the indicators and the pillars; Pearson's correlation coefficient is used to measure the correlation between the pillars.

3   Impact of modelling assumptions on the ICT Regulatory Tracker

In this section we perform an analysis of the impact of modelling choices on the final results of the ICT Regulatory Tracker results. In particular, we assess to what extent the final ranks would be affected by changes in the weights assigned to each pillar. We also assess the impact of using a partially compensatory formula (geometric aggregation formula) to calculate the overall scores, as an alternative to a fully compensatory formula such as the arithmetic average, being the latter an exact reproduction of the sum of items as introduced in Section 2.4. Note that the use of simple arithmetic averages allows countries with a comparative advantage in some pillars to compensate for comparative disadvantages in others. Conversely, geometric averages tend to reward more balanced profiles, and the formula used to calculate the average makes it more difficult to compensate low scores in one pillar with higher scores in another [4]. Table 4 shows the different sources of uncertainty taken into account for the analysis. The 2,000 simulated scenarios used in the analysis result from the combination of two alternative aggregation formulas and 1,000 sets of randomly generated weights [5]. This type of assessment aims to respond to any criticism that the country scores associated with aggregate measures are generally not calculated under conditions of certainty, even though they are frequently presented as such [6].

Table 4. Sources of uncertainty – Uncertainty analysis

Assumptions	Reference	Alternative assumptions
I. Aggregation formula	Arithmetic Mean	Geometric Mean
II. Weights of the pillars	Reference values (based on number of indicators per pillar)	Range of variation (+/- 20% from reference values)
	Pillar 1: 0.20	U[0.160,0.240]
	Pillar 2: 0.22	U[0.176,0.264]
	Pillar 3: 0.30	U[0.240,0.360]
	Pillar 4: 0.28	U[0.224,0.336]

Source: European Commission, Joint Research Centre, 2019

The main results of the uncertainty analysis are shown in Figure 2 with median ranks and 90% confidence intervals computed across the simulated scenarios.[4] All the ICT Regulatory Tracker ranks lie within the simulated 90% confidence intervals. With very

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[4] The complete table of results for the uncertainty analysis is presented in Annex III.

few exceptions, the width of the confidence intervals is narrow enough. Only 23.8% of the countries present confidence interval widths over 10 (7.2% over 15). Moreover, the original rank is less than 5 positions away from the simulated median for 97.4% of the countries. This analysis confirms the robustness of the Tracker, which is not influenced by the assumptions on importance of the pillars and by the aggregation procedure.

Figure 2. Results of the uncertainty analysis of the ICT Regulatory Tracker (nominal ranks in 2018 vs median rank, 90% confidence intervals)
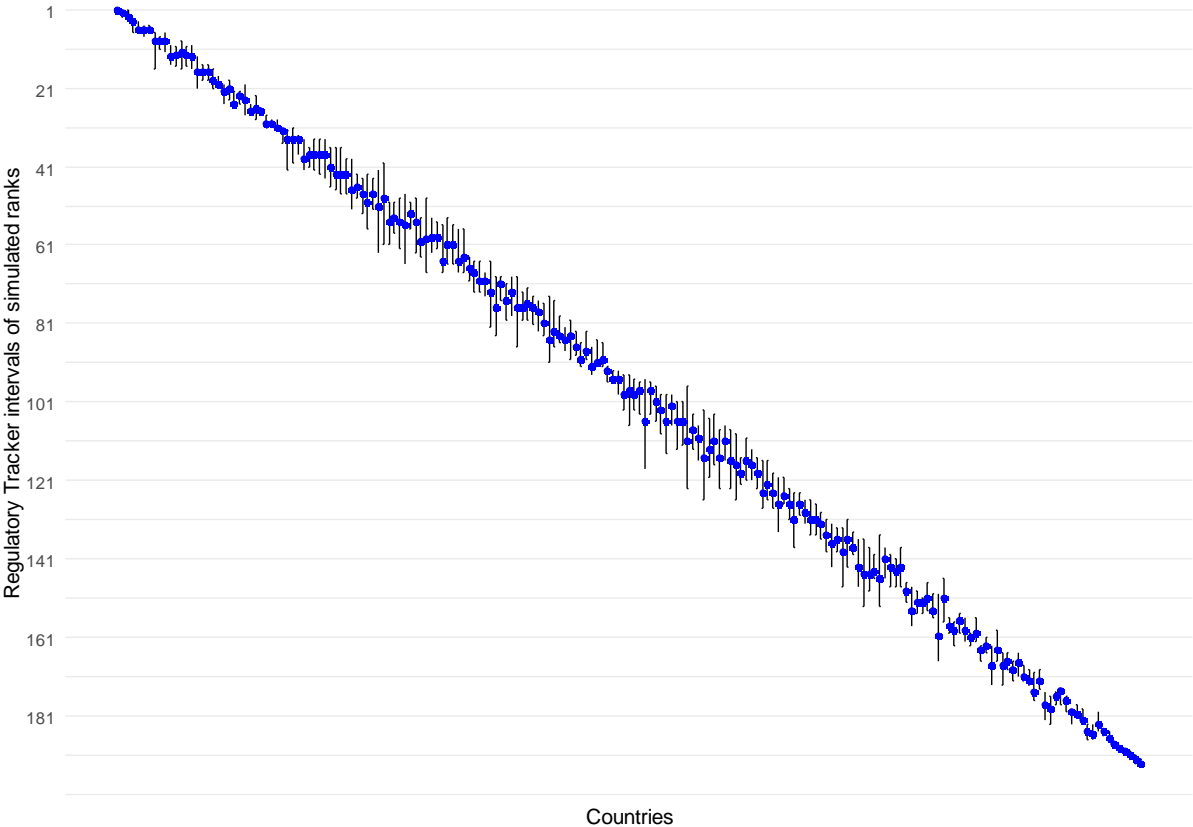
Note: Countries are arranged along the horizontal axis in descending order of nominal rank; the dots represent the simulated median ranks; the vertical bars represent the simulated 90% confidence intervals.
Source: European Commission, Joint Research Centre, 2019

Complementary to the results from the uncertainty analysis, Figure 3 shows the impact of one-at-a-time changes in weights and in aggregation formulas. On the left-hand side of the figure, the default ranks are plotted against the ranks obtained assuming and equal weighting scheme across the four pillars. On the right-hand side, we plot the ranks result from the arithmetic aggregation of pillar scores (i.e. the default aggregation option) against the ranks resulting from applying a geometric aggregation formula. We have calculated the values of the Spearman correlation coefficients for each pair of ranks in each plot. The results suggest that the impact on the ranks of either using a geometric aggregation formula or assigning equal weights to all the pillars would be of a similar

magnitude, with only a marginal difference between the Spearman correlation coefficients calculated for both options (0.996 for default versus equal weighting, and 0.998 for default versus geometric average).

Figure 3. Sensitivity analysis on: a) levels of aggregation and b) level and formula of aggregation

a) Weights: Default vs Equal-weighting Pillars

b) Aggregation: Default vs Geometric Aggregation
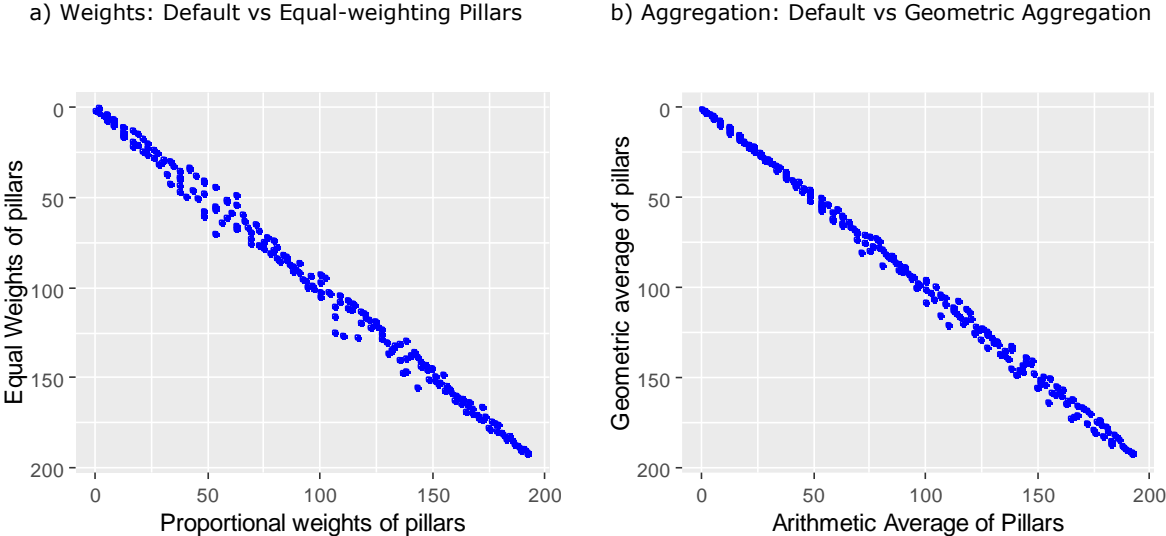
Source: European Commission, Joint Research Centre, 2019

4 Major shifts in the ICT Regulatory Tracker scores over the period 2007-2018

A number of countries monitored by the ICT Regulatory Tracker have experienced major shifts in their scores over the period 2007-2018. Those shifts provide rich analytical evidence and require special attention by the developers of the Tracker. In particular, strong and rapid improvements in the scores should be backed in every single case by significant evidence of major changes having taken place in the regulatory environment of those countries. If that was not the case, the evolution in the scores might be attributed to arbitrariness or subjectivity from those responsible for filling out the questionnaires that serve as the basis for the qualitative indicators on which the Tracker is based. In this section, we signal which countries have experienced rapid and significant improvements in their scores, and invite the developers to perform additional checks on those countries as an opportunity to learn lessons that could be shared with other countries and to gain deeper insights in the fundamentals of such an outstanding performance.

The ICT Regulatory Tracker is available from 2007 to 2018. There are 193 countries ranked in 2018 (190 in 2007). For nearly all of those 193 countries there is a score available for each of the 12 time points. The countries are divided into six regions based on the geographical groupings used by ITU. Table 5 gives information on the number of countries belonging to each region (for the last considered year). The Commonwealth of Independent States (CIS) is the region with the lowest number of countries (9 countries[5]) while the European region has the highest number of countries (45 countries).

Table 5. Number of countries belonging to each region.

Nr	Region	Number of countries (2018)
1	Africa	44
2	America	35
3	Arab States	22
4	Asia-Pacific	38
5	CIS	9
6	Europe	45

Source: European Commission, Joint Research Centre, 2019

Figure 4 illustrates the progress in average scores by region during the period from 2007 to 2018. The trend is positive for all regions and there is a positive increase in average scores for all years apart from the last year for the CIS region, the decrease being due to

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[5] Three countries (Georgia, Moldova and Ukraine) moved from CIS to Europe region in 2018, according to ITU's internal regional classification.

the change of the number of countries in the region in 2018. The European averages remain the highest for all years, followed by the American region values. These two regions are the only ones with higher average scores than the World average. The CIS region averages are the lowest for all years. The low values of Turkmenistan, Tajikistan and Uzbekistan are dragging down the average scores inside this region. The world average score has increased by 51%, from 47.0 in 2007 to 70.7 in 2018. The sharpest increase (77%) has been experienced by the Arab States region, with the scores shifting from 35.3 to 62.5.

Figure 4. Progress in average scores, by region, 2007-2018
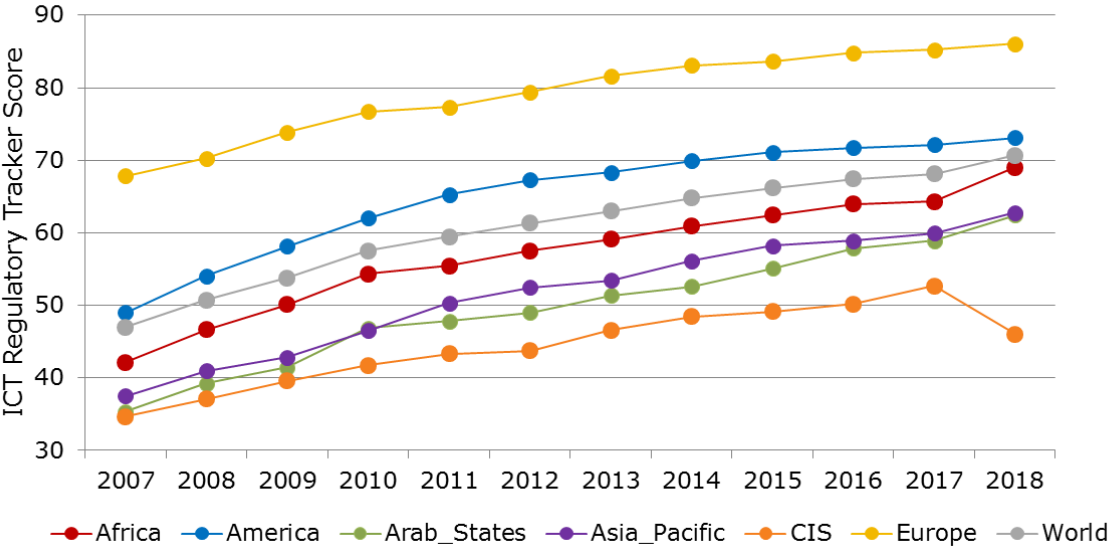
Note: CIS region counts 12 countries until 2017 and 9 countries in 2018.
Source: European Commission, Joint Research Centre, 2019

Table 6 lists the ten countries with the largest increase in scores from 2007 to 2018. All the regions except for CIS are represented in that list. The island Comoros has the biggest increase in score values from (merely) 7.5 in 2007 (G1) to 82.3 in 2018 (G3 almost G4). Somalia has also made considerable effort, rising from 0.0 in 2014 to 67.0 in 2018. The increase in the scores of both countries is largely due to the establishment of national regulatory authorities (in 2010 in Comoros and in 2018 in Somalia) and the broad regulatory reforms they have engaged in since. Four of the ten countries in Table 6 are small-sized countries, with around or less than one million inhabitants[6]. Finally, Figure 5 shows in detail the time line of the five countries that experienced the largest increase in scores.

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[6] The –countries are Comoros, Dominica, Eswatini and Vanuatu. All are islands apart from Eswatini. The country with the smallest population, Dominica, officially the Commonwealth of Dominica, is an island country in the West Indies and had an estimated population of 71,625 (reference https://data.worldbank.org/country/dominica 2018 data).

Table 6. Top 10 countries by increase in scores, 2007-2018

Order	Country	Region	Score 2007	Score 2018	Score increase 2007-2018
1	Comoros	Arab States	7.5	82.3	74.8
2	Somalia	Arab States	0.0	67.0	67.0
3	Dominica	America	12.5	72.5	60.0
4	Congo (Rep. of the)	Africa	18.0	75.7	57.7
5	Guinea	Africa	12.3	68.3	56.0
6	Myanmar	Asia-Pacific	8.8	63.7	54.8
7	Eswatini	Africa	5.5	59.3	53.8
8	Vanuatu	Asia-Pacific	17.3	71.2	53.8
9	Honduras	America	28.7	82.0	53.3
10	Italy	Europe	44.7	97.3	52.7

Source: European Commission, Joint Research Centre, 2019

Figure 5. Time line of the top five by increase in scores, 2007-2018
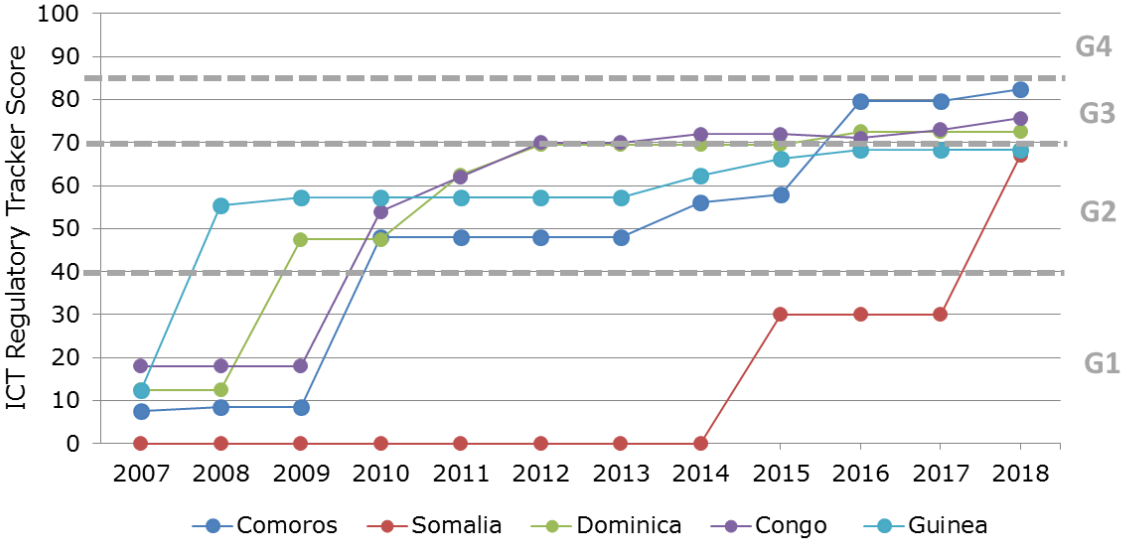
Source: European Commission, Joint Research Centre, 2019

5 Analysis of the distribution of regional ICT Regulatory Tracker scores in 2018

In this section we study the distribution of the regional scores for the latest available year (2018). As Table 7 and Figure 6 show, the scores in the European region are clearly above the other regions. 18 of the 20 countries with the highest scores are in fact coming from this region. Italy, Ireland and Hungary have the highest scores (97 or above). Small-sized countries with largely monopolistic markets like Andorra, San Marino and Monaco[7] lie at the other end of the spectrum and deviate from the rest of European region, with scores of 35 or below.[8]

Table 7. Summary statistics of regional ICT Regulatory Tracker scores in 2018

Region	Average Score	Median Score	Std Score	Nr of countries
Africa	69.0	71.0	14.1	44
America	73.1	79.0	16.4	35
Arab States	62.5	70.3	27.4	22
Asia-Pacific	62.8	66.7	21.2	38
CIS	46.1	44.5	27.7	9
Europe	86.1	91.5	17.0	45

Source: European Commission, Joint Research Centre, 2019

The scores within the Africa and the Americas regions are similarly distributed (from 25 to 88 for Africa and from 33 to 95 for America). The scores for the Arab States and the Asia-Pacific countries are also comparable. There are three deviating countries in each of these two regions[9]. The nine CIS countries are divided into three distinct groups with similar scores[10].

For five regions (Africa, Americas, Arab States, Asia-Pacific and Europe) the median scores are (somewhat) greater than the average scores, so the distributions are slightly skewed to the left. The non-parametric[11] Kruskal Wallis rank sum test confirms that the

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[7] The three countries are among the least populated in Europe with populations of less than 80 000 inhabitants, https://data.worldbank.org/country/.

[8] Coincidentally, these three small-sized European countries are currently negotiating and Association Agreement with the EU (http://www.europarl.europa.eu/doceo/document/TA-8-2019-0188_EN.html).

[9] Yemen, Djibouti and Libya in the Arab States and Marshall Islands, Tuvalu and Micronesia in Asia.

[10] High CIS scores for Armenia, Kyrgyzstan and Azerbaijan, middle CIS scores for Kazakhstan, Belarus and Russian Federation and low CIS scores for Uzbekistan, Tajikistan and Turkmenistan.

[11] Since the ANOVA assumptions of normality and homogeneity of variances are not met for the six regions, a non-parametric alternative may be used. The Kruskal-Wallis chi-squared test statistic with 5 df is large (66.5) and the p-value is very small (<0.01), so the null hypothesis is there for rejected.

six regions are significantly different. The pairwise comparisons using Wilcoxon rank sum test[12], show that Europe is significantly different from the other five regions [3], [8].

Figure 6. Box-plot of regional ICT Regulatory Tracker scores in 2018
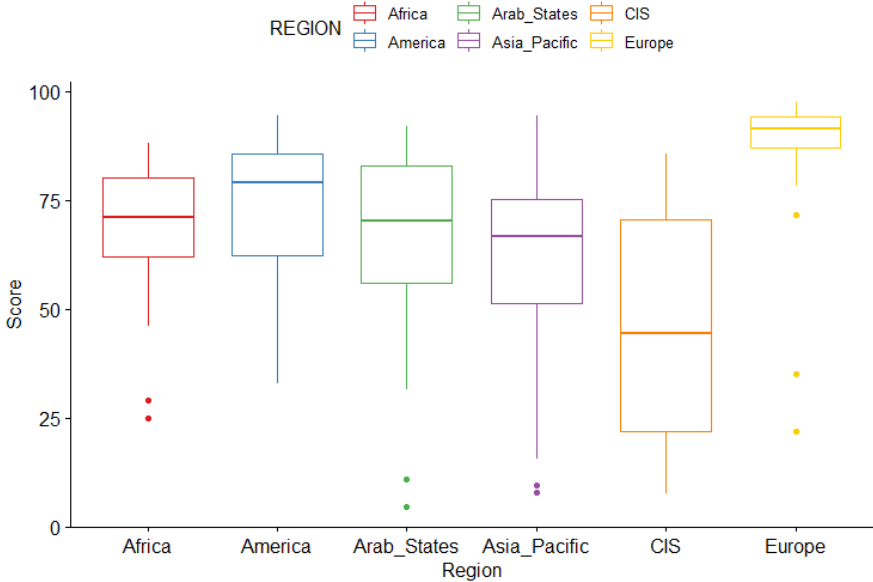
Source: European Commission, Joint Research Centre, 2019

Note: A box-plot is a method for graphically displaying data. It includes a box indicating the central 50 percent of the data, i.e. the top and bottom of the box are the 25th and 75th percentiles. The horizontal band inside the box represents the median, and the size of the box is called the Interquartile Range (IQR). The lines extending vertically from the boxes (whiskers) indicate variability outside the upper and lower quartiles. The dots beyond the vertical lines represent potential outliers in the data.

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[12] We correct for multiple testing using the adjustment method of Benjamini & Yekutieli (2001)[2].

6 Conclusions

Simplicity and clarity stand out as two of the main strengths of the ICT Regulatory Tracker monitoring framework. In addition, the present statistical assessment also underscores the fact that the conceptual structure of the index is supported by the results of the analysis. The grouping of indicators into pillars is statistically coherent, and the overall index appears to be a good and balanced summary measure of its four underlying pillars. Moreover, the robustness of the index with respect to changes in the modelling assumptions is supported also by the results of the uncertainty and sensitivity analysis.

Throughout this document, we have pointed out to the developers some elements that merit further reflection. This is the case of the additive scoring approach used to arrive at the final index scores. The additive scoring approach could be easily substituted by an equivalent arithmetic aggregation formula, prior normalisation of the pillar scores. Normalisation would have the benefit of rendering the pillar scores directly comparable and easier to read and analyse. And as explained in the section dedicated to the uncertainty analysis, arithmetic averages are not the only options that could be considered for aggregating pillar scores. Applying a geometric average formula to aggregate the four pillars could be a possible alternative. As a matter of fact, the developers' preference has been to not penalise countries with uneven performance across pillars and reward those with similar high scores in all pillars. This choice of methodology reflects the overall vision where countries build their ICT regulatory reform path around their local and national priorities, and where varying policy instrument configurations lead to the same goals. All in all, the analyses conducted herein by the Joint Research Centre suggest that the ICT Regulatory Tracker framework is a conceptually sound, statistically coherent and robust monitoring tool.

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Annexes

Annex I. List of indicators included in the ICT Regulatory Tracker

		Indicator description
Pillar 1 Regulatory authority	1	Separate telecom/ICT regulator
	2	Autonomy in decision making
	3	Accountability
	4	Percentage of diversified funding
	5	Public consultations mandatory before decisions
	6	Enforcement power
	7	Sanctions or penalties imposed by regulator
	8	Dispute resolution mechanism
	9	Appeals to decisions
	10	Existence of Competition authority
	20	Max score

		Indicator description
Pillar 2 Regulatory mandate	11	Traditional mandate: entity in charge of quality of service obligations measures and
	12	Traditional mandate: entity in charge of licensing
	13	Traditional mandate: entity in charge of interconnection rates and price regulation
	14	Spectrum: Entity in charge of radio frequency allocation and assignment
	15	Entity in charge of Spectrum Monitoring and Enforcement
	16	Entity in charge of universal service/access
	17	New mandate: entity in charge of broadcasting (radio and TV transmission)
	18	New mandate: entity in charge of broadcasting content
	19	New mandate: entity in charge of Internet content
	20	New mandate: entity in charge of IT
	21	Consumer issues: entity responsible for comparative tariff information, consumer education and handling consumer complaints
	22	Max score

		Indicator description
Pillar 3 Regulatory regime	22	Types of licences provided
	23	License exempt
	24	Operators required to publish Reference Interconnection Offer (RIO)
	25	Interconnection prices made public
	26	Quality of service monitoring required
	27	Infrastructure sharing for mobile operators permitted
	28	Infrastructure sharing mandated
	29	Co-location/site sharing mandated
	30	Unbundled access to the local loop required
	31	Secondary trading allowed
	32	Band migration allowed
	33	Number portability available to consumers and required from fixed-line operators
	34	Number portability available to consumers and required from mobile operators
	35	Individual users allowed to use VoIP
	36	National plan that involves broadband
	30	Max score

		Indicator description
Pillar 4 Competition framework	37	Level of competition in local and long distance (domestic and international) fixed line
	38	Level of competition in IMT (3G, 4G, etc.) services
	39	Level of competition in cable modem, DSL, fixed wireless broadband
	40	Level of competition in leased lines
	41	Level of competition in International Gateways
	42	Status of the main fixed line operator
	43	Legal concept of dominance or SMP
	44	Criteria used in determining dominance or SMP
	45	Foreign participation/ownership in facilities-based operators
	46	Foreign participation/ownership in spectrum-based operators
	47	Foreign participation/ownership in local service operators/long-distance service
	48	Foreign participation/ownership in international service operators
	49	Foreign participation/ownership in Internet Service Providers (ISPs)
	50	Foreign participation/ownership in value-added service providers

28   Max score

Annex II. Correlations between indicators

	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12	I13	I14	I15	I16	I17	I18	I19	I20	I21	I22	I23	I24	I25	I26	I27	I28	I29	I30	I31	I32	I33	I34	I35	I36	I37	I38	I39	I40	I41	I42	I43	I44	I45	I46	I47	I48	I49	I50
I1	1.00	0.68	0.52	0.60	0.28	0.82	0.73	0.46	0.43	0.17	0.68	0.67	0.68	0.68	0.67	0.64	0.44	0.23	0.08	0.24	0.35	0.21	0.07	0.33	0.39	0.34	0.43	0.32	0.25	0.24	0.23	0.34	0.22	0.24	0.12	0.26	0.24	0.26	0.20	0.30	0.21	0.14	0.37	0.34	0.26	0.16	0.33	0.29	0.30	0.30
I2	0.68	1.00	0.48	0.55	0.25	0.73	0.61	0.35	0.33	0.21	0.55	0.52	0.58	0.53	0.53	0.45	0.39	0.22	0.13	0.30	0.28	0.32	0.11	0.31	0.38	0.28	0.45	0.33	0.30	0.34	0.28	0.28	0.32	0.33	0.24	0.25	0.22	0.16	0.20	0.24	0.25	0.14	0.39	0.32	0.27	0.18	0.29	0.32	0.31	0.26
I3	0.52	0.48	1.00	0.45	0.13	0.52	0.53	0.33	0.34	0.19	0.41	0.40	0.39	0.41	0.46	0.34	0.27	0.20	0.12	0.20	0.28	0.23	0.21	0.22	0.27	0.24	0.33	0.29	0.32	0.27	0.20	0.28	0.19	0.23	0.08	0.21	0.13	0.20	0.10	0.21	0.18	0.10	0.37	0.36	0.10	0.02	0.17	0.20	0.21	0.19
I4	0.60	0.55	0.45	1.00	0.18	0.55	0.53	0.33	0.27	0.23	0.52	0.44	0.48	0.46	0.46	0.43	0.37	0.22	0.12	0.25	0.28	0.16	0.05	0.26	0.29	0.27	0.37	0.25	0.25	0.21	0.10	0.36	0.17	0.23	0.14	0.23	0.17	0.18	0.19	0.19	0.15	0.04	0.35	0.32	0.15	0.11	0.20	0.21	0.22	0.26
I5	0.28	0.25	0.13	0.18	1.00	0.22	0.17	0.41	0.29	0.24	0.29	0.14	0.27	0.09	0.19	0.16	0.23	0.20	0.12	0.03	0.18	0.31	0.16	0.21	0.24	0.25	0.23	0.08	0.10	0.20	0.23	0.33	0.21	0.29	0.18	0.31	0.28	0.20	0.28	0.26	0.21	0.09	0.25	0.24	0.16	0.08	0.28	0.18	0.19	0.16
I6	0.82	0.73	0.52	0.55	0.22	1.00	0.82	0.54	0.56	0.22	0.62	0.67	0.68	0.62	0.66	0.56	0.45	0.29	0.13	0.30	0.36	0.30	0.16	0.38	0.45	0.37	0.49	0.33	0.25	0.27	0.26	0.39	0.30	0.28	0.20	0.32	0.28	0.29	0.21	0.36	0.28	0.18	0.43	0.38	0.32	0.17	0.35	0.34	0.36	0.29
I7	0.73	0.61	0.53	0.53	0.17	0.82	1.00	0.46	0.52	0.14	0.52	0.60	0.57	0.58	0.60	0.57	0.38	0.27	0.05	0.24	0.35	0.26	0.15	0.33	0.37	0.34	0.44	0.34	0.28	0.24	0.15	0.38	0.26	0.26	0.22	0.28	0.23	0.28	0.17	0.35	0.24	0.16	0.37	0.35	0.33	0.07	0.35	0.33	0.33	0.30
I8	0.46	0.35	0.33	0.33	0.41	0.54	0.46	1.00	0.74	0.37	0.46	0.39	0.44	0.32	0.43	0.33	0.34	0.31	0.22	0.30	0.31	0.35	0.22	0.40	0.36	0.52	0.43	0.29	0.26	0.26	0.23	0.52	0.24	0.31	0.32	0.48	0.35	0.30	0.25	0.43	0.35	0.17	0.38	0.38	0.29	0.12	0.40	0.24	0.23	0.24
I9	0.43	0.33	0.34	0.27	0.29	0.56	0.52	0.74	1.00	0.32	0.41	0.36	0.46	0.34	0.45	0.34	0.31	0.25	0.19	0.30	0.33	0.30	0.21	0.38	0.38	0.48	0.44	0.28	0.20	0.18	0.14	0.46	0.21	0.27	0.34	0.49	0.32	0.35	0.20	0.43	0.37	0.16	0.36	0.31	0.24	0.07	0.33	0.26	0.25	0.17
I10	0.17	0.21	0.19	0.23	0.24	0.22	0.14	0.37	0.32	1.00	0.19	0.10	0.23	0.00	0.05	0.04	0.20	0.31	0.15	0.11	-0.04	0.17	0.27	0.24	0.23	0.16	0.31	0.16	0.20	0.30	0.35	0.29	0.36	0.43	0.24	0.31	0.36	0.09	0.37	0.36	0.25	0.20	0.46	0.42	0.19	0.12	0.31	0.21	0.20	0.17
I11	0.68	0.55	0.41	0.52	0.29	0.62	0.52	0.46	0.41	0.19	1.00	0.59	0.66	0.58	0.68	0.61	0.46	0.30	0.21	0.32	0.39	0.26	0.10	0.27	0.35	0.50	0.42	0.32	0.24	0.26	0.20	0.45	0.18	0.28	0.26	0.29	0.29	0.20	0.20	0.25	0.22	0.11	0.37	0.35	0.24	0.12	0.29	0.30	0.30	0.30
I12	0.67	0.52	0.40	0.44	0.14	0.67	0.60	0.39	0.36	0.10	0.59	1.00	0.57	0.77	0.74	0.69	0.48	0.22	0.15	0.22	0.30	0.23	0.11	0.27	0.26	0.27	0.39	0.30	0.22	0.30	0.19	0.32	0.22	0.23	0.21	0.12	0.22	0.19	0.16	0.21	0.16	0.03	0.25	0.27	0.28	0.17	0.26	0.29	0.29	0.21
I13	0.68	0.58	0.39	0.48	0.27	0.68	0.57	0.44	0.46	0.23	0.66	0.57	1.00	0.50	0.57	0.50	0.40	0.28	0.11	0.27	0.35	0.23	0.13	0.42	0.41	0.42	0.37	0.35	0.35	0.22	0.17	0.41	0.26	0.30	0.22	0.23	0.31	0.29	0.21	0.27	0.23	0.15	0.34	0.33	0.26	0.18	0.33	0.30	0.30	0.26
I14	0.68	0.53	0.41	0.46	0.09	0.62	0.58	0.32	0.34	0.00	0.58	0.77	0.50	1.00	0.81	0.68	0.47	0.19	0.15	0.24	0.29	0.14	0.07	0.17	0.24	0.29	0.37	0.28	0.23	0.24	0.11	0.27	0.14	0.11	0.16	0.09	0.13	0.19	0.06	0.15	0.11	0.10	0.26	0.23	0.22	0.18	0.16	0.23	0.26	0.25
I15	0.67	0.53	0.46	0.46	0.19	0.68	0.60	0.43	0.45	0.05	0.68	0.74	0.57	0.81	1.00	0.63	0.50	0.23	0.19	0.28	0.34	0.22	0.07	0.25	0.26	0.36	0.37	0.24	0.14	0.22	0.16	0.35	0.16	0.17	0.19	0.19	0.26	0.09	0.20	0.16	0.13	0.04	0.27	0.24	0.26	0.09	0.23	0.27	0.27	0.29
I16	0.64	0.45	0.34	0.43	0.16	0.56	0.57	0.33	0.34	0.04	0.61	0.69	0.50	0.68	0.63	1.00	0.39	0.22	0.09	0.26	0.36	0.21	0.01	0.23	0.30	0.27	0.37	0.33	0.23	0.25	0.08	0.29	0.20	0.23	0.12	0.15	0.17	0.17	0.13	0.19	0.20	0.04	0.31	0.25	0.26	0.12	0.20	0.21	0.25	0.23
I17	0.44	0.39	0.27	0.37	0.23	0.45	0.38	0.34	0.31	0.20	0.46	0.48	0.40	0.47	0.50	0.39	1.00	0.45	0.08	0.16	0.13	0.31	0.20	0.27	0.20	0.31	0.28	0.15	0.16	0.32	0.37	0.35	0.30	0.33	0.32	0.21	0.32	0.19	0.31	0.27	0.34	0.17	0.22	0.30	0.22	0.14	0.34	0.28	0.31	0.29
I18	0.23	0.22	0.20	0.22	0.20	0.29	0.27	0.31	0.25	0.31	0.30	0.22	0.28	0.19	0.23	0.22	0.45	1.00	0.23	0.18	0.07	0.26	0.01	0.22	0.18	0.28	0.23	0.12	0.11	0.26	0.23	0.30	0.24	0.29	0.24	0.29	0.28	0.19	0.27	0.22	0.27	0.12	0.18	0.24	0.17	0.12	0.30	0.18	0.24	0.18
I19	0.08	0.13	0.12	0.12	0.12	0.13	0.05	0.22	0.19	0.15	0.21	0.15	0.11	0.15	0.19	0.09	0.08	0.23	1.00	0.36	0.13	0.16	0.07	0.09	0.09	0.21	0.14	0.06	0.06	0.17	0.00	0.13	0.05	0.20	0.00	0.07	0.11	0.19	0.06	0.04	0.07	0.17	0.17	0.14	0.06	0.12	0.08	0.04	0.07	0.06
I20	0.24	0.30	0.20	0.25	0.03	0.30	0.24	0.30	0.30	0.11	0.32	0.22	0.27	0.24	0.28	0.26	0.16	0.18	0.36	1.00	0.29	0.10	0.02	0.16	0.21	0.35	0.19	0.09	0.11	0.06	0.04	0.19	-0.02	0.08	0.13	0.14	0.14	0.19	0.03	0.18	0.07	0.02	0.21	0.16	0.15	-0.04	0.12	0.14	0.17	0.15
I21	0.35	0.28	0.28	0.28	0.18	0.36	0.35	0.31	0.33	-0.04	0.39	0.30	0.35	0.29	0.34	0.36	0.13	0.07	0.13	0.29	1.00	0.22	-0.01	0.18	0.22	0.33	0.26	0.26	0.28	0.12	0.02	0.28	0.07	0.15	0.05	0.19	0.09	0.18	0.05	0.13	0.09	0.06	0.26	0.21	0.20	0.10	0.16	0.19	0.16	0.16
I22	0.21	0.32	0.23	0.16	0.31	0.30	0.26	0.35	0.30	0.17	0.26	0.23	0.23	0.14	0.22	0.21	0.31	0.26	0.16	0.10	0.22	1.00	0.29	0.38	0.30	0.23	0.36	0.21	0.19	0.34	0.35	0.31	0.35	0.38	0.26	0.28	0.34	0.19	0.25	0.23	0.33	0.15	0.32	0.29	0.28	0.22	0.32	0.26	0.21	0.14
I23	0.07	0.11	0.21	0.05	0.16	0.16	0.15	0.22	0.21	0.27	0.10	0.11	0.13	0.07	0.07	0.01	0.20	0.01	0.07	0.02	-0.01	0.29	1.00	0.16	0.19	0.16	0.16	0.15	0.23	0.18	0.33	0.18	0.32	0.29	0.20	0.19	0.35	0.16	0.27	0.27	0.28	0.16	0.26	0.36	0.19	0.14	0.32	0.23	0.19	0.12
I24	0.33	0.31	0.22	0.26	0.21	0.38	0.33	0.40	0.38	0.24	0.27	0.27	0.42	0.17	0.25	0.23	0.27	0.22	0.09	0.16	0.18	0.38	0.16	1.00	0.53	0.29	0.35	0.28	0.31	0.42	0.34	0.39	0.40	0.43	0.24	0.32	0.33	0.26	0.32	0.35	0.34	0.20	0.51	0.42	0.27	0.16	0.42	0.26	0.23	0.18
I25	0.39	0.38	0.27	0.29	0.24	0.45	0.37	0.36	0.38	0.23	0.35	0.26	0.41	0.24	0.26	0.30	0.20	0.18	0.09	0.21	0.22	0.30	0.19	0.53	1.00	0.22	0.38	0.32	0.35	0.36	0.28	0.30	0.37	0.33	0.11	0.25	0.29	0.29	0.23	0.30	0.29	0.20	0.49	0.39	0.24	0.15	0.32	0.23	0.28	0.28
I26	0.34	0.28	0.24	0.27	0.25	0.37	0.34	0.52	0.48	0.16	0.50	0.27	0.42	0.29	0.36	0.27	0.31	0.28	0.21	0.35	0.33	0.23	0.16	0.29	0.22	1.00	0.25	0.22	0.22	0.15	0.06	0.48	0.12	0.20	0.25	0.35	0.22	0.18	0.14	0.24	0.19	0.16	0.33	0.32	0.21	0.06	0.25	0.19	0.16	0.17
I27	0.43	0.45	0.33	0.37	0.23	0.49	0.44	0.43	0.44	0.31	0.42	0.39	0.37	0.37	0.37	0.37	0.28	0.23	0.14	0.19	0.26	0.36	0.16	0.35	0.38	0.25	1.00	0.37	0.33	0.39	0.26	0.36	0.28	0.29	0.27	0.36	0.32	0.26	0.24	0.36	0.30	0.08	0.55	0.40	0.24	0.16	0.34	0.25	0.34	0.29
I28	0.32	0.33	0.29	0.25	0.08	0.33	0.34	0.29	0.28	0.16	0.32	0.30	0.35	0.28	0.24	0.33	0.15	0.12	0.06	0.09	0.26	0.21	0.21	0.28	0.32	0.22	0.37	1.00	0.71	0.22	0.12	0.15	0.22	0.15	0.17	0.25	0.25	0.21	0.20	0.30	0.22	0.01	0.35	0.31	0.19	0.09	0.24	0.22	0.16	0.15
I29	0.25	0.30	0.32	0.25	0.10	0.25	0.28	0.26	0.20	0.20	0.24	0.22	0.35	0.23	0.14	0.23	0.16	0.11	0.06	0.11	0.28	0.19	0.25	0.31	0.35	0.22	0.33	0.71	1.00	0.25	0.18	0.23	0.24	0.22	0.16	0.21	0.25	0.17	0.20	0.26	0.20	0.05	0.39	0.38	0.20	0.12	0.26	0.27	0.24	0.20
I30	0.24	0.34	0.27	0.21	0.20	0.27	0.24	0.26	0.18	0.30	0.26	0.30	0.22	0.24	0.22	0.25	0.32	0.26	0.17	0.06	0.12	0.34	0.18	0.42	0.36	0.15	0.39	0.22	0.25	1.00	0.44	0.37	0.53	0.56	0.26	0.28	0.31	0.16	0.31	0.32	0.34	0.24	0.46	0.45	0.23	0.12	0.35	0.20	0.22	0.16
I31	0.23	0.28	0.20	0.10	0.23	0.26	0.15	0.23	0.14	0.35	0.20	0.19	0.17	0.11	0.10	0.08	0.37	0.23	0.00	0.04	0.02	0.35	0.33	0.34	0.28	0.06	0.26	0.12	0.18	0.44	1.00	0.27	0.59	0.50	0.28	0.22	0.41	0.10	0.36	0.29	0.32	0.29	0.27	0.34	0.26	0.22	0.38	0.31	0.29	0.26
I32	0.34	0.28	0.28	0.36	0.33	0.39	0.38	0.52	0.46	0.29	0.45	0.32	0.41	0.27	0.35	0.29	0.35	0.30	0.13	0.19	0.28	0.31	0.18	0.39	0.30	0.48	0.36	0.15	0.23	0.37	0.27	1.00	0.29	0.42	0.41	0.35	0.37	0.19	0.31	0.33	0.33	0.25	0.43	0.39	0.16	0.00	0.29	0.18	0.13	0.13
I33	0.22	0.32	0.19	0.17	0.21	0.30	0.26	0.24	0.21	0.36	0.18	0.22	0.26	0.14	0.16	0.20	0.30	0.24	0.05	-0.02	0.07	0.35	0.32	0.40	0.37	0.12	0.28	0.22	0.24	0.53	0.59	0.29	1.00	0.70	0.24	0.25	0.44	0.21	0.40	0.41	0.42	0.37	0.33	0.37	0.34	0.25	0.42	0.33	0.31	0.29
I34	0.24	0.33	0.23	0.23	0.29	0.28	0.26	0.31	0.27	0.43	0.28	0.23	0.30	0.11	0.17	0.23	0.33	0.29	0.20	0.08	0.15	0.38	0.29	0.43	0.33	0.20	0.29	0.15	0.22	0.56	0.50	0.42	0.70	1.00	0.30	0.31	0.44	0.15	0.41	0.37	0.37	0.29	0.38	0.42	0.25	0.12	0.42	0.26	0.24	0.21
I35	0.12	0.24	0.08	0.14	0.18	0.20	0.22	0.32	0.34	0.24	0.26	0.21	0.22	0.16	0.19	0.12	0.32	0.24	0.00	0.13	0.05	0.26	0.20	0.24	0.11	0.25	0.27	0.17	0.16	0.26	0.28	0.41	0.24	0.30	1.00	0.42	0.41	0.15	0.41	0.41	0.37	0.23	0.16	0.22	0.23	0.08	0.40	0.28	0.23	0.18
I36	0.26	0.25	0.21	0.23	0.31	0.32	0.28	0.48	0.49	0.31	0.29	0.12	0.23	0.09	0.19	0.15	0.21	0.29	0.07	0.14	0.19	0.28	0.19	0.32	0.25	0.35	0.36	0.25	0.21	0.28	0.22	0.35	0.25	0.31	0.42	1.00	0.28	0.20	0.27	0.35	0.32	0.15	0.36	0.31	0.16	0.07	0.36	0.20	0.16	0.16
I37	0.24	0.22	0.13	0.17	0.28	0.28	0.23	0.35	0.32	0.36	0.29	0.22	0.31	0.13	0.20	0.17	0.32	0.28	0.11	0.14	0.09	0.34	0.35	0.33	0.29	0.22	0.32	0.25	0.25	0.31	0.41	0.37	0.44	0.44	0.41	0.28	1.00	0.36	0.69	0.72	0.63	0.42	0.32	0.36	0.43	0.27	0.68	0.47	0.40	0.31
I38	0.26	0.16	0.20	0.18	0.20	0.29	0.28	0.30	0.35	0.09	0.20	0.19	0.29	0.19	0.29	0.19	0.26	0.17	0.19	0.19	0.07	0.10	0.18	0.19	0.16	0.18	0.26	0.21	0.17	0.16	0.10	0.19	0.21	0.15	0.15	0.20	0.36	1.00	0.38	0.41	0.40	0.19	0.22	0.23	0.25	0.18	0.38	0.29	0.27	0.14
I39	0.20	0.20	0.10	0.19	0.28	0.21	0.17	0.25	0.20	0.37	0.20	0.16	0.21	0.06	0.09	0.13	0.31	0.27	0.06	0.03	0.05	0.25	0.27	0.32	0.23	0.14	0.24	0.20	0.20	0.31	0.36	0.31	0.40	0.41	0.41	0.27	0.69	0.38	1.00	0.57	0.59	0.36	0.33	0.35	0.43	0.28	0.60	0.43	0.39	0.28
I40	0.30	0.24	0.21	0.19	0.26	0.36	0.35	0.43	0.43	0.36	0.25	0.21	0.27	0.15	0.20	0.19	0.27	0.22	0.04	0.18	0.13	0.23	0.27	0.35	0.30	0.24	0.36	0.30	0.26	0.32	0.29	0.33	0.41	0.37	0.41	0.35	0.72	0.41	0.57	1.00	0.66	0.40	0.38	0.33	0.46	0.32	0.67	0.49	0.43	0.36
I41	0.21	0.25	0.18	0.15	0.21	0.28	0.24	0.35	0.37	0.25	0.22	0.16	0.23	0.11	0.16	0.20	0.34	0.27	0.07	0.07	0.09	0.33	0.28	0.34	0.29	0.19	0.30	0.22	0.20	0.34	0.32	0.33	0.42	0.37	0.37	0.32	0.63	0.40	0.59	0.66	1.00	0.37	0.36	0.34	0.49	0.37	0.60	0.49	0.46	0.34
I42	0.14	0.14	0.10	0.04	0.09	0.18	0.17	0.16	0.20	0.11	0.03	0.15	0.10	0.13	0.04	0.17	0.17	0.12	0.17	0.02	0.06	0.15	0.16	0.20	0.20	0.16	0.08	0.01	0.05	0.24	0.29	0.25	0.37	0.29	0.23	0.15	0.42	0.19	0.36	0.40	0.37	1.00	0.20	0.18	0.39	0.27	0.39	0.35	0.26	0.21
I43	0.37	0.39	0.37	0.35	0.25	0.43	0.37	0.38	0.36	0.46	0.37	0.25	0.34	0.26	0.27	0.31	0.22	0.18	0.17	0.21	0.26	0.32	0.26	0.51	0.49	0.33	0.55	0.35	0.39	0.46	0.27	0.43	0.33	0.38	0.16	0.36	0.32	0.22	0.33	0.38	0.36	0.20	1.00	0.69	0.30	0.18	0.37	0.30	0.29	0.28
I44	0.34	0.32	0.36	0.32	0.24	0.38	0.35	0.38	0.31	0.42	0.35	0.27	0.33	0.23	0.24	0.25	0.30	0.24	0.14	0.16	0.21	0.29	0.36	0.42	0.39	0.32	0.40	0.31	0.38	0.45	0.34	0.39	0.37	0.42	0.22	0.31	0.36	0.23	0.35	0.33	0.34	0.18	0.69	1.00	0.25	0.13	0.37	0.30	0.29	0.27
I45	0.26	0.27	0.10	0.15	0.16	0.32	0.33	0.29	0.24	0.19	0.24	0.28	0.26	0.22	0.26	0.26	0.22	0.17	0.06	0.15	0.20	0.28	0.19	0.27	0.24	0.21	0.24	0.19	0.20	0.23	0.26	0.16	0.34	0.25	0.23	0.16	0.43	0.25	0.43	0.46	0.49	0.39	0.30	0.25	1.00	0.80	0.68	0.90	0.81	0.73
I46	0.16	0.18	0.02	0.11	0.08	0.17	0.07	0.12	0.07	0.12	0.12	0.12	0.17	0.18	0.09	0.15	0.12	0.14	0.12	-0.04	0.04	0.10	0.22	0.14	0.15	0.06	0.16	0.09	0.12	0.12	0.22	0.00	0.25	0.12	0.08	0.07	0.27	0.18	0.28	0.32	0.37	0.27	0.18	0.13	0.80	1.00	0.54	0.79	0.74	0.67
I47	0.33	0.29	0.17	0.20	0.28	0.35	0.35	0.40	0.33	0.31	0.29	0.26	0.33	0.16	0.23	0.20	0.34	0.30	0.08	0.12	0.16	0.32	0.32	0.42	0.32	0.25	0.34	0.24	0.26	0.35	0.38	0.29	0.42	0.42	0.40	0.36	0.68	0.38	0.60	0.67	0.60	0.39	0.37	0.37	0.68	0.54	1.00	0.75	0.62	0.55
I48	0.29	0.32	0.20	0.21	0.18	0.34	0.33	0.24	0.26	0.21	0.30	0.29	0.30	0.23	0.27	0.21	0.28	0.18	0.04	0.14	0.19	0.26	0.23	0.26	0.23	0.19	0.25	0.22	0.27	0.20	0.31	0.18	0.33	0.26	0.28	0.20	0.47	0.29	0.43	0.49	0.49	0.35	0.30	0.30	0.90	0.79	0.75	1.00	0.85	0.74
I49	0.30	0.31	0.21	0.22	0.19	0.36	0.33	0.23	0.25	0.20	0.30	0.29	0.30	0.26	0.27	0.25	0.31	0.24	0.07	0.17	0.16	0.21	0.19	0.23	0.28	0.16	0.34	0.16	0.24	0.22	0.29	0.13	0.31	0.24	0.23	0.16	0.40	0.27	0.39	0.43	0.46	0.26	0.29	0.29	0.81	0.74	0.62	0.85	1.00	0.83
I50	0.30	0.26	0.19	0.26	0.16	0.29	0.30	0.24	0.17	0.17	0.30	0.21	0.26	0.25	0.29	0.23	0.29	0.18	0.06	0.15	0.16	0.14	0.12	0.18	0.28	0.17	0.29	0.15	0.20	0.16	0.26	0.13	0.29	0.21	0.18	0.16	0.31	0.14	0.28	0.36	0.34	0.21	0.28	0.27	0.73	0.67	0.55	0.74	0.83	1.00

Note: Kendall's Tau is used to measure the correlation between the indicators
Source: European Commission, Joint Research Centre, 2019

Annex III. Nominal ranks with 90% confidence intervals

Table 1 out of 2. Countries with nominal ranks from 1 to 96

Countries	Rank	Interval	Countries	Rank	Interval	Countries	Rank	Interval
Italy	1	[1,2]	Czech Republic	33.5	[31.95,42]	Tanzania	63.5	[57,68]
Hungary	2.5	[1,3]	Sweden	33.5	[31,40]	Jordan	66	[57,68]
Ireland	2.5	[1,3]	Bahamas	35	[33,38]	Burkina Faso	67	[64,70]
Norway	4	[4,7]	Brazil	38	[34,42]	Hong Kong, China	68	[65,73]
Lithuania	6	[4,7]	Moldova	38	[36,41]	Albania	70	[65,73]
Malta	6	[5,8]	Morocco	38	[34,42]	Luxembourg	70	[68,74]
United Kingdom	6	[5,7]	Poland	38	[34,43]	United Arab Emirates	70	[65,82]
Australia	9	[7,16]	United States	38	[34,44]	Venezuela	72	[69,84]
Dominican Rep.	9	[8,11]	Slovakia	41	[36,46]	Comoros	73.5	[69,75]
Turkey	9	[7,12]	Ghana	42.5	[36,47]	Rwanda	73.5	[71,80]
Belgium	13	[10,15]	Pakistan	42.5	[36,48]	Honduras	75.5	[69,79]
Croatia	13	[10.5,15.5]	Denmark	44	[39,48]	Iran	75.5	[69,87]
France	13	[9,16]	Kenya	45	[39,52]	Korea (Rep. of)	77	[73,80]
Montenegro	13	[10.5,15.5]	Bahrain	46	[43,49]	Ukraine	78	[72,80]
Portugal	13	[10,16]	Estonia	49	[44,53]	Cabo Verde	79.5	[74,81.05]
Germany	17	[13,21]	Malawi	49	[43,57]	Thailand	79.5	[75,83]
Slovenia	17	[15,19]	Malaysia	49	[44,52]	Egypt	81.5	[76,84]
Switzerland	17	[15,19]	Peru	49	[42,63]	Mauritius	81.5	[74,91]
Bosnia and Herzegovina	19.5	[16,21]	FYR Macedonia	49	[40,61]	New Zealand	83	[75,87]
Netherlands	19.5	[18,21]	Argentina	54	[50,61]	Mali	84	[79,86]
Georgia	21.5	[20,25]	Iceland	54	[50,58]	S. Vincent and the Grenadines	85.5	[82,88]
Serbia	21.5	[19,24]	Panama	54	[49,62]	Senegal	85.5	[80,90]
Finland	24	[22,26]	Spain	54	[48,66]	Dem. Rep. of the Congo	87	[83,89]
Romania	24	[22,25]	Uganda	54	[50,57]	Chile	88.5	[86,92]
Saudi Arabia	24	[20,28]	Cyprus	57	[49,63]	Colombia	88.5	[83,90]
Bulgaria	26.5	[25,28]	Armenia	59	[54,64]	Jamaica	90	[87,94]
Singapore	26.5	[23,29]	Canada	59	[49,68]	Liechtenstein	91.5	[85,92]
Greece	28	[26,28]	Ecuador	59	[54,63]	Nigeria	91.5	[86,92]
Latvia	29	[28,31]	Trinidad and Tobago	61	[55,62]	Congo (Rep. of the)	93	[92,96]
Oman	30	[29,31]	Botswana	63.5	[56,68]	India	94	[93,96]
Mexico	31	[29,32]	Costa Rica	63.5	[54,66]	Sao Tome and Principe	95	[93,99]
Austria	32	[32,35]	Saint Lucia	63.5	[56,66]	Bangladesh	96	[94,103]

Source: European Commission, Joint Research Centre, 2019

Table 2 out of 2. Countries with nominal ranks from 97 to 193

Countries	Rank	Interval	Countries	Rank	Interval	Countries	Rank	Interval
Tunisia	97	[93.95,107]	Samoa	130	[126,132]	Guatemala	162	[156,162]
Kyrgyzstan	98	[95,103]	Viet Nam	131	[126,135]	Nauru	163	[163,167]
Grenada	100.5	[96,104]	Cambodia	132	[127,135]	Equatorial Guinea	164	[161,165]
Nicaragua	100.5	[95,118]	Benin	133	[129,136]	Tonga	165	[163,173]
Niger	100.5	[96,104]	Angola	134	[131,139]	China	166	[159,167]
Zimbabwe	100.5	[97,106]	Burundi	135.5	[132,143]	Kiribati	167	[165,173]
Gambia	103	[99,109]	Cameroon	135.5	[133,139]	Guinea-Bissau	168.5	[165,169]
El Salvador	104	[99,114]	Myanmar	137	[133,148]	Saint Kitts and Nevis	168.5	[167,172]
Afghanistan	105	[99,107]	Fiji	139	[131,143]	Belarus	170	[165,171]
Dominica	107	[101,113]	Gabon	139	[134,140]	Palestine	171	[168,172]
Indonesia	107	[101,112]	Kuwait	139	[136,148]	Russian Federation	172.5	[169,173]
Japan	107	[97,123]	Belize	141	[136,153]	Timor-Leste	172.5	[170,177]
Sudan	109.5	[104,113]	Sri Lanka	142	[138,149]	Antigua and Barbuda	174	[169,174]
Zambia	109.5	[107,116]	Guyana	143.5	[140,146]	Lao P.D.R.	175	[175,182]
Israel	111	[103,126]	Seychelles	143.5	[135,153]	Monaco	176	[176,183]
Liberia	112.5	[105,120]	Côte d'Ivoire	145.5	[138,146]	Solomon Islands	177	[175,178]
South Africa	112.5	[104,117]	Paraguay	145.5	[140,148]	Bolivia	178	[174,178]
Vanuatu	114	[108,123]	Algeria	147	[141,148]	Cuba	179	[176,180]
Mauritania	115	[107,116]	Brunei Darussalam	148	[138,148]	Lebanon	180	[179,183]
Namibia	116	[108,123]	Suriname	149	[147,152]	Ethiopia	181	[178,181]
Azerbaijan	117	[109,126]	Eswatini	150	[148,158]	Eritrea	182	[179,182]
Mongolia	118.5	[115,122]	Haiti	151.5	[149,155]	Andorra	183.5	[183,187]
Qatar	118.5	[110,121]	Papua New Guinea	151.5	[151,155]	San Marino	183.5	[183,187]
Madagascar	120	[113,121]	Chad	153	[147,154]	Uzbekistan	185	[180,185]
Bhutan	121	[115,123]	Central African Rep.	154	[150,156]	Marshall Islands	186	[184,186]
Togo	122	[116,128]	Iraq	155	[150,167]	Tajikistan	187	[185,187]
Barbados	123	[116,126]	Mozambique	156	[146,157]	Yemen	188	[188,188]
Guinea	124	[119,128]	Sierra Leone	157	[156,160]	Tuvalu	189	[189,190]
Nepal	125	[120,134]	Syrian Arab Republic	158	[157,163]	Micronesia	190	[189,191]
Lesotho	126	[120,127]	South Sudan	159	[155,160]	Turkmenistan	191	[190,192]
Philippines	128	[123,131]	Kazakhstan	160	[156,162]	Djibouti	192.5	[191,193]
Somalia	128	[124,138]	Maldives	161	[160,163]	Libya	192.5	[192,193]
Uruguay	128	[124,130]						

Source: European Commission, Joint Research Centre, 2019

Annex IV. Values of the normalised pillars by country in 2018

Country	Sum of pillars (default)					Weighted mean of Pillars				
	P1	P2	P3	P4	Overall Score	P1	P2	P3	P4	Overall Score
Afghanistan	15	20	19	19.3	73.3	75	90.9	63.3	69	73.3
Albania	18	16	25	24	83	90	72.7	83.3	85.7	83
Algeria	18	16	16	11.5	61.5	90	72.7	53.3	41.1	61.5
Andorra	6	8	8	0	22	30	36.4	26.7	0	22
Angola	14	20	20	10.7	64.7	70	90.9	66.7	38.1	64.7
Antigua and Barbuda	8	11.5	8	13.3	40.8	40	52.3	26.7	47.6	40.8
Argentina	17	20	21	28	86	85	90.9	70	100	86
Armenia	19	19.5	20	27	85.5	95	88.6	66.7	96.4	85.5
Australia	19	21.5	26	28	94.5	95	97.7	86.7	100	94.5
Austria	18	16.5	28	27	89.5	90	75	93.3	96.4	89.5
Azerbaijan	8	13.5	24	25	70.5	40	61.4	80	89.3	70.5
Bahamas	19	18.5	26	25.3	88.8	95	84.1	86.7	90.5	88.8
Bahrain	17	18	26	26.3	87.3	85	81.8	86.7	94	87.3
Bangladesh	17	20	15	22.7	74.7	85	90.9	50	81	74.7
Barbados	17	12.5	18	21	68.5	85	56.8	60	75	68.5
Belarus	6	11.5	11	16	44.5	30	52.3	36.7	57.1	44.5
Belgium	18	19	30	27	94	90	86.4	100	96.4	94
Belize	17	18.5	20	7.3	62.8	85	84.1	66.7	26.2	62.8
Benin	16	16	21	12	65	80	72.7	70	42.9	65
Bhutan	15	20	16	18.3	69.3	75	90.9	53.3	65.5	69.3
Bolivia	9	9	8	8.5	34.5	45	40.9	26.7	30.4	34.5
Bosnia and Herzegovina	19	21	27	26	93	95	95.5	90	92.9	93
Botswana	18	22	19	26	85	90	100	63.3	92.9	85
Brazil	16	18.5	26	28	88.5	80	84.1	86.7	100	88.5
Brunei Darussalam	15	17	17	12.3	61.3	75	77.3	56.7	44	61.3
Bulgaria	19	16.5	28	28	91.5	95	75	93.3	100	91.5
Burkina Faso	19	19	20	26	84	95	86.4	66.7	92.9	84
Burundi	11	18	12	23	64	55	81.8	40	82.1	64
Cabo Verde	17	20	23	21.3	81.3	85	90.9	76.7	76.2	81.3
Cambodia	13	17	14	21.3	65.3	65	77.3	46.7	76.2	65.3
Cameroon	17	18	16	13	64	85	81.8	53.3	46.4	64
Canada	19	16.5	30	20	85.5	95	75	100	71.4	85.5
Central African Rep.	14	18	9	17	58	70	81.8	30	60.7	58
Chad	15	16	13	14.3	58.3	75	72.7	43.3	51.2	58.3
Chile	14	20	18	27	79	70	90.9	60	96.4	79
China	7	11	16	15	49	35	50	53.3	53.6	49
Colombia	15	15	22	27	79	75	68.2	73.3	96.4	79
Comoros	17	19	24	22.3	82.3	85	86.4	80	79.8	82.3
Congo (Rep. of the)	17	17	22	19.7	75.7	85	77.3	73.3	70.2	75.7
Costa Rica	19	16	26	24	85	95	72.7	86.7	85.7	85
Côte d'Ivoire	17	15.5	14	15.3	61.8	85	70.5	46.7	54.8	61.8
Croatia	19	19	28	28	94	95	86.4	93.3	100	94
Cuba	2	12	14	5	33	10	54.5	46.7	17.9	33
Cyprus	18	16	28	23.7	85.7	90	72.7	93.3	84.5	85.7
Czech Republic	17	17	30	25	89	85	77.3	100	89.3	89
Dem. Rep. of the Congo	14	20	20	25.3	79.3	70	90.9	66.7	90.5	79.3
Denmark	18	18	28	23.7	87.7	90	81.8	93.3	84.5	87.7
Djibouti	0	2.5	2	0	4.5	0	11.4	6.7	0	4.5
Dominica	11	15.5	20	26	72.5	55	70.5	66.7	92.9	72.5
Dominican Rep.	19	19.5	28	28	94.5	95	88.6	93.3	100	94.5
Ecuador	20	18.5	21	26	85.5	100	84.1	70	92.9	85.5
Egypt	15	20.5	21	24.3	80.8	75	93.2	70	86.9	80.8
El Salvador	19	14.5	14	26	73.5	95	65.9	46.7	92.9	73.5
Equatorial Guinea	13	15	13	9.3	50.3	65	68.2	43.3	33.3	50.3
Eritrea	8	11	4	2	25	40	50	13.3	7.1	25
Estonia	14	20	26	27	87	70	90.9	86.7	96.4	87
Eswatini	19	19	14	7.3	59.3	95	86.4	46.7	26.2	59.3

Country										
Ethiopia	7	12	8	2	29	35	54.5	26.7	7.1	29
Fiji	13	14	19	17	63	65	63.6	63.3	60.7	63
Finland	18	17	30	27	92	90	77.3	100	96.4	92
France	18	20	30	26	94	90	90.9	100	92.9	94
Gabon	15	17	16	15	63	75	77.3	53.3	53.6	63
Gambia	20	19	16	18.7	73.7	100	86.4	53.3	66.7	73.7
Georgia	18	16.5	30	28	92.5	90	75	100	100	92.5
Germany	16	20.5	30	27	93.5	80	93.2	100	96.4	93.5
Ghana	18	21	22	27	88	90	95.5	73.3	96.4	88
Greece	20	17	28	26.3	91.3	100	77.3	93.3	94	91.3
Grenada	14	17	20	23	74	70	77.3	66.7	82.1	74
Guatemala	12	12.5	10	18.7	53.2	60	56.8	33.3	66.7	53.2
Guinea	16	18	22	12.3	68.3	80	81.8	73.3	44	68.3
Guinea-Bissau	10	10	8	18	46	50	45.5	26.7	64.3	46
Guyana	18	18	15	11	62	90	81.8	50	39.3	62
Haiti	14	19.5	10	15	58.5	70	88.6	33.3	53.6	58.5
Honduras	17	19	26	20	82	85	86.4	86.7	71.4	82
Hong Kong, China	18	18.5	20	27.3	83.8	90	84.1	66.7	97.6	83.8
Hungary	19	22	28	28	97	95	100	93.3	100	97
Iceland	18	18	22	28	86	90	81.8	73.3	100	86
India	18	14.5	20	23	75.5	90	65.9	66.7	82.1	75.5
Indonesia	16	13.5	18	25	72.5	80	61.4	60	89.3	72.5
Iran	19	19	28	16	82	95	86.4	93.3	57.1	82
Iraq	17	21.5	16	3.3	57.8	85	97.7	53.3	11.9	57.8
Ireland	20	19	30	28	97	100	86.4	100	100	97
Israel	8	11.5	28	24	71.5	40	52.3	93.3	85.7	71.5
Italy	18	22	30	27.3	97.3	90	100	100	97.6	97.3
Jamaica	19	12.5	19	28	78.5	95	56.8	63.3	100	78.5
Japan	8	11.5	26	27	72.5	40	52.3	86.7	96.4	72.5
Jordan	19	20	24	21.5	84.5	95	90.9	80	76.8	84.5
Kazakhstan	6	10	14	24	54	30	45.5	46.7	85.7	54
Kenya	18	21.5	21	27	87.5	90	97.7	70	96.4	87.5
Kiribati	13	18.5	4	12	47.5	65	84.1	13.3	42.9	47.5
Korea (Rep. of)	18	22	20	21.7	81.7	90	100	66.7	77.4	81.7
Kuwait	20	19	12	12	63	100	86.4	40	42.9	63
Kyrgyzstan	16	16.5	16	26	74.5	80	75	53.3	92.9	74.5
Lao P.D.R.	0	12	17	7.7	36.7	0	54.5	56.7	27.4	36.7
Latvia	18	16.5	30	26	90.5	90	75	100	92.9	90.5
Lebanon	8	18	5	0.7	31.7	40	81.8	16.7	2.4	31.7
Lesotho	16	17.5	16	18.3	67.8	80	79.5	53.3	65.5	67.8
Liberia	17	20	22	12.3	71.3	85	90.9	73.3	44	71.3
Libya	2	2.5	0	0	4.5	10	11.4	0	0	4.5
Liechtenstein	14	14	24	26.3	78.3	70	63.6	80	94	78.3
Lithuania	19	21	28	27	95	95	95.5	93.3	96.4	95
Luxembourg	18	17	22	26	83	90	77.3	73.3	92.9	83
Madagascar	17	17.5	18	17	69.5	85	79.5	60	60.7	69.5
Malawi	18	22	20	27	87	90	100	66.7	96.4	87
Malaysia	18	22	24	23	87	90	100	80	82.1	87
Maldives	13	20	12	8.3	53.3	65	90.9	40	29.8	53.3
Mali	18	18	18	26.3	80.3	90	81.8	60	94	80.3
Malta	19	20	28	28	95	95	90.9	93.3	100	95
Marshall Islands	2	6.5	4	3	15.5	10	29.5	13.3	10.7	15.5
Mauritania	17	19	18	17	71	85	86.4	60	60.7	71
Mauritius	18	20.5	15	27.3	80.8	90	93.2	50	97.6	80.8
Mexico	19	17	26	28	90	95	77.3	86.7	100	90
Micronesia	0	4	4	0	8	0	18.2	13.3	0	8
Moldova	19	17.5	26	26	88.5	95	79.5	86.7	92.9	88.5
Monaco	0	15	8	12	35	0	68.2	26.7	42.9	35
Mongolia	18	19	18	14.7	69.7	90	86.4	60	52.4	69.7
Montenegro	19	19	28	28	94	95	86.4	93.3	100	94
Morocco	18	19.5	24	27	88.5	90	88.6	80	96.4	88.5

Mozambique	16	10.5	16	15.2	57.7	80	47.7	53.3	54.2	57.7
Myanmar	6	17	17	23.7	63.7	30	77.3	56.7	84.5	63.7
Namibia	19	17	22	12.7	70.7	95	77.3	73.3	45.2	70.7
Nauru	10	11.5	6	23	50.5	50	52.3	20	82.1	50.5
Nepal	18	17	11	22	68	90	77.3	36.7	78.6	68
Netherlands	19	18	28	28	93	95	81.8	93.3	100	93
New Zealand	17	13.5	22	28	80.5	85	61.4	73.3	100	80.5
Nicaragua	18	18	12	26	74	90	81.8	40	92.9	74
Niger	15	20	20	19	74	75	90.9	66.7	67.9	74
Nigeria	17	20	20	21.3	78.3	85	90.9	66.7	76.2	78.3
Norway	20	18.5	30	27	95.5	100	84.1	100	96.4	95.5
Oman	17	19	28	26.3	90.3	85	86.4	93.3	94	90.3
Pakistan	20	19	22	27	88	100	86.4	73.3	96.4	88
Palestine	4	11.5	13	13.7	42.2	20	52.3	43.3	48.8	42.2
Panama	19	21	20	26	86	95	95.5	66.7	92.9	86
Papua New Guinea	16	19.5	12	11	58.5	80	88.6	40	39.3	58.5
Paraguay	18	15.5	12	16.3	61.8	90	70.5	40	58.3	61.8
Peru	18	13	28	28	87	90	59.1	93.3	100	87
Philippines	16	12	17	22	67	80	54.5	56.7	78.6	67
Poland	16	17.5	28	27	88.5	80	79.5	93.3	96.4	88.5
Portugal	19	18	30	27	94	95	81.8	100	96.4	94
Qatar	14	18	21	16.7	69.7	70	81.8	70	59.5	69.7
Romania	18	19	28	27	92	90	86.4	93.3	96.4	92
Russian Federation	4	11	13	14	42	20	50	43.3	50	42
Rwanda	20	20	18	24.3	82.3	100	90.9	60	86.9	82.3
Saint Kitts and Nevis	5	15	6	20	46	25	68.2	20	71.4	46
Saint Lucia	16	18	24	27	85	80	81.8	80	96.4	85
Saint Vincent and the Grenadines	17	18	18	27	80	85	81.8	60	96.4	80
Samoa	14	17	22	13.3	66.3	70	77.3	73.3	47.6	66.3
San Marino	0	4	2	16	22	0	18.2	6.7	57.1	22
Sao Tome and Principe	16	17	21	21	75	80	77.3	70	75	75
Saudi Arabia	19	22	29	22	92	95	100	96.7	78.6	92
Senegal	19	19	24	18	80	95	86.4	80	64.3	80
Serbia	20	19.5	26	27	92.5	100	88.6	86.7	96.4	92.5
Seychelles	6	12	16	28	62	30	54.5	53.3	100	62
Sierra Leone	16	19	14	7	56	80	86.4	46.7	25	56
Singapore	17	21.5	26	27	91.5	85	97.7	86.7	96.4	91.5
Slovakia	15	18.5	28	26.7	88.2	75	84.1	93.3	95.2	88.2
Slovenia	20	18.5	28	27	93.5	100	84.1	93.3	96.4	93.5
Solomon Islands	9	14	8	3.7	34.7	45	63.6	26.7	13.1	34.7
Somalia	14	19	10	24	67	70	86.4	33.3	85.7	67
South Africa	17	17	24	13.3	71.3	85	77.3	80	47.6	71.3
South Sudan	12	17	12	13.7	54.7	60	77.3	40	48.8	54.7
Spain	16	14	28	28	86	80	63.6	93.3	100	86
Sri Lanka	18	20	15	9.3	62.3	90	90.9	50	33.3	62.3
Sudan	15	20	18	18.7	71.7	75	90.9	60	66.7	71.7
Suriname	15	17	18	9.7	59.7	75	77.3	60	34.5	59.7
Sweden	19	20	24	26	89	95	90.9	80	92.9	89
Switzerland	18	18.5	30	27	93.5	90	84.1	100	96.4	93.5
Syrian Arab Republic	19	15	15	6.3	55.3	95	68.2	50	22.6	55.3
Tajikistan	2	6	2	4	14	10	27.3	6.7	14.3	14
Tanzania	20	21	19	25	85	100	95.5	63.3	89.3	85
Thailand	20	19.5	22	19.8	81.3	100	88.6	73.3	70.8	81.3
FYR Macedonia	18	20	30	19	87	90	90.9	100	67.9	87
Timor-Leste	13	21	3	5	42	65	95.5	10	17.9	42
Togo	15	22	20	12	69	75	100	66.7	42.9	69
Tonga	1	11	15	22.7	49.7	5	50	50	81	49.7
Trinidad and Tobago	18	19	22	26.3	85.3	90	86.4	73.3	94	85.3
Tunisia	19	16	25	14.7	74.7	95	72.7	83.3	52.4	74.7
Turkey	19	19.5	30	26	94.5	95	88.6	100	92.9	94.5
Turkmenistan	0	6	0	1.7	7.7	0	27.3	0	6	7.7

Tuvalu	0	4.5	0	5	9.5	0	20.5	0	17.9	9.5
Uganda	17	20	22	27	86	85	90.9	73.3	96.4	86
Ukraine	17	17.5	23	24	81.5	85	79.5	76.7	85.7	81.5
United Arab Emirates	19	21	27	16	83	95	95.5	90	57.1	83
United Kingdom	20	20	28	27	95	100	90.9	93.3	96.4	95
United States	19	17.5	28	24	88.5	95	79.5	93.3	85.7	88.5
Uruguay	17	17	20	13	67	85	77.3	66.7	46.4	67
Uzbekistan	7	6.5	2	6.3	21.8	35	29.5	6.7	22.6	21.8
Vanuatu	17	14.5	14	25.7	71.2	85	65.9	46.7	91.7	71.2
Venezuela	20	21.5	16	25	82.5	100	97.7	53.3	89.3	82.5
Viet Nam	10	19	24	13	66	50	86.4	80	46.4	66
Yemen	0	3	4	4	11	0	13.6	13.3	14.3	11
Zambia	19	18	15	19.7	71.7	95	81.8	50	70.2	71.7
Zimbabwe	20	19	18	17	74	100	86.4	60	60.7	74

Source: European Commission, Joint Research Centre, 2019

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