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Wrapping up the Europe 2020 strategy: A multidimensional indicator analysis

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ABSTRACT

The Europe 2020 Strategy was launched by the European Commission in 2010 to promote smart, sustainable, and inclusive growth across EU member states. As the strategy draws to a close in 2020 and is superseded by the Sustainable Development Goals and the Green Deal, this work aims to assess the progress made over the last decade, and to carry forward lessons for future endeavours. A composite indicator approach is adopted, which aggregates the distance of each country or region to politically-agreed targets. This allows a high-level summary of progress, but also examines detailed trends at national and regional levels, as well as by degree of urbanisation and by development. The results show that although the EU has moved forward as whole, some regions have lagged behind or even moved backwards, and within some countries, regions are moving further away from one another. Progress has been particularly strong in education, but more work is needed in the environmental dimensions.

1. Introduction

1.1. The EU2020 strategy

In 2010, José Manuel Barroso launched the European Commission's *Europe 2020 Strategy* in the wake of the 2008 financial crisis, and as a successor to the Lisbon Strategy. The strategy, consisting of measurable targets and underlying proposals, aimed to promote "smart, sustainable, and inclusive" growth across the 28 EU member states[1] (European Commission, 2010).

The Europe 2020 Strategy (hereafter 'EU2020') identified eight headline targets, accompanied by measurable indicators, to be attained by the end of 2020, involving employment, research and development, climate and energy, education; and social inclusion and poverty reduction—see Table 1. EU Cohesion Policy is also linked to the Europe 2020 strategy, as the former provides the investment framework to meet the defined goals.

The EU-level targets in each indicator were also complimented by national targets, which are adaptions of EU-level targets that are realistically attainable given each member state's particular circumstances. In general, countries that are further from EU targets have lower national targets, and vice versa. Indeed, some countries have actually set targets higher than the EU values (see Appendix for more details).

Since 2010, the EU2020 strategy has been one of the guiding stars behind European policy-making. In recent years, it has been complemented and perhaps overshadowed by the Sustainable Development Goals (SDGs). The SDGs are a set of 17 global goals designed to achieve a 'better and more sustainable future for everybody', which were adopted in a UN General Assembly in 2015 and to be achieved by the year 2030 (United Nations General As, 2015). However, the SDGs are based on many of the same principles as the EU2020 strategy, including reducing poverty, improving education, and tackling climate change.

The SDGs were accompanied by an official global set of 231 indicators which were agreed on in a UN resolution (United Nations General As, 2017); since then the number has increased to 247, including some repetitions. These indicators were intended to be a basis for regional and national systems of monitoring. However, many have poor data coverage, and in practice, national and regional statistical offices have adopted a streamlined subset, with modifications appropriate to the national/regional context. The EU has its own set of SDG indicators

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[1] At the time of writing, the UK was a member of the EU. Since the EU2020 strategy included the UK for almost its entire duration, and this is a retrospective study, it will be included as a member state in this paper.

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Table 1
EU2020 Objectives, corresponding policy areas and acronyms. SDG numbers refer to the use of these indicators in the official EU Sustainable Development Goals monitoring system.

Policy Area	No.	Objective	Acronym	SDG in EU monitoring system
Employment	1	75% of 20–64 year-olds to be employed	EMP	8
R&D	2	3% of EU GDP to be invested in R&D	R&D	9
Climate change and energy sustainability	3	Greenhouse gas emissions 20% (or even 30%, if the conditions are right) lower than 1990	GHG	13
	4	20% of energy from renewables	REN	7
	5	20% increase in energy efficiency compared to 2005	EFF	7
Education	6	Reducing the rates of early school leaving below 10%	ESL	4
	7	At least 40% of 30–34-year-olds completing tertiary education	TERT	4
Fighting poverty and social exclusion	8	At least 20 million fewer people in or at risk of poverty and social exclusion	AROPE	1

which are reported on an annual basis (European Commission, 2020), and these can be directly mapped onto the EU2020 indicators (see again Table 1). The EU SDG indicators include seven of the eight EU2020 indicators.

More recently, the EU announced its "Green Deal", which aims for a carbon-neutral society by 2050 (European Commission, 2019). While this focuses on the environmental dimension of sustainable development, it also aims for a "just and inclusive transition", and to generate jobs by supporting industry and the green economy. Therefore, both the Green Deal and the SDGs have considerable overlap with the preceding EU2020 strategy.

The EU2020 strategy, the SDGs and the Green Deal all have a notion of inclusiveness at their core, although the meaning differs to some extent. The EU2020 strategy aimed for "inclusive growth, fostering a high-employment economy delivering social and territorial cohesion" (European Commission, 2010). This implies growth for all regions of the EU, as well as pursuing gender equality and equality for older citizens, although none of the indicators explicitly measure these concepts (they can however be disaggregated in some cases). The SDGs, on the other hand, put the concept of "leaving no one behind" at the heart of its agenda, and two of the SDGs explicitly target these concepts—SDG5 (gender equality) and SDG 10 (reduced inequalities). The inclusive element of the Green Deal is a little harder to pinpoint, but includes a "Just Transition Mechanism" which aims to support transitions in carbon-intensive regions with greater socioeconomic challenges (European Commission, 2019).

With the ten-year period of the EU2020 strategy drawing to a close (at the time of writing, in early 2020), it is interesting to take stock of the progress made towards the targets set in 2010. Despite being superseded by the SDGs and the Green Deal, the strategy is still highly relevant since it is used for setting the targets in assessing sustainable development within the European Union (Statistical Office of the, 2019). But the picture is complex: the situation varies considerably between one country and the next, even more so at the regional level. Has growth really been "inclusive", as the strategy set out to achieve? Where does more work need to be done, and what lessons can be learned, looking forward to the SDG targets of 2030?

Tools already exist to monitor progress towards EU2020 targets at the national level - see for example (Pasimeni, 2013), (Rappai, 2016) covering EU countries and (Çolak and Ege, 2013) which additionally includes candidate member states. Extensions to these indexes have investigated progress relative to country groups, targets and best performers in (Walheer, 2018), and in (Pasimeni and Pasimeni, 2016) the effects of institutions on progress towards EU2020 targets was analysed. Notably, however, no studies can be found in the literature which examine progress towards EU2020 targets at the sub-national level. As this study demonstrates, there can be a huge heterogeneity between regions inside the same country, and this information is crucial in helping direct investment and building effective cohesion policies.

This paper aims to examine the progress made towards EU2020 targets using composite indicator approach. The "EU2020 Index" summarises progress towards EU2020 targets at the national and regional (NUTS2) levels, as well as at examining trends with respect to degrees of development and urbanisation. It is calculated covering the whole period of the EU2020 strategy, from 2010 to 2018, with later years still unavailable due to data limitations.

1.2. Composite indicators

Composite indicators are aggregations of measurable indicators which aim to quantify concepts that are not directly measurable, such as financial secrecy (Cobham et al., 2015), human development (United Nations Development Programme, 2015), or climate hazards (Lung et al., 2013). They allow the identification of overall trends, and have the advantage of being easily conveyed to non-specialists, such as policy-makers and the general public, in the form of rankings and maps which facilitate easy comparisons of countries, regions or institutions.

Due to their simplicity, composite indicators feature in the media and can have a strong impact on public perception and policy (Kelley and Simmons, 2015). The number of composite indicators has increased rapidly in recent years—partial inventories can be found in (Bandura, 2008) and (Yang, 2014). However, composite indicators are mainly communication tools, or can be considered as "access points" to a hierarchical set of indicator data, rather than decision-making tools in their own right.

The construction of composite indicators is a delicate process because it involves a number of subjective decisions—this means that scores and rankings are not objective but are dependent on the assumptions made in the construction of the index. Composite indicator guidelines stress that the assumptions and uncertainties used in their construction should always be made clear, with ideally all data and processing being made publicly available (Handbook on Constru, 2008).

Since the EU2020 strategy is built around headline indicators, a composite indicator approach is a natural way to summarise overall progress. As this work shows, it allows a relatively simple starting point for making sense of a complex spatiotemporal data set. The present EU2020 Index is built to follow best practices is composite indicator development, and includes a discussion and quantification of uncertainty.

The approach here is to use a straightforward methodology that can be easily applied and understood. The methodology is in a similar vein to the Regional Lisbon Index by DG REGIO (Dijkstra, 2010), which was designed to measure regional performance in meeting the goals set forth by the 2000 Lisbon Treaty. In their index, Regional performance in a particular indicator was measured via the ratio of its distance to the target over the maximum such distance across all regions. The Lisbon Index was then calculated as the simple average of performance across indicators and particular attention was paid to intuitiveness and consistency.

The EU2020 Index follows a similar approach: the progress of each geographical entity towards meeting an individual goal is measured via the (appropriately normalised) distance between the value of the respective indicator and its target. Subsequently, the Europe 2020 Index

score is calculated by considering a weighted arithmetic average of these percentage shortfalls over the set of all indicators.

This paper is structured as follows. In Section 2 the framework that is common to all four versions of the EU2020 Index (national, regional, and by degrees of development and urbanisation) is described, including indicators, data, targets and construction. Sections 3 to 6 then present the results, along with specific methodological notes for each version of the index. Finally, Section 7 gives an overall discussion and conclusions of the work.

2. A general framework for the EU2020 index

This section presents the underlying general framework of the EU2020 Index. In the following, acronyms are used to denote each indicator as shown in Table 2. The four versions of the EU2020 index will also hereafter be referred to as the "national", "regional" (at NUTS 2[2]level), "DDev" (by degree of development) and "DUrb" (by degree of urbanisation) indexes, for the sake of conciseness.

2.1. Indicators and data availability

The availability of data differs from one indicator to the next: this is summarised in Table 3, as well as the data sources used. The table uses a simple rating system to rate the completeness of the data set. "Complete" means that there are no missing data entries from 2010 up to the year stated. "Good" means the same, but that there are some few exceptions. "Fair" means that there are a more substantial number of exceptions. This is meant as an overview to outline the completeness of the data underpinning each version of the index; greater details are given in the following sections.

From the table it is evident that the national index has very good data coverage in all eight indicators, whereas the other indexes have poorer data availability. The regional and DDev indices both have five indicators available, but lack all three of the environmental indicators (arguably, these are anyway less meaningful at the sub-national level). The DUrb index additionally has no data on the R&D indicator. In terms of data quality, the DUrb index has quite good coverage in its available indicators, while the regional and by DDev indexes have good to fair coverage. This should be kept in mind when drawing conclusions from the results.

The GHG data is a special case in that the measurement of emissions is divided into two categories: Emissions Trading Scheme (ETS) emissions, and non-ETS "Emissions Sharing Directive" (ESD) emissions. ETS emissions data is taken from the European Environment Agency (EEA, 2016) and excludes emissions from aviation since they are only available from 2012 onwards, however they only account for around 3% of the total (considering direct emissions only). ESD emissions are taken from Eurostat. The ETS and ESD indicators are combined by taking the weighted distance of each to its respective target, with weightings of 45% and 55% respectively, representing the proportional contributions of each to the EU total emissions.

Where data was missing for a given region, a sensible imputation procedure was adopted. If data was not available for a particular year, the latest available year was used. In some particular regions, data was not available at the NUTS2 level, and this was proxied by NUTS1 data.

Some indicators were also adjusted to account for time effects. Table 4 summarises these adjustments: ESL and TERT both use a three-year average centred on the index year, whereas AROPE uses one year ahead of the index year. For instance, the EU2020 Index for year 2016 would use 2015–2017 averages for education (ESL and TERT) data, 2017 poverty and social exclusion data, and all other indicator data from 2016. The consideration of a three year moving average for ESL and TERT was pursued in light of many regions' small sample sizes for these indicators.

[2] The current NUTS 2016 classification valid from 2018 has been used.

Table 2
EU2020 indicators and abbreviations.

1. Percentage of 20–64 year-olds in employment (EMP)
2. Percentage of GDP invested in R&D (R&D)
3. Greenhouse gas emissions, percentage of 2005 value (GHG)
4. Percentage of energy from renewable sources (REN)
5. Percentage primary energy consumption compared to 2005 (EFF)
6. Percentage 18–24 year olds with at most lower secondary education (ESL)
7. Percentage of 30–34 year-olds with completed tertiary education (TERT)
8. Percentage population at risk of poverty or social exclusion (AROPE)

Table 3
Data availability and sources of EU2020 indicators.

	Source	Data Availability			
Indicator		National	Regional	DUrb	DDev
EMP	Eurostat	To 2018, complete	To 2018, good	To 2018, good	To 2018, good
R&D	Eurostat	To 2017, complete	To 2016, fair	No data	To 2016, fair
GHG	Eurostat, EEA[a]	To 2018,2017, good	No data	No data	No data
REN	Eurostat	To 2017, complete	No data	No data	No data
EFF	Eurostat	To 2018, complete	No data	No data	No data
ESL	Eurostat	To 2018, complete	To 2018, good	To 2018, good	To 2018, good
TERT	Eurostat	To 2018, complete	To 2018, good	To 2018, good	To 2018, good
AROPE	Eurostat	To 2018, complete	To 2018, fair	To 2018, good	To 2018, fair

[a] European Environment Agency.

The one-year look-ahead convention for AROPE was adopted to accommodate the temporal structure of the EU-SILC survey from which these data are drawn.

2.2. Targets

Each of the EU2020 indicators comes with an overall EU-level target, as given in Table 1. However, there also exist national targets which were created to accommodate the heterogeneity of EU28 countries (Mayer, 2018). This was done for a majority of country-indicator pairs (by the member countries themselves), but not for all. Notably, the UK lacks employment, R&D, education, and poverty targets, while a handful of other countries lack targets in R&D and poverty reduction. In general, Member States selected lower national targets when the distance to the EU target was great. Only the Nordic Member States, Austria and the Netherlands set most targets higher. Nevertheless, the distance to national targets remained higher for the member states far removed from the EU targets, than for the ones close to them. Note that no targets are available at the regional level.

The energy efficiency indicator is a special case with a more complex target. Whereas other indicators have percentage targets which can be easily applied to individual member states, the energy efficiency target is

Table 4
Construction of Europe (2020) index for a year X.

	Year
EU 2020 Index	X
EMP	X
R&D	X
GHG	X
REN	X
EFF	X
ESL	Average of $\{X\text{-}1, X, X+1\}$
TERT	Average of $\{X\text{-}1, X, X+1\}$
AROPE	$X+1$

relative to a projection made in 2007: it requires a 20% reduction in primary energy consumption (PEC) from 2005 values relative to a "business as usual" projection with no targeted policy measures in place (European Commission and Statistical Office of the European Union, 2019). At the EU level, this translates to an actual reduction of 13.4% compared to 2005 values. However, this percentage cannot be applied to all member states since each has a different projection associated with it. As a result, individual target values are used for each country, obtained from Eurostat data tables. This is therefore the only indicator with individual targets for each country, even in the index constructed with EU targets.

In the large majority of this paper, the EU-level targets are used, to allow a clear comparison between countries. Arguably, even though countries started at very different points in 2010, Europeans should be entitled to the same standards in these key issues. However, some comparison is also given with national targets with the national-level index. For more details on national targets, including imputation issues, please see the Appendix.

2.3. Constructing the index

In this section, we describe the methodology we used to calculate the index. Specifically, we provide a brief description of its mathematical structure and discuss issues related to outlier treatment.

2.3.1. Normalisation

Consider a region r (which may also denote a country in the national index) and a set of I indicators $x_1, x_2, \ldots, x_I$. For each indicator, define the constant f_i to equal 1 if higher values correspond to better performance, and -1 if they correspond to worse performance. The variables T_{ri} and x_{ri} denote region r's target and performance with respect to the ith indicator. The set of targets for a region r is denoted by the I-dimensional vector $T_r = (T_{r1}, T_{r2}, \ldots, T_{rI})$, and its actual performance in all indicators by the vector $(x_{r1}, x_{r2}, \ldots, x_{rI})$.

Focusing on indicator i, the variable d_{ri} denotes the distance between a region r's performance relative to its target (with no extra "points" awarded if the target is met):

$$d_{ri} = \max(f_i(T_{ri} - x_{ri}), 0). \tag{1}$$

The distances d_{ri}, $r = 1, \ldots, R$ are now normalised by the 95th percentile of distances over all R regions in indicator i, denoted as $P_{95,r\in R}(d_{ri})$. The 95th percentile is used rather than the maximum distance to adjust for the effect of outliers. This normalised value y_{ri} is therefore defined as:

$$y_{ri} = \max\left[1 - \frac{d_{ri}}{P_{95,r\in R}(d_{ri})}, 0\right], \tag{2}$$

where the subtraction from one is used to ensure that smaller distances to the target score higher. The above quantity ranges between a minimum of 0, if region r has the greatest distance-to-target with respect to indicator i, and a maximum of 1, if it meets or exceeds the target. Clearly, higher values imply better performance.

Importantly, the normalisation of distances to target (i.e., the denominator in the expression of y_{ri}) was done by considering the all distances in that indicator over all available years (2010–2017) and with respect to both national and EU-level targets. This ensures comparability over time and over both types of target.

2.3.2. Weights and aggregation

Suppose now that each indicator i is assigned a weight of $w_i \geq 0$, such that $\sum_{i=1}^{I} w_i = 1$. This is the standard approach to aggregating variables in a composite indicator (Handbook on Constru, 2008). Taking a weighted arithmetic average over the set of all indicators yields the total performance $y_r(w)$, of region r:

$$\text{EU2020}_r = y_r(w) = \sum_{i=1}^{I} w_i y_{ri}. \tag{3}$$

This quantity is bounded below by 0 and above by 1, with higher values implying better performance. Given a set of weights, the quantity $y_r(w)$ is therefore the EU2020 Index value for a region r. This approach is reminiscent of (though distinct from) scholarly contributions in the measurement of different multidimensional phenomena involving thresholds and cut-off points, such as poverty (Alkire and Foster, 2011).

The weights used in all versions of the EU2020 index are derived from the idea of equal weighting over policy areas. Looking back at Table 1, one can see that some policy areas have one associated indicator, whereas others have two or three. Each policy area is weighted equally in the index, so that if a policy area contains more than one indicator, the weight of that policy area is equally divided between its indicators. To clarify via an example, for the NUTS2 regional index, the available indicators were EMP, R&D, ESL, TERT, and AROPE. To reflect balance across policy areas, the component scores of indicators EMP, R&D and AROPE were assigned weights of 0.25 each (given that each uniquely represents a policy area), while a weight of 0.125 was assigned each to ESL and TERT (which both contribute to the same policy area). An alternative weighing scheme using equal weights for all indicators is investigated in Appendix B, and the impacts of this methodological choice are noted in the conclusions of the study.

2.4. Uncertainty

Composite scores and rankings are by their nature uncertain, because they involve necessarily subjective choices regarding the methodology of their construction. That said, the EU2020 index is in many ways less uncertain than most composite indicators, because the starting point is a set of politically-agreed indicators and targets. Thus, there is no ambiguity in which indicators to include or exclude, or how to structure the index.

Nevertheless, a number of methodological uncertainties remain in the construction and weighting of the index. To explore this uncertainty, a simple sensitivity analysis is performed in Appendix B, investigating two key choices: an alternative weighting scenario using equal weights across indicators, and the effect of excluding EFF (which is based on somewhat unclear targets). The results show that the weighting does have a significant impact on the results, although top and bottom-ranked countries remain fairly stable. Excluding EFF, on the other hand, has only a very minor impact on the results.

Additionally, in a separate study a full global sensitivity analysis was performed, along the lines discussed in (Saisana et al., 2005). A Monte Carlo analysis was applied which randomly explored the effect of changing weights within plausible bounds (±20% in this case), and assigning different five different possible aggregation methods. This analysis generated 1500 alternative rankings.

At the regional level, it was found that nominal EU2020 scores are always within the 95% confidence intervals established by the 1500 Monte Carlo rankings. Of the 250+ NUTS2 regions, most have fairly narrow confidence intervals, within 10 places (of 281), which implies a relatively robust ranking. The full details of this latter uncertainty and sensitivity analysis can be found in a European Commission technical report on the EU2020 Index in (Athanasoglou and Dijkstra, 2014).

3. National-level analysis

The national index is the most complete in terms of representing EU2020 objectives, consisting of all eight indicators, all of which have good data coverage. Exceptions are R&D and REN, where data are missing for 2018, Croatia has no AROPE data for 2009 and France has no R&D data for 2017. Furthermore, some GHG data is missing for some

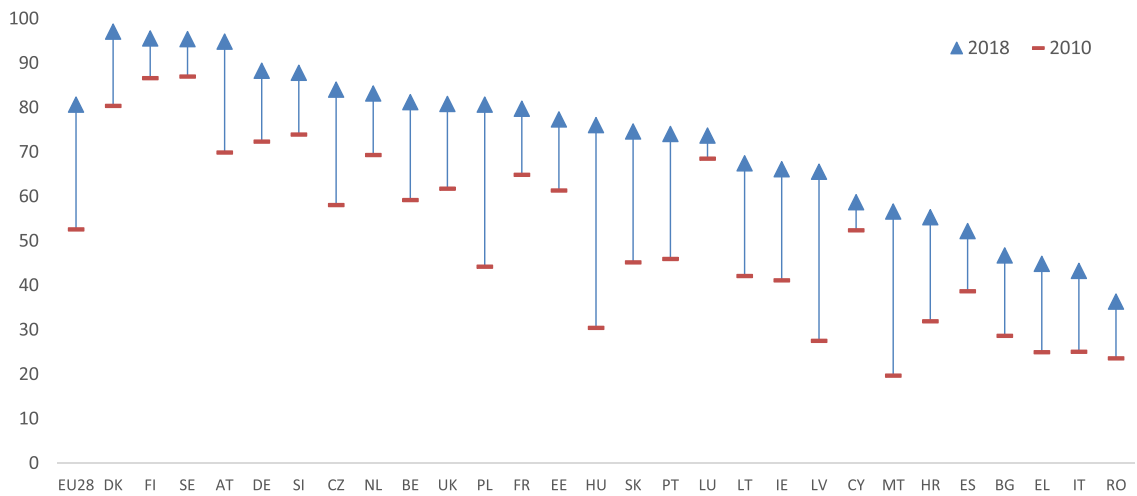

Fig. 1. National EU2020 Index, showing changes from 2010 to 2018, using EU targets and sorted by 2018 values.

years for Bulgaria, Croatia, and Romania. Imputed values were taken from the nearest known year.

The national index is the only version of the EU2020 index which includes the GHG and EFF indicators. The former is actually a weighted distance to targets of ETS and ESD emissions, as described in Section 2.1. Notably, individual ETS and ESD distances to targets are not allowed to be negative in the weighted average, so surpassing the target in one will not compensate for a shortfall in the other.

The results at the national level are shown in Fig. 1. Scores are taken with respect to EU targets, as opposed to national targets: this allows a clearer comparison between countries. In these figures, a value of 100 means that a country has reached or surpassed all of the EU2020 targets.

The overall picture is familiar: while no single country has met all EU-level targets, Scandinavian countries such as Denmark, Finland and Sweden have the highest scores, while southern and eastern countries, such as Greece, Italy and Romania, have the lowest. Both Greece and Italy have low employment rates (59.5% and 63% respectively in 2018), but Greece also has high poverty levels (31.8% in 2018), whereas Italy has particularly low scores on tertiary graduates (27.8% in 2018) and a relatively large number of early school leavers (14.5% in 2018).

Of particular interest is how countries have progressed over 2010–2018: while all countries have made overall progress, some have progressed relatively little. One such case is Sweden, but this is because it had anyway reached most EU targets in 2010 (except REN, GHG and EFF) and in 2018 was only short on GHG and EFF. Luxembourg also stands out in this respect, with very little progress over the 9-year period. While it had already achieved ESL and TERT targets in 2010, its R&D expenditure has dropped (from 1.62% in 2010 to 1.26% in 2017), and the percentage of people at risk of poverty or social exclusion has actually increased from 17.8% to 21.5% over the same period. This fact is perhaps particularly notable given that Luxembourg has the highest GDP per capita of any EU member state.

In contrast, Hungary, Latvia and Poland have shown dramatic progress (46, 38 and 37 points respectively), with notable improvements in employment rate and poverty reduction for all three of these countries. The EU as a whole has also made a 28 point increase since 2010.

How is the distance to EU2020 targets linked to national wealth? Fig. 2 shows plots of EU2020 index scores in 2018 against GDP per capita (GDPpc). This shows that EU2020 scores are indeed closely linked to wealth (correlation = 0.66, $p < 0.001$), with the exception of two outliers: Ireland and Luxembourg. These are the top two countries in GDPpc, but only have middling ranks on the EU2020 Index. This indicates that these two countries could get more for their money. On the other hand, countries such as Poland, Czechia and Slovenia do relatively well, being well above the average score given their GDPpc.

Finally, although the focus of this work is on EU-level targets, it is helpful to compare results with those obtained using national targets: this is shown in Fig. 3. Here the picture is somewhat different - Czechia has the highest score of 96.5, having achieved its *national* targets in five of eight indicators (except early school leavers, energy efficiency and greenhouse gas emissions). At the other end, Luxembourg again stands out, this time because it is the furthest from its national targets of any EU country, and has only achieved one of its seven EU2020 national targets.

Particularly significant differences between the scores with respect to national and EU targets are Croatia, and Latvia (which are respectively 20 and 15 places lower in the EU-targets index than the national-targets index), and France and Finland (which are respectively 12 and 14 places higher). In the case of Croatia, this difference is due to the fact that it has a particularly low national target for employment rate (62.9%, the lowest in the EU), as well as lower (or higher in the case of AROPE and GHG) national targets in all other indicators except for early school leavers. On the other hand, France and Finland have equal or more ambitious targets in all indicators.

4. Regional differences

National scores represent the average state of progress in each country, but this can obscure significant and important differences at the sub-national level. The regional EU2020 index examines progress at the NUTS2 level (being the most granular data available), in all 281 regions in member states of the EU. At this level of resolution, the data availability is poorer and GHG, EFF and REN indicators are not present in the index. This means that the index does not include any of the environmental objectives. Of the indicators that are available, R&D and AROPE have some significant gaps in data coverage. At the time of writing, 2018 data for R&D was not available at all, and so was proxied using 2016 data. AROPE data had slightly better coverage, but still around half of countries, including Belgium, Germany, France and the UK, had only national-level data. The other three indicators (EMP, ESL and TERT) all had fairly good coverage, with an occasional imputation necessary.

Fig. 4 shows the regional index results in 2018 with respect to EU targets. It shows that the best-performing regions in the EU are the capital regions of Sweden,[3] Finland and two regions[4] in Germany, while the worst performing regions are in Spain, Italy, Bulgaria and Romania. Italy

[3] Two other regions in Sweden score the maximum value of 100, East-Central Sweden and West Sweden.

[4] Stuttgart and Upper Bavaria.

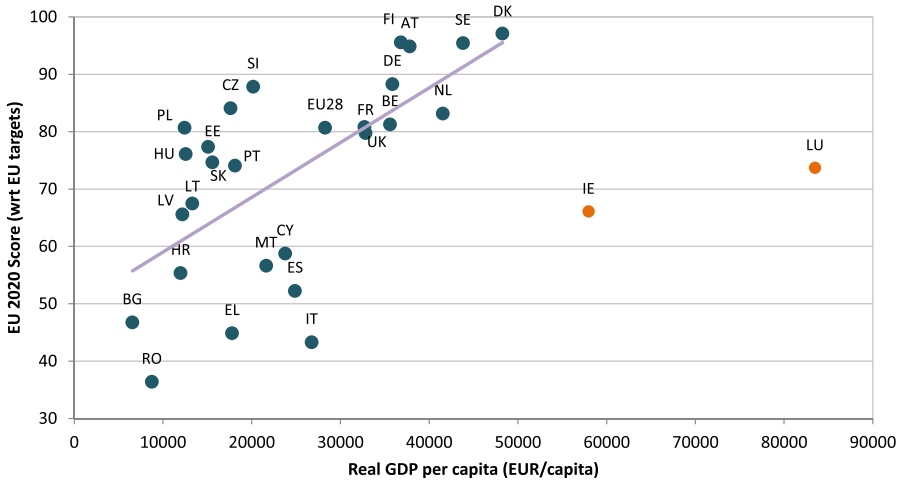

Fig. 2. EU2020 Index scores with respect to EU targets, against real GDP per capita in 2018. Trend line excludes Ireland and Luxembourg.

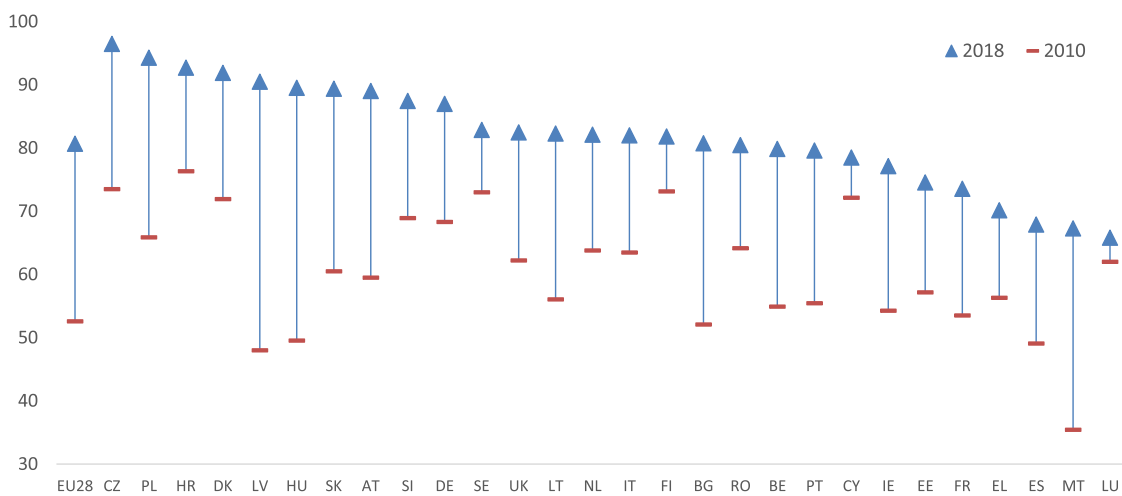

Fig. 3. National EU2020 Index using national targets, sorted by 2018 values.

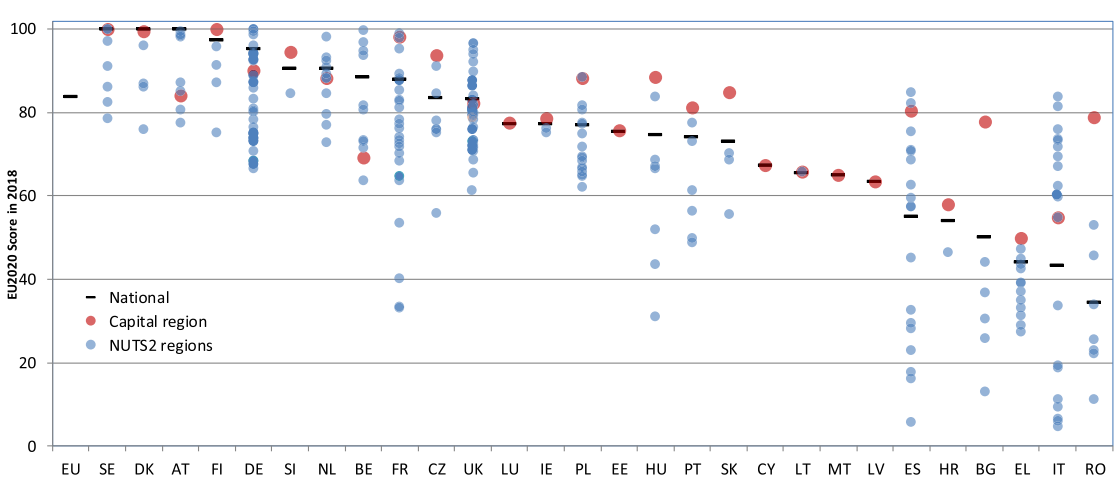

Fig. 4. Regional EU2020 index 2018 with respect to EU targets.
Note: NUTS2 regions are illustrated as blue circles, capital regions as red circles and national values as black lines. The countries are sorted by national scores (using the same limited set of indicators used at the regional level). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

in particular has several regions with scores below 20.

The capital region tends to be the one of the highest scoring regions in each country, in particular for East-European countries such as Romania and Bulgaria, whose capital regions are comparable with the national average of Germany or the UK. However, a number of West-European countries have a capital region with a score which is only around the national average, and Belgium stands out in that its capital region is one of the lowest-scoring in the country.

It is also clear that some countries have a considerably greater spread in EU2020 scores across their regions than others, and this can also be a source of feelings of discontent and unfairness in certain regions. Italy has the highest variance in EU2020 score over its regions of any EU country, and also the widest range, with scores ranging from only 4.5 in Sicily to 83.8 in Emilia Romagna. Spain, France and Hungary also stand out in this respect, but to a lesser degree.

Examining differences in scores at the regional level from 2010 to 2018, the large majority (88%) of NUTS2 regions have made positive progress – see Fig. 5. Particularly large strides have been made by regions in Hungary, Malta and Latvia, which have seen increases of 30+ points in EU2020 scores. At the other end, however, a number of regions have gone backwards, mainly in Northern Europe, including regions in Sweden, Germany and Finland. As Fig. 5 shows, regions with negative progress include those with relatively high scores (in Sweden and Germany), but also those with low scores, including regions in France (Guadeloupe), Greece (both North and South Aegean), Spain (Ceuta) and Italy (Sardinia). These latter regions, many of which are in isolated or periphery regions of the EU, should be of particular concern to policy makers.

The regional data allows a further interesting analysis to see the extent to which NUTS2 regions have converged over the time period considered (2010–2018). Here, divergence is defined as the increase in the *dispersion* (which is measured by the variance) of NUTS2 regions within each member state. For example, if the variance of EU2020 scores has increased over the period 2010–2018, this would indicate that regions have moved further apart from one another, i.e. diverged. Fig. 6 shows this definition of divergence, plotted against the change in the national level EU2020 score (using the limited set of indicators used for the regional index) over the same period. This shows to what extent member states are experiencing divergence or convergence (internally), and furthermore whether they are converging to higher values or to lower values.

The results show that all countries (except Estonia, Latvia, Luxembourg, Cyprus and Malta, which do not have a divergence score since they have only one NUTS2 region) have experienced an overall increase in EU2020 score, with respect to the indicators used in the regional index. However, around half of member states have actually experienced internal divergence, which means that regions have become further away from each other in terms of EU2020 targets. In particular, the regions of Italy, Romania and Bulgaria have diverged significantly, whereas Slovakia and Slovenia show the greatest convergence.

5. The effect of development

EU Cohesion Policy targets all regions and cities within the EU and has the objective to improve the economic, social and territorial cohesion throughout the whole union (Official Journal of the European Communities, 1987). EU regional policy goes back to the beginning of the European Communities, in 1957 and the Treaty of Rome, where regional differences were mentioned (European Union, 1957). Cohesion Policy is in fact the EU's main investment policy and complements other policies concerning e.g. agriculture, education, employment, energy, environment, single market, research and innovation. Almost one third of the total EU budget has been allocated to Cohesion Policy for this programming period (2014–2020), 351.8 billion Euro. EU Cohesion Policy goes hand in hand with the Europe 2020 strategy, as the former provides the investment framework to meet the defined goals.

Regions are categorised according to their GDP in three categories, as "more developed", "transition" or "less developed". Depending on the category, the Cohesion Policy funds can provide from half up to 85% of the total financing of a project. Most of the Cohesion Policy funding is dedicated to the less developed regions. Out of the 281 NUTS 2 regions (v.2016) 73 (26%) are classified as less developed, 50 (18%) as transition and the remaining 158 (56%) as more developed.

The EU2020 Index by degree of development (DDev) is based on the regional index and uses these development categories to look at how EU2020 scores are related to this definition of development, both at the EU level, and at the national level.

To relate the EU2020 scores to development at the EU level, the approach here is to treat all regions that fall into a given development category as a single aggregated region which has its own EU2020 score. However, to do this properly, the normalised scores of each region must be weighted for each indicator by the appropriate statistic. For example, for EMP, the (normalised) distance of each region to the target is weighted by the population that are aged 20–64, which ensures that each region contributes to the overall score proportionately to its size in terms of each indicator. The quantities used to weight each indicator are given in Table 5.

The EU2020 index is defined as the weighted sum of normalised scores y_{ri} (see Equations (1)–(3)). Consider a development category, "less developed", and denote *LD* as the set of regions in the EU which fall into that category. Now the EU2020 index over all less developed regions in the EU is defined as follows:

$$\mathrm{EU2020}_{LD,EU} = \sum_{i=1}^{I} w_i \left[\frac{1}{A_i} \sum_{r \in LD} y_{ri} a_{ri} \right] \tag{4}$$

where $A_i = \sum_{r \in LD} a_{ri}$. In other words, the scores for each *LD* region are summed, weighted by their relevant statistic, a_{ri}, and divided by the sum of all the a_{ri}. Then the EU2020 index is constructed in the normal way, by a weighted sum of the scores in each indicator using the global weights w_i. This definition naturally extends to the other development categories e.g. by considering *MD* instead of *LD*.

At the national level the same approach is taken, except now we define e.g. LD_c as the set of regions in country *c* which are classed as less developed, and use LD_c in place of *LD* in Equation (4). So this gives a combined EU2020 score for all the regions in a given development category, for a given country.

At the EU level, the EU2020 scores by degree of development are plotted over time in Fig. 7. Evidently, there is an upward trend all three development groups, and more developed regions easily score highest overall. It is also notable that less developed regions are improving more rapidly than transition and more developed regions on the whole: this is likely due in part to receiving a greater share of cohesion funding, and points to the success of these programmes. However, transition regions have actually improved the least, and even experienced a slight decline in 2012 and 2013. This may suggest that transition regions should receive a little more attention from regional policy-making.

At the national level, Fig. 8 show the EU2020 scores by degree of development in 2018 (top figure), and also the change of each development category over 2010–2018 (bottom figure). The national scores echo the scores at the EU level: in general, the highest scores are found in more developed regions, the lowest in less developed regions, and transition regions are somewhere in between. The only exception to this is in Portugal, where the Algarve region scores lower than the less developed regions, despite being a transition region.

Across countries, the scores of in each development category vary significantly and overlap with other categories. For example, transition regions in Italy, Greece and Spain have lower scores than most less-developed regions in other countries. The more developed regions of Greece (Attiki and Notio Aigaio) have scores lower than most transition and less developed regions in other parts of the EU.

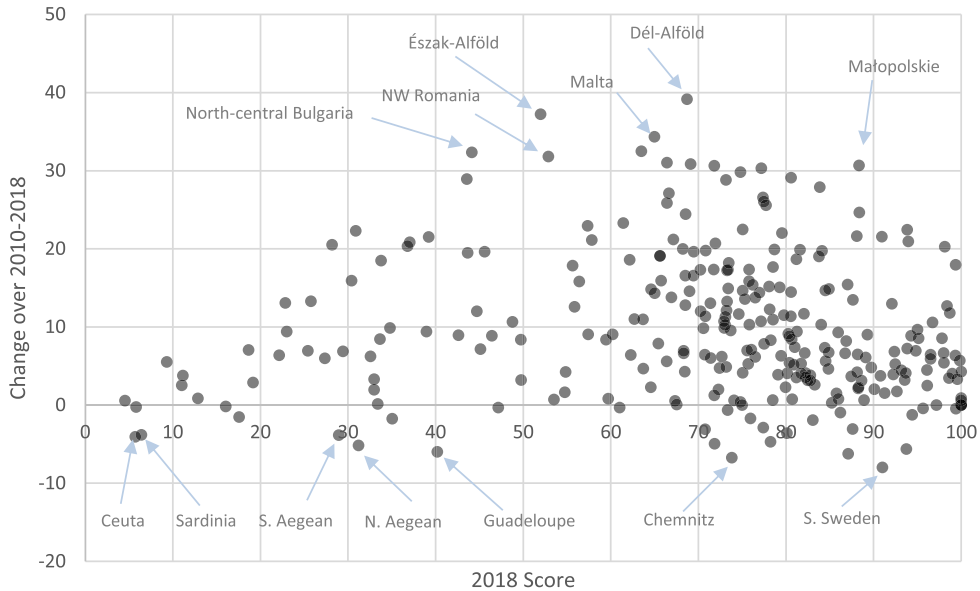

Fig. 5. Changes in regional scores over 2010–2018 plotted against 2018 scores, for all 281 NUTS2 regions.

Fig. 6. Divergence (measured as the change in the variance over regions) against change in national score, over the period 2010–2018. Countries with only one NUTS2 region (Cyprus, Estonia, Latvia, Luxembourg and Malta) are not shown here since divergence cannot be measured.

Table 5
Weighting statistics used in calculation of EU2020 DDev index.

EMP	R&D	ESL	TERT	AROPE
Population of region aged 20–64 in 2018	GDP of region in 2017	Population of region aged 18–24 in 2018	Population of region aged 30–34 in 2018	Total population of region in 2018

Over the 2010–2018 period, there has been a general increase in EU2020 scores, however, some have remained effectively static, or have decreased slightly. This is not limited to one particular degree of development. The less developed regions of Spain, along with transition regions of Denmark and Germany, and the more developed regions of Slovenia and Luxembourg, have all experienced small decreases in their scores. Although these are small steps backwards, in the context of

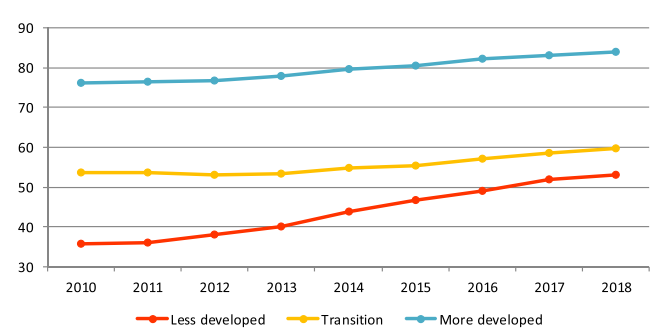

Fig. 7. EU2020 index by degree of development, grouping all EU regions into development categories; left is with respect to national targets; right is with respect to EU targets.

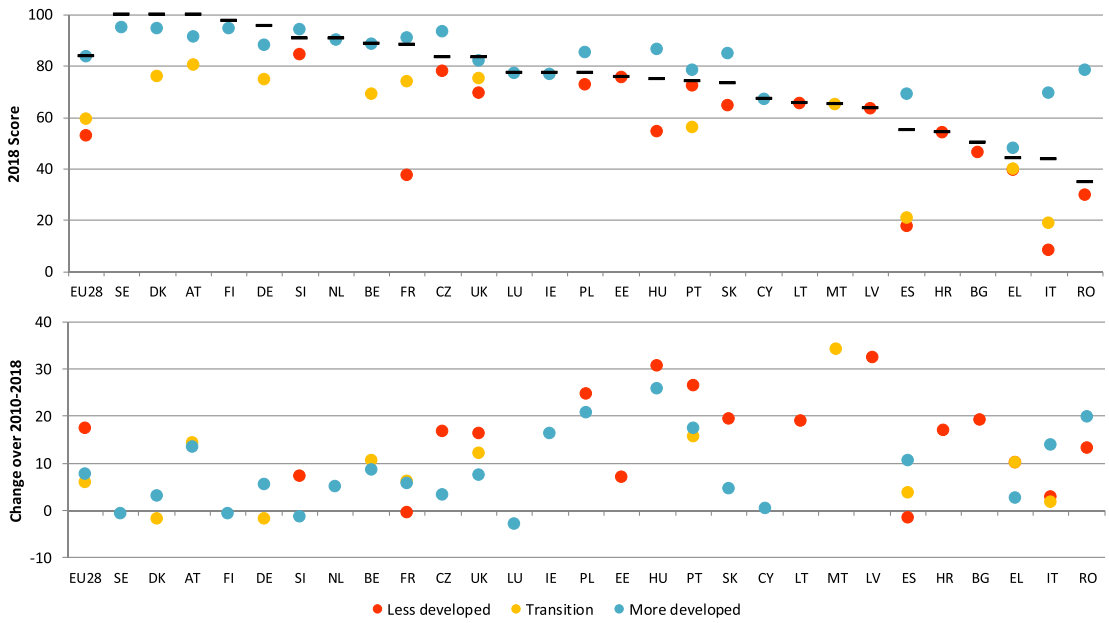

Fig. 8. EU2020 scores with respect to EU targets, by degree of development in 2018 (top) and change over 2010–2018 (bottom). Sorted by 2018 overall national scores using regional indicators.
Note: Regions are categorised as more developed (MD, blue circles), transition (yellow circles) and less developed (LD, red circles). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

overall European improvement, these regions should be examined closely. Again, this information could help to direct regional policy from 2020 onwards.

6. Degree of urbanisation

The final angle of analysis for the EU2020 index is compare progress by degree of urbanisation, using Eurostat data. Indicator data was available at the national level by degree of urbanisation, for four indicators: EMP, ESL, TERT and AROPE. In this data set, there are three degrees of urbanisation: cities, towns and suburbs, and rural areas. The degree of urbanisation classifies local administrative units, which are much smaller than NUTS-2 regions. This data is different from NUTS2 data—i.e. it is not simply NUTS2 regions classified into each degree of urbanisation and aggregated, as with the index by degree of development. Data coverage is relatively good, with only a few entries missing. Some minor imputations were necessary, done by using the nearest year for a small number of countries.

Fig. 9 shows the results with respect to EU targets. Overall for the EU, the differences in scores are fairly small, but cities have on average

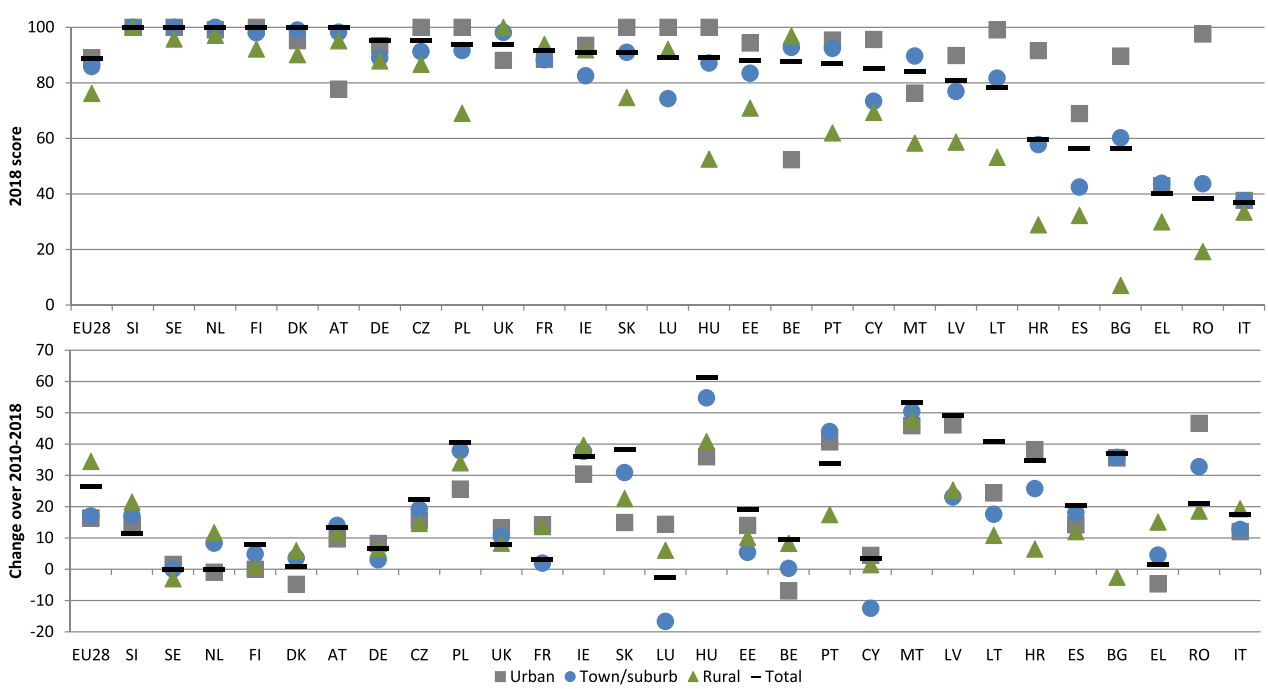

Fig. 9. EU2020 index by degree of urbanisation with respect to EU targets in 2018 (top), sorted by total scores, and change over 2010–2018 (bottom).

slightly higher scores than towns and suburbs, which in turn score higher than rural areas. At the national level, the differences become greater: as the national score decreases (moving right along Fig. 9, top), the difference between degrees of urbanisation increases. Countries such as Romania and Bulgaria, and other Eastern European countries, have particularly high differences between city and rural scores with cities scoring 90 or above in most cases. Italy is an exception in this respect, having similar scores for all degrees of development, which is more characteristic of a high national average such as Sweden or the Netherlands.

Slovenia also stands out here in having the highest overall score. This is because the data by degree of urbanisation only includes four indicators (EMP, ESL, TERT and AROPE). Slovenia has achieved the EU targets for all of these indicators, in all of its degrees of urbanisation, and so gets a maximum score.

Some countries go against the general trend, by having cities scoring worse than other areas: these are the UK, France, Belgium and Austria. These countries, along with Slovenia, the Netherlands, and Sweden, have the highest levels rural development, according to the available indicator data.

Examining the lower chart in Fig. 9, it is clear that the large majority of areas have made progress over 2010–2018. That said, towns and suburbs in Luxembourg and Cyprus, as well as cities in Belgium, Denmark and Greece, have moved overall further away from EU2020 targets. Cities in Bulgaria, Romania, Croatia and Latvia have made particularly positive progress. At the EU level, rural areas have made the most progress, with towns and suburbs and cities making slightly less. On the other hand, the average score change (averaged across countries, for each degree of urbanisation) paints a slightly different picture: the average score change for cities is +18, +17 for towns and suburbs, and +15 for rural areas. This is likely due to the different sizes of urbanisation categories in different countries.

7. Discussion and conclusions

Human development and sustainable development are complex multidimensional topics that cannot be perfectly encapsulated within an indicator framework. Nevertheless, the EU set clear and measurable targets to be achieved over 2010–2020, and this allows a fairly clear measurement of progress to these specific targets. Even this simplified picture is rather complex, and can be viewed from many angles and levels of disaggregation.

What progress has been made over the period of the EU2020 strategy, and what lessons might be learned? Overall, there has been clear and tangible progress in each dimension: at the EU level, employment rates have risen, R&D spending and renewable energy have increased, emissions are down, there are more tertiary graduates, and the numbers of early school leavers and people at risk of poverty or social exclusion have dropped. However, only one of these dimensions (tertiary graduates) has met the target as of 2018.

At the national level, every EU country has made overall progress since 2010, however as of 2018, no country has yet succeeded in meeting all EU-level targets. Sweden and Denmark have met six of seven targets (for which data is available), but should further reduce greenhouse gas emissions to complete the set.

While Scandinavian countries unsurprisingly occupy the top places, some countries have made particularly strong progress since 2010: Hungary, Latvia and Poland in particular have made significant improvements in employment rates and poverty reduction, and have seen large positive changes in national-level scores, with some regions showing the greatest increases in the EU.

On the other hand, some areas have seen little progress, or even moved backwards. Luxembourg in particular has remained relatively static, and has seen increases in poverty and social exclusion, despite having the highest GDP/capita in the EU. Some more isolated regions of Spain (Ceuta), Italy (Sardinia) and Greece (N. and S. Aegean) have moved backwards, and these are some of the lowest-scoring regions in the EU. This should be of particular concern to policy-makers, all the more so because Italy and Spain have the largest intra-regional differences of any country, and these differences are actually increasing. Lagging regions contribute to the feeling of unfairness and inequality, and go against the original EU2020 objectives of inclusive growth, and cohesion policy in general: this can in turn lead to populism and distrust in institutions (Al Khudhairy et al., 2017). These countries and areas should be focused on in the next policy cycle.

For the specific indicators, the greatest progress seems to have been made in education (tertiary graduates and early school leavers, with 18 of 28 countries having achieved these targets in 2018), but much less has been made in R&D spending, with only four countries reaching the 3% target. Worst of all, no countries have yet met targets (either EU-level or national) in greenhouse gas emissions. Given the pressing need to cut emissions, this is rightly a major focus area of the EU with the inception of the Green Deal in the present decade.

How do these findings compare to recent studies on sustainable development in Europe? At the national level, the UN Sustainable Development Solutions Network (SDSN) has produced a European Sustainable Development Report based on their SDG Index and Dashboards (SDSN & IEEP, 2019). Here, the overall results are very similar: the top five countries in the SDG Index are the same as those in the EU2020 national index (with respect to EU targets), while the bottom five include three of the five bottom five in the EU2020 index. They also note that the areas in need of the most attention are those related to responsible consumption and production, climate and biodiversity, which reflects the EU2020 index observations that the EU should focus on environmental targets in particular. This conclusion is also reflected in the EU's Sustainable Development Monitoring Report, which identifies climate action as the goal with the least progress, apart from gender inequality (European Commission and 'Sus, 2020). The EU study also includes a rich set of information about specific goals and countries, but does not explicitly rank countries.

The UN also publishes its own reports on SDG progress (United Nations Department, 2020) – here it is somewhat hard to compare with the EU2020 Index results, because this is a global report. It identifies major challenges in almost all SDGs, and does not focus on national results in particular.

While none of these studies mentioned examine regional data, the UN SDSN report does provide an interesting "Leave No One Behind Index", which is based on indicators of inequality (including poverty, income equality, gender equality and access to services). This draws somewhat similar conclusions to the convergence study presented in this paper, showing that Bulgaria and Romania are of particular concern. However, the EU2020 index particularly flags Italy as a country of concern, which is less evident in the SDSN study – this is due to the specific use of subnational data here rather than using national-level indicators.

As a final point, consider that the period of analysis here is 2010–2018, and that particular events can alter or even reverse the trends observed in this study. In particular, the COVID crisis of 2020 has altered caused economic upheaval and altered political priorities. However, the impacts on sustainable development will only become clear when sufficient data is available.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Targets

Table 6 lists the national Europe 2020 targets. All values here were directly obtained from Eurostat. As with GHG data, GHG targets are a specific case because emissions consist of both ETS and ESD contributions. ETS targets cannot be disaggregated to the country level, as emissions that are part of the ETS trading scheme are auctioned and traded EU-wide. Therefore effectively there is only one single EU-level target for ETS emissions, which is set at 21% below 2005 levels (European Parliament, and Council of the European Union, 2009). The ESD emissions, on the other hand, have national-level targets in the same way as the other indicators—see e.g. (Barbuet al., 2015). These are given in Table 6.

In some cases, national targets were not available for certain countries. This means that either such targets will need to be occasionally imputed, or some countries and/or indicators will need to be omitted from the analysis. In this work, we have predominantly opted for the former option by imputing national targets where they are not available, provided the corresponding EU-28 regional data are not too sparse. While we have attempted to do so with care, such imputation introduces an unavoidable degree of subjective judgment to the results.

AROPE national targets involve numerical goals regarding the reduction of the total number of people at risk of poverty or social exclusion. However, given that the effort to reduce the number of people at risk should be seen in light of the total population of country and its share of population at risk, we transformed the national AROPE Europe 2020 targets into population percentages using 2009 national data on total population P_{2009}, number of people at risk of poverty AROPE_{2009}, and the EU2020 target reduction R. The first two types of data we obtained from Eurostat, while the third by visiting each country's individual webpage at the Europe 2020 Commission website.[5] For the sake of analytic precision, the AROPE target of country c expressed as a population percentage, denoted by $T(\text{AROPE})_c$, is equal to:

$$T(\text{AROPE})_c = \frac{\text{AROPE}_{2009,c} - R_c}{P_{2009,c}}.$$

Looking at Table 6, none of the listed national targets are available for the United Kingdom (UK). A handful of other countries have either not reported targets for certain objectives (Croatia for AROPE), or have provided targets that are of a different nature than the Europe 2020 figures (the Czech Republic for R&D and Sweden for AROPE).

Table 6
Europe 2020 national and EU-28 targets; units as in Table 2. Imputed targets in grey.

Country	EMP	R&D	REN	ESL	TERT	AROPE	GHG*	EFF
EU-28	75.0	3.0	20.0	10.0	40.0	19.5	90.0	1483
AT	77.0	3.8	34.0	9.5	38.0	17.6	84.0	31.5
BE	73.2	3.0	13.0	9.5	47.0	17.0	85.0	43.7
BG	76.0	1.5	16.0	11.0	36.0	42.0	120.0	16.9
CY	75.0	0.5	13.0	10.0	46.0	19.8	95.0	2.2
CZ	75.0	1.0	13.0	5.5	32.0	14.9	109.0	39.6
DE	77.0	3.0	18.0	10.0	42.0	19.5	86.0	276.6
DK	80.0	3.0	30.0	10.0	40.0	15.8	80.0	17.4
EE	76.0	3.0	25.0	9.5	40.0	18.0	111.0	6.5
EL	70.0	1.2	18.0	9.7	32.0	23.2	96.0	24.7
ES	74.0	2.0	20.0	15.0	44.0	21.3	90.0	119.8
FI	78.0	4.0	38.0	8.0	42.0	14.3	84.0	35.9
FR	75.0	3.0	23.0	9.5	50.0	15.0	86.0	219.9
HR	62.9	1.4	20.0	4.0	35.0	28.8	111.0	11.15
HU	75.0	1.8	14.7	10.0	34.0	23.3	110.0	24.1
IE	69.0	2.0	16.0	8.0	60.0	22.7	80.0	13.9
IT	67.0	1.5	17.0	16.0	26.0	22.0	87.0	158
LT	72.8	1.9	23.0	9.0	48.7	23.6	115.0	6.5
LU	73.0	2.3	11.0	10.0	66.0	13.6	80.0	4.5
LV	73.0	1.5	40.0	10.0	34.0	28.2	117.0	5.4
MT	70.0	2.0	10.0	10.0	33.0	18.3	105.0	0.7
NL	80.0	2.5	14.0	8.0	40.0	14.2	84.0	60.7
PL	71.0	1.7	15.0	4.5	45.0	26.2	114.0	96.4
PT	75.0	2.7	31.0	10.0	40.0	24.2	101.0	22.5
RO	70.0	2.0	24.0	11.3	26.7	42.8	119.0	43
SE	80.0	4.0	49.0	7.0	45.0	13.8	83.0	43.4
SI	75.0	3.0	25.0	5.0	40.0	16.0	104.0	7.3
SK	72.0	1.2	14.0	6.0	40.0	17.5	113.0	16.4
UK	77.1	2.9	15.0	12.3	42.9	19.5	84.0	177.6

*GHG targets represent EDS targets only.

When national targets for a particular country-indicator pair were not available, a reasonable estimate, based on the national targets of countries with roughly similar "starting points", was derived. To illustrate this, take the example of the UK's TERT target. In 2009 the UK had a TERT of 41.5, which was similar to that of DK (40.7), NL (40.5), LT (40.6), PT (71.2), FR (43.2), and CY (43.9). Using the TERT targets for the latter countries, the average distance of their 2009 rates to their corresponding targets was computed,⁶ which was equal to 1.4. This represents an average distance to target for countries with similar TERT starting points to the UK. To impute the UK target, we added to its 2009 value this average distance to target, resulting in a target of $41.5 + 1.4 = 42.9$. This strategy was applied for all missing values highlighted in Table 6.

The EFF targets are complicated and based on a 20% reduction with respect to a "business as usual" projections of 2020 primary energy consumption made in 2007 (European Commission and Statistical Office of the European Union, 2019). Clearly, these projections can be subject to considerable debate, therefore the EFF targets are not considered to be as clear and robust as the other targets. For this reason, the EFF indicator is removed in a

[5] http://ec.europa.eu/europe2020/europe-2020-in-your-country/index_en.htm.

[6] Where this distance was negative (as in the case of DK and NL), meaning that a country had already attained its target in 2009, we truncated it to 0.

sensitivity analysis in Appendix B.

A final note on targets is that for the GHG indicators, the national ESD targets and EU ETS targets were both used in the indexes with respect to EU targets *and* with respect to national targets. This is because there are no national targets available for the ETS emissions, and ESD emissions targets anyway add up to the EU total and are legally binding. By the same argument, the REN national targets are used in both the EU-targets versions of the index, and the national-targets versions.

Appendix B. Sensitivity Analysis

In this section the EU2020 index is tested against varying some selected assumptions. This amounts to a conceptually simple sensitivity analysis to demonstrate the impact of selected important methodological choices. A more detailed sensitivity analysis is available in (Athanasoglou and Dijkstra, 2014).

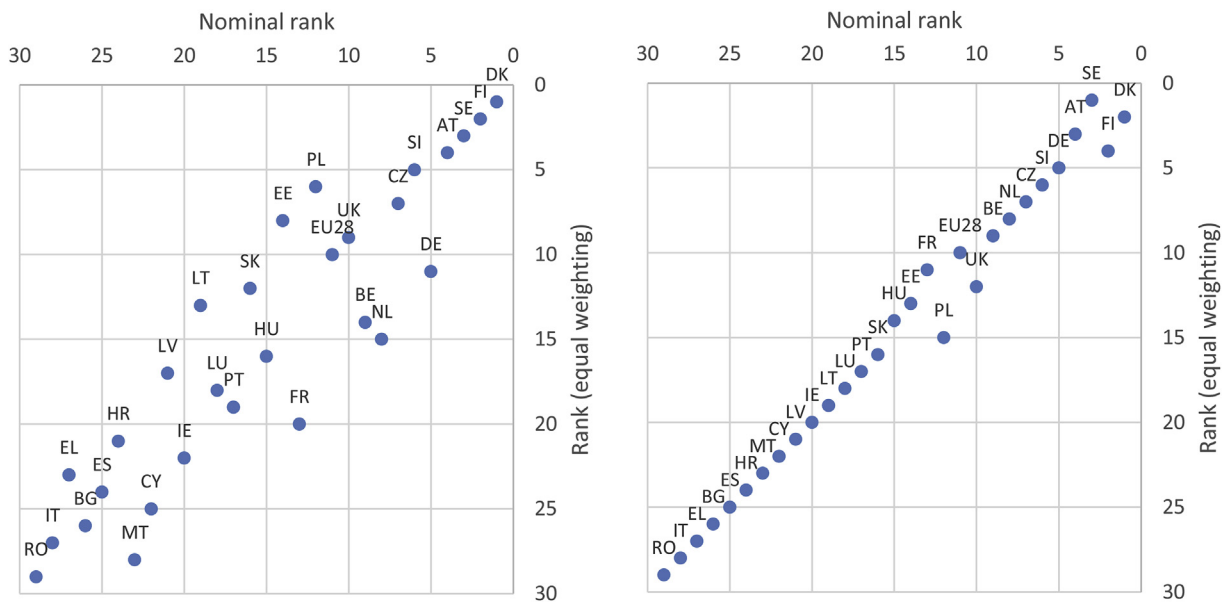

Fig. 10. EU2020 national index with EU targets, plotted against alternative formulations: with equal weighting for each indicator (left); and with removing EFF (right).

Two particular assumptions are tested here. The first is based on weights: the EU2020 index uses equal weighting across the five policy areas (see again Table 1), and since different policy areas have different numbers of indicators, this means that the indicators themselves are not equally weighted. An alternative formulation is to equally weight the indicators themselves. This amounts to increasing the relative weight of the environmental and education policy areas, since both have more than one indicator associated with them. Fig. 10 (left) shows the effect of this variation: the alternative weighting has a significant impact on the rankings, with a few countries dropping up to 7 places in the rankings (the Netherlands and France). On the other hand, the top and bottom countries are relatively stable.

The second assumption to test is removing EFF. As mentioned previously, EFF has an unusual target system based on projections, and arguably this does not amount to a clear and measurable target. Fig. 10 (right) shows the effect of recalculating the index without this indicator. Here, the impact is very minor, with the majority of countries unchanged in the rankings. Poland is a slight exception, dropping three places as a result of this change.

Overall, the choice of weighting does have a significant impact on the results of (particularly) mid-ranked countries, and this should be accounted for in the conclusions of the study. Weighting by policy areas represents one possible perspective of progress towards EU2020 targets.

References

Al Khudhairy, D., Campolongo, F., Langedijk, S., Benczúr, P., Kommission, Europäische (Eds.), 2017. What Makes a Fair Society? Insights and Evidence. Publications Office of the European Union, Luxembourg.

Alkire, S., Foster, J., Aug. 2011. Counting and multidimensional poverty measurement. J. Publ. Econ. 95 (7–8), 476–487. https://doi.org/10.1016/j.jpubeco.2010.11.006.

Athanasoglou, S., Dijkstra, L., 2014. European Commission, and Joint Research Centre, the Europe 2020 Regional Index. Luxembourg: Publications Office.

Bandura, R., 2008. A Survey of Composite Indices Measuring Country Performance: 2008 Update. United Nations Development Programme, Office of Development Studies (UNDP/ODS Working Paper), New York.

Barbu, A.-D., et al., 2015. Trends and Projections in Europe 2015 Tracking Progress towards Europe's Climate and Energy Targets. Luxembourg: Publications Office.

Cobham, A., Janský, P., Meinzer, M., 2015. The financial secrecy index: shedding new light on the geography of secrecy. Econ. Geogr. 91 (3), 281–303.

Çolak, M.S., Ege, A., Jan. 2013. An assessment of EU 2020 strategy: too far to reach? Soc. Indicat. Res. 110 (2), 659–680. https://doi.org/10.1007/s11205-011-9950-2.

Dijkstra, L., 2010. The Regional Lisbon Index. DG for Regional Policy, European Commission.

EEA, 2016. EU Emissions Trading System (ETS) Data Viewer — European Environment Agency'. European Environment Agency. http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer. (Accessed 31 May 2016).

European Commission, 2010. Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth: Communication from the Commission. Publications Office of the European Union.

European Commission and Statistical Office of the European Union, 2019. Smarter, Greener, More Inclusive?: Indicators to Support the Europe 2020 Strategy, 2019 edition.

European Commission, Dec. 11, 2019. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: the European Green Deal (COM/2019/640 Final). Publications Office of the European Union [Online]. Available: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:640:FIN.

European Commission, 2020. Sustainable Development in the European Union: Monitoring Report on Progress towards the SDGs in an EU Context [Online]. Available: https://ec.europa.eu/eurostat/documents/3217494/11011074/KS-02-20-202-EN-N.pdf/334a8cfe-636a-bb8a-294a-73a052882f7f.

European Parliament, and Council of the European Union, 2009. Directive 2009/29/EC of the European parliament and of the council. Off. J. Eur. Union 63–87. Apr. 23.

European Union, 1957. Treaty of Rome [Online]. Available: https://eur-lex.europa.eu/legal-content/IT/TXT/?uri=celex:11957E/TXT.
OECD, 2008. Handbook on Constructing Composite Indicators. Methodology and User Guide. OECD, Paris.
Kelley, J.G., Simmons, B.A., 2015. Politics by number: indicators as social pressure in international relations. Am. J. Polit. Sci. 59 (1), 55–70.
Lung, T., Dosio, A., Becker, W., Lavalle, C., Bouwer, L.M., Jul. 2013. Assessing the influence of climate model uncertainty on EU-wide climate change impact indicators. Climatic Change 120 (1–2), 211–227. https://doi.org/10.1007/s10584-013-0825-1.
Mayer, C., 2018. Smarter, Greener, More Inclusive?: Indicators to Support the Europe 2020 Strategy. Publications Office of the European Union, Luxembourg.
Official Journal of the European Communities, 1987. Single European Act, OJ L 169'.
Pasimeni, P., Jan. 2013. The Europe 2020 index. Soc. Indicat. Res. 110 (2), 613–635. https://doi.org/10.1007/s11205-011-9948-9.
Pasimeni, F., Pasimeni, P., Jul. 2016. An institutional analysis of the Europe 2020 strategy. Soc. Indicat. Res. 127 (3), 1021–1038. https://doi.org/10.1007/s11205-015-1013-7.
Rappai, G., Oct. 2016. Europe en route to 2020: a new way of evaluating the overall fulfillment of the Europe 2020 strategic goals. Soc. Indicat. Res. 129 (1), 77–93. https://doi.org/10.1007/s11205-015-1092-5.
Saisana, M., Saltelli, A., Tarantola, S., Mar. 2005. Uncertainty and sensitivity analysis techniques as tools for the quality assessment of composite indicators. J. Roy. Stat. Soc. 168 (2), 307–323. https://doi.org/10.1111/j.1467-985X.2005.00350.x.
SDSN & IEEP, 2019. The 2019 Europe Sustainable Development Report. Sustainable Development Solutions Network and Institute for European Environmental Policy, Paris and Brussels.
Statistical Office of the European Communities, Sustainable Development in the European Union: Overview of Progress towards the SDGs in an EU Context, 2019 edition, 2019.
United Nations Department for Economic and Social Affairs, 2020. Sustainable Development Goals Report 2020. S.l.: UNITED NATIONS.
United Nations Development Programme, 2015. Human Development Report 2015. United Nations Development Programme [Online]. Available. http://hdr.undp.org/sites/default/files/2015_human_development_report.pdf.
United Nations General Assembly, 2015. Transforming Our World: the 2030 Agenda for Sustainable Development. A/RES/70/1.
United Nations General Assembly, 2017. Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development. A/RES/71/313'.
Walheer, B., Dec. 2018. Decomposing the Europe 2020 index. Soc. Indicat. Res. 140 (3), 875–905. https://doi.org/10.1007/s11205-017-1797-8.
Yang, L., 2014. An Inventory of Composite Measures of Human Progress. United Nations Development Programme Human Development Report Office.