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Social Progress Index 1990–2020: measuring societal wellbeing over 31 years

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ABSTRACT

Measuring people's wellbeing has been at the heart of policy and research efforts for decades. The Social Progress Index 1990–2020 offers a unique approach by focusing only on social outcomes, leaving out economic and input-oriented metrics. This paper describes in detail the methodology and calculation of the Social Progress Index over an extensive period from 1990 to 2020. The longitudinal assessment, based on publicly available data, covers 172+ countries. Over the observed period, social progress improved in nearly all countries around the world. Some countries made remarkable gains and clearly advanced their people's standard of life. However, the rate of progress has slowed in recent years, and many countries have experienced stagnation. Some have even reversed progress that was previously achieved. The results also indicate an uneven rate and spatial distribution of progress, with some components of the Index faring better than others.

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Social progress; measurements; beyond GDP; composite indicators; methodology

1. Introduction

The better measurement and understanding of societal welfare have been the focus of research and policy efforts for decades. Gross domestic product (GDP) as the predominant metric of countries' success has been increasingly criticized in recent years (see, for example, Stiglitz et al. (2010); Fleurbaey and Blanchet (2013)), despite its limitations having already been acknowledged at its inception by Kuznets (1934).

The first significant effort to produce a comprehensive, multidimensional assessment of welfare was pioneered by Amartya Sen (Robeyns & Byskov, 2021). His concept of 'capabilities' was foundational for the Human Development Reports, initiated in 1990 by the United Nations Development Programme, and for the construction of the Human Development Index, which has ever since been the leading alternative metric of country performance (UNDP, 2023).

Following the introduction of the Human Development Index, many other efforts incorporating a wider range of social performance metrics have sprung up, often emphasizing their 'beyond GDP' nature (Stiglitz et al., 2018). These include metrics such as the Organization for Economic Cooperation and Development's Better Life Index (OECD, 2020), the Social Progress Index (Social Progress Imperative, 2022), the Legatum Prosperity Index (Legatum Institute, 2023), and

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more recently, efforts to measure the Sustainable Development Goals (SDGs), such as the SDGs Index (Sachs et al., 2022).

Among these efforts, the Social Progress Index stands out for two mutually reinforcing reasons: (1) as an applied policy tool; (2) with a unique set of design principles. The Social Progress Index, published annually by the Social Progress Imperative, assesses countries' performance by relying on publicly available data sources. The Index employs unique design principles (discussed later in detail), most notably that it only takes into account social and environmental outcome indicators, which make it 'the first available metric of purely social and environmental aspects' (Annoni & Scioni, 2022).

Since its first publication in 2013, the Index's approach and methodology have been applied by policy makers on various levels of administration in different parts of the world. The European Commission adopted the Social Progress Index for the NUTS2[1] regions of the EU (Annoni & Bolsi, 2020; Annoni et al., 2016; De Dominicis et al., 2024). It has been applied for the states of Australia (Centre for Social Impact, n.d.), the provinces of South Africa (IQbusiness, 2018), Thailand (Sasin School of Management, n.d.), and Costa Rica (Instituto Costarricense de Turismo, 2019). Smaller administrative units, e.g. the region of Kosice, Slovakia (Author[s]), and London's Borough of Barking and Dagenham (LBBD, 2022) have also used the Index. The Index is also increasingly used in academic research, such as by Pritchett (2022), Ottaviani et al. (2021), Charles and D'Alessio (2020), O'Sullivan and Kraisornsuthasinee (2019), Syrovátka and Schlossarek (2019), and Malay (2019).

In the 2022 edition (Social Progress Imperative, 2022), the Index included 60 social and environmental outcome indicators covering 169 countries, spanning 12 years (2011–2022). While this is a sufficiently long period to offer insights on countries' current performance and on global trends, it does not allow for an in-depth understanding of longer-term societal wellbeing. Therefore, this paper presents the methodology and key findings of a novel and unprecedented Social Progress Index constructed for a 31-year long period of 1990–2020, and in doing so, it aims to make the following three contributions:

Firstly, the paper contributes to the methodologies used for constructing composite indicators (see the subsequent section for more details about composite indicators). While the Index generally follows standard methodological approaches (summarized, for example, in Nardo et al., 2008), its global coverage of more than 170 countries over 31 years with 52 indicators required tailored and less common solutions, which could have a potentially broader applicability. Secondly, the paper provides a contribution to defining and solidifying *social progress* as a research and policy field. The application of the Social Progress Index principles and methodology over 31 years represents an unparalleled effort of longitudinal measurement of social progress on a global scale. Thirdly, the paper provides insights and a greater understanding of social progress over time for the world as a whole and for individual countries.

While the Social Progress Index 1990–2020 follows an established methodology and approaches of an existing index, it should be noted that it is essentially a new metric. While other attempts to replicate the Social Progress Index methodology and produce such a longitudinal assessment are acknowledged (Peiró-Palomino et al., 2023), these efforts differ in several aspects. Notably, they cover fewer countries (139), over a shorter period of time (1995–2017), and use fewer indicators (45).

The paper begins with a conceptual establishment of social progress as defined by the Social Progress Index. It continues to discuss in detail the data and methodological choices for the construction of the Social Progress Index 1990–2020. It concludes with a discussion of its main findings and insights.

2. Defining social progress

In order to establish a measurement approach, it is necessary to define what constitutes social progress in the first place. While scientific consensus on the definition of social progress has been

difficult to find (Welzel et al., 2003), the policy dialogue has perhaps achieved more substantive outcomes. While the Stiglitz, Sen and Fitoussi report (Stiglitz et al., 2009) does not define social progress per se, it provides a useful framework for further elaboration by summarizing three key conceptual approaches used to define and measure the quality of life: (1) subjective well-being, (2) the notion of capabilities, and (3) the notion of fair allocations. Furthermore, it proposes eight dimensions to be considered simultaneously when assessing well-being: (i) Material living standards (income, consumption, and wealth); (ii) Health; (iii) Education; (iv) Personal activities including work; (v) Political voice and governance; (vi) Social connections and relationships; (vii) Environment (present and future conditions); (viii) Insecurity of an economic as well as a physical nature.

Based on these conceptual groundings, the Social Progress Imperative, a US-based global think-tank, established the Social Progress Index, which defines social progress as 'the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential' (Porter et al., 2014). This definition alludes to three broad dimensions of social progress: the provision of people's Basic Human Needs; establishing the Foundations of Wellbeing for individuals and communities to sustain the quality of their lives; and Opportunity for all individuals to reach their full potential. Each dimension consists of four components, which are further defined by a set of indicators responding to conceptual questions the components seek to answer (see Annex D in the online supplementary file). While defaultly used with countries – which are still the most common unit of measurement (as in this paper) – the aforementioned definition of social progress has been applied to various levels of administration (as already shown).

The composition of the Social Progress Index builds on the many philosophies and thoughts that have been developed about what constitutes human well-being. Among these, the Natural rights theory has been foundational for defining and conceptualizing the Social Progress Index framework (O'Sullivan, 2014). The Basic Human Needs dimension is grounded in its moral and political philosophy, which outlines that for the spiritual well-being and fulfillment of human potential, certain rights should be respected as absolute for every human being except to the extent that they may infringe on the rights of others. The most basic rights are those related to survival, which implies to live in security, with adequate shelter, sufficient water and food, and basic medical care to be able to survive to maturity (Van Duffel, 2011). In the Foundations of Wellbeing dimension, O'Sullivan (2014) also refers to the Natural rights theory for basic knowledge, access to information and environmental quality. Health and Wellness are, in his view, anchored in a utilitarian value judgment about well-being. Burgers (2022) and Jones (2021) extend the application of the Natural rights theory to environmental concerns. Finally, the Opportunity dimension is anchored in the thoughts of John Locke, who argued that the rights to liberty are intrinsic to human beings, thus forming the basis for individual freedoms and opportunities in society (Van Duffel, 2011).

3. Social Progress Index 1990–2020: data and methodology

This section addresses the data and methodology used in constructing the Social Progress Index 1990–2020, thus covering 31 years of social progress. It provides an account of the key challenges for indicator selection and discusses in detail each step of the calculation.

The Social Progress Index is a composite indicator. The Index is built based on the Social Progress Index standard framework and methodology (Stern et al., 2022), and follows the Handbook on Constructing Composite Indicators, which lays the foundations for constructing composite measures (Nardo et al., 2008). While our intention is to follow the standard methodology whenever possible, developing an index with a significantly longer time coverage requires modifications and adaptations stemming from the many conceptual challenges discussed below. While the basic framework of the Index is kept intact in terms of its core structure, i.e. components and

dimensions, indicators were selected and methods adapted to reflect the longitudinal nature of the entire 31-year period. In this sense, the presented Index should be regarded as a new metric of social progress.

3.1. Data

With more than 200 countries around the world, with distinct contexts and cultures, any comparative assessment effort will essentially encounter data challenges. Moreover, the 1990–2020 period witnessed many significant historical events as diverse as the global expansion of democracy after the fall of the 'iron curtain', wars and the rise of the digital world. This inherently implies conceptual measurement challenges, which can be summarized under three broader aspects: what is measured and how; what is not measured; and who measures.

In terms of what the Index measures and how, it follows the key design principles of the Social Progress Index: (1) It considers exclusively social and environmental indicators, which allows for a more rigorous and systematic analysis of the relationship between economic development (measured, for example, by GDP per capita) and social development. Prior efforts to move beyond GDP have commingled social and economic indicators, making it difficult to disentangle the two dimensions of development. This shows that the Index is a true representative of the 'Beyond GDP' agenda which has gradually become the cornerstone of development metrics (Stiglitz et al., 2018). (2) The Index measures the outcomes that matter to people, and not the inputs. For example, the Index considers metrics that assess people's health status and educational attainment, and excludes indicators such as quantities of schools and hospitals. (3) As the coverage of the Index is global, all indicators need to be relevant to all (or nearly all) units of observation, i.e. countries. For this reason, some specific issues such as malaria deaths cannot be included as they do not affect all countries. However, indicators are selected carefully to ensure the different contexts are captured, e.g. measuring premature deaths from non-communicable diseases. (4) The Index is meant to provide evidence to inform decision-making and advancing social progress, and this is also reflected in the selection of indicators.

The Index only considers reliable and credible indicators that are as complete as possible and offer an objective account of the period. Indicators are selected only if they are measured well, with consistent methodology, by the same organization and across all (or essentially all) countries in the sample. These principles ensure consistency in measurement across countries. Each indicator is evaluated to ensure that it meets these quality criteria and that it captures what it purports to capture. In total, 52 indicators from 12 data sources were used to construct the Social Progress Index 1990–2020, and a further 13 supportive indicators were used to calculate new indicators and impute missing values (discussed below). The Index framework is captured in Figure 1. Detailed information for all indicators (including the supportive ones) is included in Annex A and Annex B, respectively, in the supplementary file.

Despite our best efforts, many critical societal concerns are not directly measured by the Index, and some are only measured through imperfect proxies. Mental health, the rights and freedoms of LGBTQI+ communities, as well as the rights of migrants and other minorities are just a few examples of such issues that are insufficiently addressed. This is partly due to the lack of global, comparative metrics, which meet the above criteria for indicator selection.

Retrospective measurement also meant that we had to face difficult tradeoffs in the indicator selection process. We acknowledge that the Index is anchored in the present, defining historical measurement retrospectively. This is best demonstrated in the Access to Information and Communications component where the conceptual approach reflects the current period of internet access and mobile devices but considers the past through access to landlines.

The question of 'who measures' can significantly affect the rigor and objectivity of data. While we have striven to consider the implicit bias of any indicator source and construct a combination of indicators that would eliminate the influence of such bias to provide a robust and comprehensive

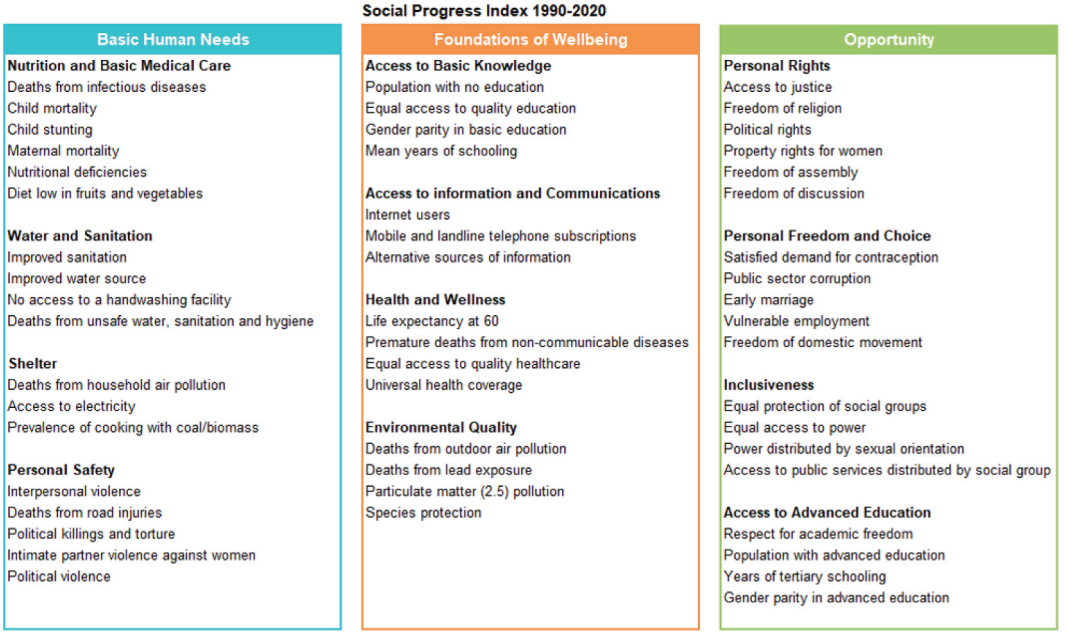

Figure 1. Social Progress Index 1990–2020, indicators framework. Source: Authors Note: We provide full definitions of indicators (Annex A) and full citations of data sources (Annex C) in the online supplementary file.

assessment of each concept, this often proved difficult due to the unavailability of data. Some components have been affected more than others. This is the case in the Opportunity dimension and especially in the Personal Rights and Inclusiveness components, which predominantly rely on the Varieties of Democracy dataset. While these biases have been highlighted recently (Little & Meng, 2024), we are confident that they have only a minimal effect on the conceptual validity of the measurement and are still a meaningful assessment of social progress, especially when aggregated with other metrics.

In the light of these challenges, we argue that constructing a composite indicator is an appropriate approach, as it enables complex, multi-dimensional issues to be summarized into a single metric that is easier to interpret and compare across countries while also harnessing the power of various methodological approaches that limit the influence of diverse cultural and historical contexts.

We acknowledge that these challenges had a direct influence on the indicator selection, and thus on defining the concept of *social progress*, as well as on the measurement challenges (discussed below) and, therefore, any interpretation of the results should reflect this.

3.2. Methodology

There are several core steps for calculating the Social Progress Index 1990–2020 that are discussed in detail. These steps are preceded by the actual data collection for each individual indicator. The data collection process follows the above-mentioned quality criteria but also requires certain procedures of data management (e.g. country coding, year alignment) and cleaning due to the variety of sources. Unlike the annual Social Progress Index, where the assessment is lagged by 1 or 2 years, the 1990–2020 Index is precisely aligned, unless there were issues with data availability (discussed later). The data collection took place in 2021 and 2022. Some of the data providers have since published new data (e.g. Varieties of Democracy), while other sources retracted previously published information (Our World In Data).[2]

Once the full dataset is established, the core calculation methodology is as follows: 1) calculating indicators derived from more than one original indicator, 2) addressing missing values, 3) treating outliers and highly skewed indicators 4) establishing best- and worst-case scenarios, 5) inverting indicators, 6) calculating component scores, 7) aggregating components and dimensions to overall Social Progress Index scores, 8) testing for statistical validity and 9) conducting robustness checks.

3.2.1. Indicator calculation

There are six indicators that are specifically created for the Index to achieve the best conceptual and statistical fit. After the calculation, the indicators are included in the final list of indicators as shown in Figure 1.

(1) *Diet low in fruits and vegetables* was constructed using a simple average based on two individual indicators measuring diet low in (i) fruits and (ii) vegetables. Both indicators come from the same source (Global Burden of Disease Collaborative Network, 2020a) and are measured on the same scale.
(2) *Mobile and landline telephone subscriptions* indicator aggregates both landline and mobile subscriptions (per 100 population; World Bank, 2022) to reflect the technological evolution within the measurement period. This method of inclusion was preferred, instead of considering the two indicators separately, or only relying on mobile phone subscriptions, to account for the reality that landlines were the prevailing publicly accessible mode of telephone communication in the initial decade of the measurement period. The final indicator is the weighted average of landline and mobile phone subscriptions per 100 population, where the weights are applied counter-parallelly over 5-year periods to reflect the (un)availability of the service in the following manner:
    - 1990–1994: 100% weight for landlines, 0% weight for mobile phone
    - 1995–1999: 80% weight for landlines, 20% weight for mobile phone
    - 2000–2004: 60% weight for landlines, 40% weight for mobile phone
    - 2005–2009: 40% weight for landlines, 60% weight for mobile phone
    - 2010–2014: 20% weight for landlines, 80% weight for mobile phone
    - 2015–2020: 0% weight for landlines, 100% weight for mobile phone

(3,4) Gender parity in basic education, and *Gender parity in tertiary education* are calculated to reflect the equality between boys and girls in a more gender-neutral fashion. The indicators are transformed to express the absolute distance from 1, where 1 represents an equal number of girls and boys enrolled. While in most countries, more boys are enrolled in education than girls, there are countries, and this trend is more evident over time and in recent years, in which the opposite is true. Therefore, the absolute distance from 1 is used to acknowledge the lack of parity for both boys and girls across countries.

(5,6) *Proportion of population with no education* and *Proportion of population with advanced education* were each calculated as population-weighted average of the same indicator for males and females. All indicators come from the same source (Global Burden of Disease Collaborative Network, 2020b) and are measured on the same scale.

3.2.2. Missing values

The methodology strives to ensure that all indicators included in the Social Progress Index 1990–2020 are missing as few observations as possible to avoid jeopardizing the conceptual quality of the Index. However, when measuring 52 indicators over 31 years for more than 170 countries, it is inevitable that some indicators will have missing observations either for some countries, for some periods of time, or a mix of both. Missing values can stem from the lack of coverage by the data source, as well as incomplete reporting by a country to international organizations.

The treatment of missing values depends on the overall methodology of any composite indicator. The imputation methods range from simple 'untreatment', i.e. disregarding the missing values, to highly complex and technical statistical estimates. The more complex the imputation procedure is, the less understandable is the Index for a wider audience, while simple solutions might provide a misleading estimate.

The Index applies a combination of approaches based on a careful consideration of each case. Generally, there are two scenarios when data points are missing. In the first case, a country lacks some, not all, indicator data within the examined time period. In the second case, a country does not have any (i.e. is missing all) data points of an indicator. Each scenario requires a different approach. In the first case, when a country is missing some data points of an indicator, depending on when in the 31-year long period the value is missing, two methods are applied: i) A future or historical value is carried back or forward (for the maximum of 5 consecutive years) if a data point is missing at the beginning or at the end of the time-series[3]; ii) Gaps between years are imputed by applying linear interpolation (for the maximum of 14 consecutive years). This ensures smooth year-to-year estimates based on current and historical data, and by assuming linear change. If data are missing for longer periods, regression predictions are used to calculate the missing values. If regression imputations do not align with available data points, for the extrapolation and interpolation, the methodology applies the regression trend that is anchored in the observed values.

The second scenario uses regression predictions to impute missing values for indicators that lack all observations for a country. The regression method relies on all indicators within the respective component to estimate the missing values. The indicator with missing data points is predicted using all other indicators from the respective component as predictors. This approach is generally applied only for countries that have missing values for no more than one indicator per component. However, there are two notable exceptions; *Access to electricity* and *Tertiary school life expectancy* indicators. These exceptions are allowed in order to include more countries in the final ranking. To impute the missing values, the methodology first uses supportive indicators (listed in Annex B in the online supplementary file), which correlate highly with the indicator in question and can therefore approximate the missing data with better precision than other indicators. Only after this 'pre-imputational' step is the rest of the missing values calculated through the standard component-based regression.

In addition, there are a few cases that require a more unconventional approach. The Index includes a full Index score, ranks and relative performance for the West Bank and Gaza. Some indicator sources provide data for the West Bank and Gaza, while others provide data separately for the West Bank and for Gaza. In these cases, indicator values are calculated as a population-weighted average to obtain one data point for the whole entity, which is then used in the overall Index calculation. Similarly, to have a full Index score for Serbia, raw values of Internet users (over 1990–2003), and both Mobile and Landline telephone subscriptions (also over 1990–2003) are imputed as averages of countries of former Yugoslavia (i.e. Slovenia, Croatia, Northern Macedonia, Bosnia and Herzegovina).

3.2.3. Outlier treatment and data transformation

When constructing a composite indicator, in an ideal case, the underlying indicators have a near normal distribution. This is commonly measured by the skewness and kurtosis tests. However, data are often not normally distributed, and include extreme values, i.e. outliers. Both cases require treatment in order not to distort the final measurement. There is a plethora of techniques to deal with outliers and imperfect distributions. Winsorization methods are commonly used to cap an outlying value by replacing it with a lower value. The application approaches range from simply using the next highest/lowest value (Saisana et al., 2018) to more advanced such as one-sided winsorization (Chambers et al., 2000). Indicators with high skewness are often treated with logarithmic transformation. However, logarithmic transformation needs to be applied with extreme caution as it can distort the data in a way that they 'are often not relevant for the original, non-

transformed data' (Feng et al., 2014). Other common methods include square-root, Box-Cox, and reciprocal transformation.

We strive to make as few adjustments as possible in order not to distort the information the indicator provides. There are three occasions that require indicator transformation. In the first case, data are transformed to meet the boundaries set by the indicator definition. In the second case, extreme values that may distort results if left untreated are addressed. Thirdly, indicators with extreme skewness are transformed. The main two techniques of data transformation are to either cap an indicator (winsorization), setting a clear upper or lower boundary cut-off value, or to use the square root of an indicator. We chose the square root method instead of logarithmic transformation because it better preserves the original performance levels and can be used with zero values, which is not the case for the latter.

We use two statistical tests to help identify indicators that should be considered for transformation. The test of skew determines the degree of asymmetry of each indicator. The Handbook (Nardo et al., 2008) recommends treating indicators with the coefficient of skewness >2. After a careful assessment of all indicators, the Social Progress Index 1990–2020 methodology applies a threshold of 1.5 skew for indicator transformation, where indicators with the coefficient of skewness >2 are transformed using the square root, while indicators with skewness between 1.5 and 2 are capped at the 99th/1st percentile value. The square root transformation allows to retain the relative positioning of countries while creating a more sensible distribution. Only two indicators are transformed using the square root transformation: *Deaths from lead exposure* and *Interpersonal violence*.

The second test, which considers the difference between the indicator minima and the 1st percentile and the indicator maxima and the 99th percentile, helps to identify a single or a handful of extreme values in an otherwise relatively less skewed distribution. If the difference is greater than 2 standard deviations, a cap is applied at the 99th/1st percentile value.

Based on the above tests, the following indicators are capped at the 99th percentile value (one indicator capped at the 1st percentile value):

- Child mortality
- Deaths from infectious diseases
- Deaths from unsafe water, sanitation, and hygiene
- Deaths from household air pollution
- Deaths from road injuries
- *Life expectancy at 60* (capped at the 1st percentile)
- Premature deaths from non-communicable diseases
- Deaths from outdoor air pollution
- Early marriage

In addition, several indicators are capped based on theoretical boundaries. A floor is set at 0.03 for *gender parity in education* indicators to allow for measurement error based on the recommendations of UNESCO (UNESCO Institute for Statistics, 2010). The *Phone subscriptions* indicator is capped at 100 subscriptions to reflect the boundary set by its unit of measurement (number of subscriptions per 100 people). *Years of tertiary schooling* are capped at 5 years to avoid the influence of a few near-outliers and to be in line with the established Bologna system of tertiary education (3 + 2). Lastly, the *Proportion of the population with advanced education* is capped at 0.85 to reflect international targets and current achievements (Eurostat, 2023).

3.2.4. Best- and worst-case scenarios

Establishing the boundaries for each indicator, i.e. the best- and worst-case scenarios, is a crucial step in the methodology since it directly affects the level of final scores (0–100). Therefore, while the best- and worst-case values are defined for each indicator, we strive to follow the same method for similar metrics. For indicators with pre-defined boundaries (all indicators from Varieties of

Democracy, summary exposure values, etc.) the upper and lower cases are established based on the predefined scale. Natural boundaries are used for indicators that have a natural best-case scenario, such as maternal mortality (zero) and mobile phone subscriptions (100 per 100 population). For indicators that do not have a clear worst case or where the probability of reaching the worst-case scenario is extremely unlikely (e.g. child mortality, for which the theoretical worst case would be that every child dies before the age of five), the boundary is based on the worst recorded performance in the measurement period (i.e. 1990–2020). Caps constitute the boundaries for capped indicators. Best- and worst-case indicator values are included as two additional observations within the country dataset. See Annex A (in the online supplementary file) for the specific values used for each indicator's best- and worst-case scenario.

3.2.5. Indicator inversion

The inversion of indicators is required to align all indicators in the same direction. Specifically, all indicators for which a higher value denotes lower social progress (e.g. death rates) are transformed by a simple multiplication by −1. This inverts the direction of the indicators to correspond with higher values entailing better performance. There are 25 inverted indicators in the 1990–2020 Social Progress Index, these are noted in Annex A in the online supplementary file.

3.2.6. Component scores

The calculation of component scores is based on the aggregation of indicators within each component across all observations (i.e. countries and years) using the principal-component factor (PCF) analysis (Fávero & Belfiore, 2019). The PCF, using Stata's-*factor, pcf*-command, is a data reduction technique for analyzing a group of indicators thought to measure a single concept. It identifies composite elements from the indicators and combines them into a common construct (Acock, 2023).[4] For many of the 12 components, PCF generates similar weights for the indicators. This is due to ensuring a fair level of correlation between indicators within a component prior to the Index calculation.[5] However, for those cases where indicators are less correlated within their component, such as Personal Safety and Access to Information & Communications, PCF provides a good statistical approach for determining these indicators' contribution to the component scores while remaining objective (ibid). For this reason, PCF is preferred over equal weighting to ensure that indicators are meaningfully contributing to a component score, while accounting for similarities between them.[6] Weights derived by PCF are noted in Annex A in the online supplementary file. Component scores are scaled to 0–100 values using the min-max standardization method, where the best-case scenarios constitute the maxima, while the minimum value is represented by the worst-case scenarios. Prior to applying the PCF method, indicators are standardized into z-scores, which result in values with a mean of 0 and standard deviation of 1.

3.2.7. Final aggregation

Each dimension score is calculated as the arithmetic average of the four components that make up the dimension. The Index is then calculated as the arithmetic average of the three dimensions. We choose arithmetic average over generalized means and geometric average even though it allows for full compensability across components. We do so based on the validation of robustness and considering the advantages of arithmetic average. Countries that do not have scores in all four components of a given dimension do not have a dimension score. If a country does not have a dimension score, it does not have the Index score either.

3.2.8. Statistical validity

The statistical validity of the Index is tested multiple times during the calculation. We strive to include only such indicators that adequately capture the concept of each component and that are conceptually as well as statistically linked to one another. The statistical fit of indicators pre-selected for a component is first assessed in the exploratory phase by correlation and factor analysis.

Indicators that are statistically incompatible with the rest of the component are excluded from further consideration, and, if possible, are replaced with alternatives. Statistical fit is repeatedly confirmed throughout the calculation process.

As per JRC guidelines (Nardo et al., 2008), ideally, there should be only one determining factor per component (eigenvalue > 1). This criterion has been met for all components of the Index. Furthermore, the standard Social Progress Index methodology involves evaluating the fit between the individual indicators by calculating Cronbach's Alpha for each component. The alpha statistic is measured on a 0–1 scale and provides a measure of the internal consistency of indicators within a component, i.e. the extent to which all items measure the same concept or construct. As an applied rule of thumb, the alpha value should be above 0.7 for any logical grouping of variables (Stern et al., 2022). The alpha values calculated for the Index components are all above the threshold, however, near the limit in the case of Access to Information & Communications and Environmental Quality. Lastly, the goodness of fit of indicators within each component is evaluated using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy. The measure reflects the proportion of variance among variables that might be the common variance. The KMO values range from 0 to 1, while the mean KMO should be above 0.5 (Stern et al., 2022). In the Social Progress Index 1990–2020, all mean KMO values are greater than this threshold. The statistical validity results are summarized in Annex E in the online supplementary file.

3.2.9. Robustness check

To assess the robustness of the calculation procedure, particularly that of the aggregation and weighting methods, the Index is recalculated three times using different aggregation and weighting approaches. The standard methodology uses principal-component factor generated weights for aggregation on the component level, while it applies unweighted arithmetic averaging in the final aggregation step (from components to dimensions and from dimensions to the Index). The alternative options to this baseline that were tested are:

- (i) unweighted arithmetic averaging in all stages
- (ii) unweighted geometric averaging in all stages[7]
- (iii) PCF-generated weights and aggregation in all stages

Comparing the three alternative approaches with the applied methodology (i.e. baseline), we observe that the rank correlation (spearman) coefficients between the baseline and all three alternative options are very high. Specifically, the lowest coefficient of 0.96 is observed between the baseline and the second alternative that is based on geometric average. However, while the high coefficients suggest a general robustness of the calculation methodology (and limited sensitivity to changes in the aggregation approach), they may also mask some significant differences in rankings of individual countries between the baseline and the three alternative options. Indeed, the descriptive statistics of the rank differences demonstrate this, especially when the baseline ranking is compared with that based on geometric aggregation, which essentially confirms the finding highlighted above. This is not unexpected, as the geometric average aggregation penalizes the uneven performance of countries across components. The complete results of the robustness checks are available in Annexes F and F.2 in the online supplementary file.

4. Discussion of results

The results of the Social Progress Index 1990–2020, covering 170+ countries, offer a multitude of opportunities for analyses on a plethora of topics. This paper, however, focuses only on the following aspects:

- Trends in social progress globally; based on aggregate analysis and individual country analysis.

- Performance of social progress across countries; based on countries' absolute and relative performance, and distance to best-case-scenario method.

To examine trends in social progress globally, we approximate the Social Progress Index score for the world in the following manner: to calculate the scores, indicators are first aggregated into population-weighted raw values, using data of all ranked (170+) countries. Weights generated by PCF (based on the original country sample) are applied prior to calculating dimensions and the Index score. It is important to note that this method is different from calculating population-weighted scores (i.e. applying weights on component scores), and in essence treats the world as a country.

Based on this approach, the world score improved by 13.43 points between 1990 and 2020. The world performance was the best in the Basic Human Needs dimension, for which its score increased substantially from 63.23 in 1990 to 76.83 in 2020. Its performance in Foundations of Wellbeing increased even more (from 44.01 to 63.64), driven largely by gains in the Access to Information and Communications component. The Opportunity dimension, however, does not conform to this growth pattern – while there was a consistent increase from 1990 (48.89) to 2011 (56.64) it was followed by a period of stagnation (and even slight decline) until 2020 (55.93). A similar trend of uneven development is also observed across all components (see Annex G in the online supplementary file).

The results demonstrate that while the social progress of the world improved over time, the paths and trajectories of its dimensions and components were not the same. Some dimensions and components retained their good performance, while others stalled and declined, but some also achieved remarkable gains reversing their previously lagging position. The results also indicate that the world's social progress performance may be unevenly distributed over time. To better understand this pattern, we further examine gains by decades and 5-year periods (the results are available in Annex H in the online supplementary file).

Gains in the world's social progress peaked between 2000 and 2010 (+5.64 pts) but slowed down in the following decade (+3.56 pts). A similar trajectory is observed in both the Basic Human Needs and the Foundations of Wellbeing dimensions. In contrast, the Opportunity dimension recorded the highest gains in the 1990s, but experienced a decline in the most recent decade (−0.15 pts). This uneven progress over time is also an inherent feature of most components.

These results suggest an overall slowdown in social progress in the most recent decade. Comparing the last 5 years to the preceding three periods reveals a substantial slowdown for the Index, all dimensions and 11 components. This trend is also apparent when examining the level of progress of individual countries over time. For example, the most recent period recorded the highest number of countries either in decline or in stagnation in terms of the overall Index.

4.1. Country level results

Social progress performance varies widely across countries. While countries' scores are more similar in 2020 than they were in 1990, variability remains high. The biggest gains in terms of narrowing the spread in country performance were achieved in Basic Human Needs. Foundations of Wellbeing recorded the largest overall increase, whereas Opportunity lagged both on the overall improvement, as well in terms of bringing countries closer together. Component level analysis provides further insight (see Annex I and Annex J in the online supplementary file).

Despite turbulent developments and uneven achievements across countries, seven of the top 10 performers in 1990 retained their top position also in 2020. Of the three countries that have lost their premiership, the United States declined the most, falling to 31st place (Belgium 12th, Australia 14th). On the other hand, Iceland improved by 11 places to make it to the top 4 in 2020 (Austria improved by 7 and Netherlands by 3 places, respectively). Similarly, five of the bottom performers in 1990 still find themselves among the bottom ten 31 years later. Among

these bottom countries that improved, Angola achieved the greatest jump (14 places) taking the 152nd place in 2020. See Annex K in the online supplementary file for the top and bottom 10 performers in 1990 and 2020.

While almost all countries improved significantly in terms of the Index score (148 out 170 countries improved by 10 and more points),[8] the gains were unevenly distributed. The top five improvers in terms of score change were Bhutan (+29.73 pts); Maldives (+27.68pts); Myanmar (+26.96 pts); Ethiopia (+26.85 pts); Cambodia (+26.09 pts). At the other end of the spectrum, countries that did not do so well are Venezuela (−2.42 pts); Tajikistan (+0.53 pts); Nicaragua (+4.83 pts); Belarus (+4.97 pts); and Ukraine (+5.54 pts). It should be noted, however, that while only one country declined over the 31-year period, more countries experienced declines in the most recent years as discussed above.

Furthermore, the uneven distribution of absolute gains was reflected in the relative order of countries, i.e. in ranks. Countries that improved the most in this regard were the Maldives (improved by 39 ranks), Bhutan (38), South Africa (34), Albania (33), and Cabo Verde (26). At the other end, the countries that declined the most were Venezuela (decline by 59 ranks), Tajikistan (45), Nicaragua (40), Turkmenistan (37), and North Korea (37).

Countries with initially lower scores achieved higher gains in social progress over the 31 years – this is indicated by a high negative correlation ($r = -0.53$) between countries' initial level of social progress (in 1990) and the change in points over the 1990–2020 period. This is, to some extent, the consequence of the bounded nature of the Index, meaning that countries closer to the best-case scenarios have slower growth rates than countries further away from them. Therefore, it is useful to look at the performance of countries also from the perspective of distance reduction to the best-case scenario. In this regard, the most successful country over 1990–2020 was South Korea, which reduced its distance by 64.9%, followed by Iceland (64.3%), Ireland (62.9%), and Switzerland (62.6%). The bottom five performers are Venezuela (−7.4%), Tajikistan (1.2%), Central African Republic (9.4%), North Korea (10.2%), and Nicaragua (11.2%). The correlation between countries' initial level of social progress and the percentage of distance reduced is positive and stronger (0.64), showing that countries with higher initial levels of social progress are better in closing the gap to the ideal performance. However, it can be argued that focusing on the reduction of the distance discriminates against countries with initially the lowest scores since they have the longest distance to cover (Easterly, 2009).

5. Conclusion

Despite conceptual and measurement challenges, we constructed a new Social Progress Index spanning 31 years and covering 172 countries entirely and further 24 countries partially. The Social Progress Index 1990–2020 was built using only publicly available data and credible sources, and it represents an unprecedented effort in measuring the quality of life globally, over an extensive time period. However, there are considerations that should be taken into account when interpreting the results.

The Index is built in the present mind-set and only measures what was feasible to measure due to data limitations, which entails that many issues are not captured directly by the Index, including the most recent years and the impact of the COVID-19 pandemic. These challenges required some uncommon solutions in terms of missing values imputations and data transformations, but statistical validation confirms that the Index is a robust metric.

While the results indicate that there was an overall increase in social progress performance globally from 1990 to 2020,[9] a closer analysis reveals that this progress has been very uneven in terms of (i) elements of social progress, (ii) progress over time, and also (iii) distribution of progress across countries. Only a few components improved consistently over time, with reduced differences among countries. Some other areas stagnated or even declined over the 31-year period. During the

last decade, and especially since 2015, the Index shows an overall slowdown in almost all elements of social progress.

Differences between countries persist in terms of social progress levels, as well as in trajectories. While many successful countries remain successful, and many unsuccessful countries struggle to achieve significant progress, there are many examples of countries that improved over time, but also of those that declined.

While this paper and its accompanying online annexes provide an overview of the findings, we acknowledge that a more detailed analysis of the Index results would be both possible and highly valuable. However, such an effort would require either a significant shift from the methodological focus or an extensive expansion of the paper. Therefore, we plan to undertake a more detailed exploration of the results in the future research, and we also encourage other researchers interested in measuring social progress and societal wellbeing to utilize the presented findings for their own analytical and research purposes.

Notes

1. NUTS stands for Nomenclature of territorial units for statistics, which is a system for dividing up the territory of The European Union.
2. The Varieties of Democracy have since published a new edition of its dataset. Our World in Data no longer publishes the Access to electricity indicator with its 1990–2016 time series.
3. The IHME Covariates dataset is available from 1980 to 2019, in this case the entire time series is shifted by one year (i.e. 1989–2019 is used for 1990–2020).
4. The Stata command -factor, pcf- performs a factor analysis using principal component analysis (PCA) for factor extraction. This provides basically identical results as running PCA for example in SPSS, but the two methods should be regarded as different (see for example Jolliffe, 2002; Mardia et al., 2024; Mulaik, 2009).
5. As per recommendations (Nardo et al., 2008), the correlation coefficients should range between 0.30 and 0.92. From the 92 correlation coefficients in the framework (all of which are significant at the 1% level), 10 are lower than 0.30 (the lowest value is 0.13, while the highest value is 0.92).
6. It should be noted that PCF and other data-driven weighting methods have also received notable criticism in recent years, see for example Greco et al. (2019).
7. The calculational sequence was adapted as well: the standardization of indicators (to 0–100 scores) was done prior to aggregation to eliminate negative values.
8. Two countries are not considered as their data only became available later – Timor-Leste and South Sudan.
9. In line with the findings of Peiró-Palomino et al. (2023).

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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