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Social Progress Around the World: Measurement, Evolution and Convergence

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Abstract

This paper develops a new composite index to measure social progress in 139 countries over the period 1995-2017; notably, it allows for comparisons across countries and over time. The index considers 45 raw variables covering three fundamental pillars of social progress; namely, basic human needs, foundations of well-being, and opportunities. The results point to a marked improvement in social progress all over the world from the mid-1990s, although they also paint a picture of a highly polarized world. Cross-country convergence patterns are also investigated, revealing a reduction in the differences in social progress, largely driven by the narrowing of the gap in basic human needs. Conversely, sizeable cross-country disparities remain in foundations of well-being and opportunities. The analysis also accounts for people, and shows that social progress has improved for a large share of the world's population due to the remarkable advances of some highly populated countries.

Keywords: Convergence; Composite index; Social progress; World
JEL classification: C43; F63; O11; O15.

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1 Introduction

Social progress is of paramount importance for today's societies, and improving citizens' quality of life should be a priority for those in positions of governance (Pinker, 2018). In this regard, GDP per capita has long been the indicator used to assess not only economic but also social progress. Nevertheless, the limitations of GDP have been widely recognized (see Stiglitz *et al.*, 2009; Rojas and García-Vega, 2017). Indeed, a focus on income alone may distract policymakers from other important drivers of well-being (Rojas, 2020). International organizations such as the OECD and the World Bank acknowledge that underdevelopment is about more than just income; it concerns social vulnerability and exclusion, poor government institutions and violence, among other factors.

Accordingly, several initiatives have emerged aimed at building indicators to measure societies' development. As pointed out by Barrington-Leigh and Escande (2018), since the 1970s more than 80 such measures have been proposed using different concepts that include *augmented GDP*, *human development*, *social indicators*, *social progress* and more frequently *well-being*. Some of these initiatives have been promoted by national statistical offices,[1] supported by private initiatives in many countries, and in some cases they even drill down to the regional level. Examples from the scientific literature include Inoguchi and Fujii (2009) for Japan, Przybyla *et al.* (2014) for Poland, Felix and García-Vega (2012) for Mexico, Peiró-Palomino *et al.* (2019) for Spain, and Calcagnini and Perugini (2019) for Italy. Nevertheless, the country-specific nature of these measures makes cross-country comparisons unfeasible.

From a cross-national perspective, a well-known measure is the United Nations' Human Development Index (HDI). A more comprehensive framework is that of the Better Life Index produced by the OECD and currently available for 40 countries. This database, which was constructed following the guidelines of the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz *et al.*, 2009), provides information on 11 well-being dimensions. Its use in empirical analyses has become widespread. Several authors, such as Mizobuchi (2014, 2017), Lorenz *et al.* (2017) and Peiró-Palomino and Picazo-Tadeo (2018), have dealt with the issue of

[1] For instance, the Office of National Statistics in the UK (see Everett, 2015), the Australian Bureau of Statistics (2014), the Irish Central Statistics Office (2012) or the Community Foundations of Canada (2013).

aggregation[2] and established rankings of countries using the Better Life Index; moreover, Döpke *et al.* (2017) and Peiró-Palomino *et al.* (2020) have published results for the European regions using the Regional Well-being Database, which is the regional version of the Better Life Index.

A more recent framework is the Social Progress Index provided by Porter *et al.* (2014), which constitutes one of the most comprehensive proposals to assess social progress. It is based on three non-economic pillars: basic human needs, foundations of well-being, and opportunities. In turn, each pillar is made of different components represented by an extensive list of indicators. The index, published by the non-profit organization Social Progress Imperative, was launched in 2013 and since then has been released annually.[3] To date, however, it has received relatively little attention in the scientific literature. To the best of the authors' knowledge, only Fehder *et al.* (2018, 2019) have used the Social Progress Index in empirical analyses. The former study assesses the relationship between social progress and subjective well-being, whereas the second one focuses on the impact of economic institutions on social progress.

Despite the extensive research in the field of social progress in recent years, there are still important gaps to be filled. A very common limitation in this literature is that it is not feasible to compare social progress over time due to heterogeneity in the composition of the indexes in different releases; besides, changes in the sample modify the relative positions of the countries, making long-run analyses a difficult task. Another shortcoming is the limited geographical coverage of most studies, as they are generally restricted to reduced samples of relatively homogeneous developed countries, such as those of the OECD. Both these limitations make it harder to gain a good understanding of the long-run evolution of social progress in the world. It is no surprise then that, unlike convergence in income, convergence in social progress across a wide range of countries remains largely unexplored.

Against this background, this paper attempts to make a threefold contribution to the literature on social progress. First, taking as a reference the index of social progress proposed by Porter *et al.* (2014), several enhancements are incorporated to expand both its geographical and temporal coverage. Accordingly, the paper develops a composite index to measure social progress in 139 countries over the period

[2]Aggregation is one the challenges of the construction of composite indicators made of different dimensions (see Greco *et al.*, 2019, for a recent review on this issue).

[3]The available releases can be found at https://www.socialprogress.org

1995-2017. It is based on the original pillars from the Porter *et al.* (2014) index; namely, basic human needs, foundations of well-being, and opportunities. In turn, these are built from 11 components primarily based on 45 raw indicators gathered from reliable statistical sources. The construction of this database is in itself a contribution of this research. Modern missing data imputation techniques, standardization procedures and Principal Components Analysis (PCA) are combined to aggregate the indicators into components. Then, components are aggregated into pillars, and these into scores of social progress using an equal weighting procedure. Notably, the index is homogeneous in terms of construction issues and sample composition, thus enabling comparisons across countries and over time.

Second, not only countries but also people are accounted for in order to analyze the distribution of social progress around the world and its trends. In doing so, non-parametric statistical tools are employed to compute both unweighted and population-weighted distributions of countries' social progress scores. Very few previous studies have done so; one of the exceptions in this respect is the paper by Peiró-Palomino and Picazo-Tadeo (2018) for OECD countries. As stated by the World Bank Social Development Program, "*people need to be put first*" in development processes. In this regard, improvements in social progress are welcome in any country, but advances in highly populated countries are more meaningful for global progress.

Third, convergence in social progress is analyzed by testing the notions of β-convergence and σ-convergence. On the one hand, β-convergence refers to a process of catching-up of laggard countries, and it is tested with dynamic panel regressions, as in Islam (1995). On the other hand, σ-convergence, which refers to a reduction of the dispersion of social progress scores across countries over time, is tested following the novel approach by Kong *et al.* (2019).

Regarding the results, the social progress index computed in this research (SPI henceforth) reveals the existence of huge disparities worldwide. Figure (1) depicts the geographical distribution of social progress in 2017. The Nordic countries, Switzerland, Japan, New Zealand and Austria take the lead. Western European countries, the USA, Canada and Australia also show remarkably high levels of social progress. Intermediate levels are seen in South American countries, together with some MENA and South Asian countries. Most of the Caribbean countries register similar values to the Asian giants, including India and China, all with relatively low scores. Finally, the worst scores for social progress are found in Sub-Saharan African and some

Middle Eastern countries.

INSERT FIGURE (1) ABOUT HERE

Apart from this global picture, there are several takeaway messages from the results of this research. The first is that social progress has improved remarkably over the 23-year period analyzed virtually all over the world, although a marked polarization between advanced and laggard countries is found. The second message is that disparities in social progress have narrowed, mainly due to the strong convergence observed in the basic human needs pillar; conversely, disparities persist in the foundations of well-being and opportunities pillars. Finally, more substantial improvements in social progress are found in highly populated countries, which suggests a more notable advance in social progress in terms of people benefiting than in terms of countries.

The remainder of this paper is structured as follows. Section (2) introduces the measure of social progress. Section (3) analyzes the evolution and distribution of social progress across countries and people. In Section (4), a convergence analysis is carried out. Finally, Section (5) concludes.

2 Measuring Social Progress

Composite indexes are useful tools that aggregate into a single figure the information gathered on multidimensional realities. According to the OECD (2008) (pp. 15-16), the main steps involved in building a composite index are: (i) setting a theoretical framework; (ii) selecting the raw indicators; (iii) imputing missing data; (iv) standardizing the data in order to produce comparable figures; (v) selecting the weightings to aggregate the indicators; and finally, (vi) analyzing its robustness. Following these guidelines, this paper builds a SPI for 139 countries and 23 years (from 1995 to 2017 inclusive), yielding 3,197 final observations. As will be explained in detail in this section, the index primarily relies on a selection of 45 indicators, so that the raw database contains 143,865 data points.

2.1 Theoretical framework and selection of indicators

Setting a framework for the measurement and analysis of social progress based on a composite index poses major theoretical and empirical challenges. One issue in this regard is that "*social progress*" is a broad concept that has no single definition (see Streeten, 2013; O'Sullivan, 2014 for detailed discussions). Furthermore, most of the interpretations of social progress are easily understood but difficult to measure, as measurement involves value judgments and ultimately entails a normative basis.[4]

As mentioned above, this paper closely follows the conceptual framework established in Porter *et al.* (2014), that 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*". This definition alludes to three broad elements of social progress or "pillars"; namely, (I) Basic human needs; (II) Foundations of well-being; and (III) Opportunities. These pillars are made up of components, which draw on a wide array of outcome-oriented raw indicators.[5] Given that the main objective of this research is to extend both the geographical and temporal span of the index provided by Porter *et al.* (2014), the same indicators are used whenever possible; appropriate alternatives were sought when information was not available. The ultimate goal is to maintain a reasonable balance between sticking to the original index and maximizing coverage, both geographical and temporal, without impairing its quality.

Most of the normative judgments guiding the selection of indicators and the construction of the SPI are related to the Natural Rights Theory, which was first enunciated by Locke (1689) and Rosseau (1762), and aspires to be universal with inalienable rights not being dependent on any particular culture. However, the concept of "*social progress*" embodied in the SPI also reflects to some extent happiness-based

[4]Note that *"progress"* implies an an idea of movement—either literal or metaphorical—towards a desired goal or end; therefore, getting closer to the desired goal is regarded as something positive for the actors involved and can be judged as an improvement. In this regard, measuring the evolution towards such a goal or end entails specific value judgments about the common good, social welfare and well-being.

[5]The use of an extensive range of indicators has the advantage of making the index less vulnerable to serious distortions if any indicator is inappropriate. The set of indicators used to build the index are intended to reflect outcomes rather than inputs, given that input-based composite indexes require some degree of consensus on how the inputs lead to outcomes. In the context of social progress, this would mean a clear consensus and understanding of which inputs lead to better social outcomes. Hence, an outcome-oriented index such as the one developed in this study is more appropriate (Fleurbaey and Blanchet, 2013).

or utilitarian value judgments, a Rawlsian view of justice, or the liberal principle of equality of opportunity, among others (O'Sullivan, 2014).[6] The following paragraphs explain in detail the architecture of the SPI and its theoretical foundations. A summary of the indicators, data sources, the polarity of the variables and the share of missing data is reported in Table (1).

(I) Basic human needs

Basic human needs refer to adequate nourishment, basic medical care, clean water, sanitation devices, adequate shelter and personal safety. The selection of components and raw indicators for this pillar draws on the moral and political philosophy of the Natural Rights Theory, which is the inspiration for declarations of rights in many countries' constitutions and in the United Nations Declaration of Human Rights. To model social progress along this dimension, the basic human needs pillar consists of three components: (I.1) Nutrition and basic medical care; (I.2) Basic sanitation and shelter; and (I.3) Personal safety.

(I.1) Nutrition and basic medical care. This component represents two factors that are key prerequisites for both survival and preventing early-life damage that may lead to permanent impairment (Black *et al.*, 2008; Nisbett *et al.*, 2014). Having a diet that is sufficient in terms of caloric requirements and diverse enough to meet additional nutritional needs is essential for good health (Blesh *et al.*, 2019). Besides, a poor diet and lack of access to medical care increase the chances of malnutrition and death caused by treatable infectious diseases (Rice *et al.*, 2000; UN, 2019). The component is measured by (1) the prevalence of undernourishment as a percentage of the population; (2) the depth of the food deficit in kilocalories per person/day; (3) the maternal mortality ratio per 100,000 live births; (4) the under-five mortality rate per 100,000 live births; and (5) the number of deaths from infectious diseases per 100,000 people.

(I.2) Access to clean water, sanitation, and shelter. Clean water is essential for drinking and cooking, and must be pathogen-free to prevent the spread of disease (Cutler and Miller, 2005). Similarly, sanitation prevents the spread of disease, and is an aspect of human dignity that can affect multiple facets of a person's life (Pruss *et al.*, 2002; Fewtrell *et al.*, 2005). Besides, adequate shelter conditions are essential to ensuring safety, health and human dignity by providing protection from the elements and including basic facilities. This component is measured by (6) people with access to at least basic drinking water services; (7) people with access to electricity; (8)

[6]The diverse normative and moral basis can be seen as a strong point of the SPI.

people with access to at least basic sanitation services; (9) people practicing open defecation; and (10) people with access to clean fuels and technologies for cooking. All these variables are measured as a share of the total population.

(I.3) Personal safety. Safety is essential for the attainment of health, peace, justice and acceptable living conditions. Populations severely affected by violence, crime and war usually suffer from an excess of infant mortality, destroyed health infrastructure and eroded agricultural systems and living conditions (Gates *et al.*, 2012; Wischnath and Buhaug, 2014). This component is measured by (11) the homicide rate per 100,000 people; (12) traffic deaths per 100,000 people; (13) the physical violence index developed by Coppedge *et al.* (2019, 2020); and (14) the political stability and absence of terrorism index developed by Kauffman *et al.* (2010).

(II) Foundations of well-being

Foundations of well-being highlight the extent to which people can access basic education, obtain information and communicate freely, benefit from a modern healthcare system, and live in a healthy environment. Specifically, this pillar consists of four different components: (II.1) Access to basic knowledge; (II.2) Access to information and communications; (II.3) Health and wellness; and (II.4) Environmental quality. As explained by O'Sullivan (2014), the moral inspiration for the first two components is the theory of natural rights. Freedom of thought and conscience is a fundamental right whose exercise depends on education and information. The third component has its roots in a utilitarian and happiness-based moral philosophy, whereas the last component draws from the Aristotelian natural law, which holds that human well-being is achieved through a life in harmony with nature.

(II.1) Access to basic knowledge. It measures the extent to which the population has attained a certain degree of education. As shown by Samarakoon and Parinduri (2015), education is fundamental to individual freedom and empowerment, and can lead to increased satisfaction (Hossain *et al.*, 2019). With basic knowledge in reading, writing, and math, an individual can improve his/her social and economic circumstances, as well as more fully participate in society and politics (Henderson and Chatfield, 2011). This component is measured by (15) the literacy rate, as a percentage of the population; (16) a gender parity index for gross school enrollment in primary and secondary education; and (17) the access to basic education index developed by Coppedge *et al.* (2019, 2020).

(II.2) Access to information and communications. It measures the degree of free-

dom to access and exchange information, which is essential for an efficient, open, and accountable society (Besley and Prat, 2006; Costas-Pérez *et al.*, 2012). In this regard, the ability of an individual to connect with others via phone or internet facilitates learning and the exchange of ideas, and strengthens the social fabric. In addition, exposure to different views and cultures is extremely important, as widespread communication technologies favor transparency and can lead to democratizing waves and limit pathways to corruption and tyranny (Ferraz and Finan, 2008; Lotan *et al.*, 2011). Moreover, press freedom ensures that access to information is not suppressed by the government, allowing citizens to educate themselves (Bhattacharyya and Hodler, 2015). This component is measured by (18) the number of mobile cellular subscriptions per 100 people; (19) the share of the population using the internet; (20) the media corruption index; and (21) the index of government efforts to censor the media, both developed by Coppedge *et al.* (2019, 2020).

(II.3) Health and wellness. It measures the capacity to live a long and healthy life. Life expectancy at birth is one of the most frequently-used health status indicators. Bad health not only undermines individuals' quality of life, but also shortens their lifespan. At a collective level, poor health hinders social development by reducing the human capital available within society (OECD, 2019). Thus, long and healthy lives is an indicator of societal well-being and success (Eurostat, 2017). In addition, it is important to measure the extent to which high-quality basic healthcare is guaranteed to all citizens and if it is sufficient to enable them to exercise their basic political rights as adult citizens (Sigman and Lindberg, 2019). This component is measured by (22) life expectancy at birth, in years; and (23) an index of health equality.[7]

(II.4) Environmental quality. A safe and protected natural environment is a precondition for living a healthy and satisfying life and enables longer-term community resilience (Hoek *et al.*, 2001). It is tied to both health and survival: outdoor pollution can affect people's capacity to breathe freely while greenhouse gas emissions and loss of biodiversity and habitat threaten the world's collective climate conditions, food chain, and disease containment (Keesing *et al.*, 2010;Pongsiri *et al.*, 2009). This component includes (24) CO_2 emissions in metric tons per capita; (25) renewable energy consumption, as a percentage of the total final energy consumption; (26) a forest conservation index; (27) the terrestrial biome protection index; and (28) the

[7]This indicator has a direct link with the egalitarian principle of democracy (Sigman and Lindberg, 2019). In addition to protecting the rights and freedoms of groups institutionally, literature on egalitarian democracy suggests that inequalities of health or education, inhibit the exercise of political power and the enjoyment of political rights. Hence, a more equal distribution of these resources across social groups is necessary to achieve political equality.

species protection index; the latter two indices were both developed by Wendling *et al.* (2018) as part of the Environmental Performance Index project.

(III) Opportunities

This pillar refers to the extent to which individuals have the right conditions to allow them to achieve their full potential in a society. It comprises the following components: (III.1) Personal rights; (III.2) Personal freedom and choice; (III.3) Tolerance and inclusion; and (III.4) Access to advanced education.

(III.1) Personal rights. These include political and property rights, as well as rights of association and expression. They capture whether an individual is able to participate freely in society without the intrusion of government, social organizations, or private power over personal freedom, and they are included in all the contemporary declarations of human rights (O'Sullivan, 2014). They all contribute to human dignity and worth, and facilitate the participation of individuals in building a free and democratic society, where the people's voices are valued in determining state and community affairs (Beetham, 2004). This component is measured by (29) the political rights index; (30) the freedom of expression index; (31) the freedom of religion index; (32) the access to justice index; and (33) respect for the women's property rights.

(III.2) Personal freedom and choice. It focuses on individual freedom over life decisions. An individual should be able to choose where to live, where to work, when and whom to marry, and when to start a family, as all these matter for life satisfaction (Verme, 2009; Delhey, 2010). The philosophical foundations of this component are related to the theory of natural rights and to the liberal political philosophy (Mill, 1869; O'Sullivan, 2014). This component also includes corruption, which distorts individuals' choices, creating insecurity and uncertainty in social relationships (Bhattacharyya and Hodler, 2015). The component is measured by (34) freedom of foreign movement; (35) freedom from slave work; (36) political corruption; (37) public sector corruption; and (38) the women empowerment index developed by Sundström et al. (2017).

(III.3) Tolerance and inclusion. A tolerant society is an inclusive society, where every individual can pursue his/her human right to a life of dignity and worth. Regardless of the reason, discrimination prevents people from fully participating in society, creating a pretext for violence and social conflict (Montalvo and Reynal-Querol,

2005 Choi and Piazza, 2016).[8] This component draws from a Rawlsian view of justice but also relies on the principles of egalitarian democracy (see Sigman and Lindberg, 2019) and the imperative of ensuring equality of opportunity for all people, a norm which pervades both socialist and liberal political thought.[9] The component is measured by (39) equality of political power by gender; (40) equality of political power by socio-economic position; and (41) equality of political power by social group.

(III.4) Access to advanced education. Even though not every individual will choose to pursue advanced education, the choice in itself is fundamental to advancing both societal enlightenment and individual opportunity (Pinker, 2018). As shown by Iaria *et al.* (2018), access to top research is key for scientific and technological progress. Moreover, world-class educational and research institutions provide benefits beyond simply educating individuals; they are key contributors to solving problems through innovation and error correction. This component is measured by (42) average years of education; (43) the number of university students per capita; (44) enrollment rates in tertiary education; and (45) a scientific production index.

INSERT TABLE (1) ABOUT HERE

2.2 Treatment of missing data

Missing values for raw indicators can stem from: (i) lack of coverage by the data source; or (ii) incomplete reporting by the country to international organizations. A large amount of missing values can severely affect the statistical quality of the SPI. As shown in the last column of Table (1), the share of missing data in the sample is about 6.10%, with differences across pillars (12.30% for basic human needs, 4.12% for foundations of well-being and 2.65% for opportunities). For the purpose of the analysis carried out in this research, a balanced panel is required.

To interpolate missing data and replace it with estimated values, penalized cubic smoothing spline methods have been used, which are a flexible tool producing much

[8] See the European Charter of Fundamental Rights (op.cit.) Article 21: *"Any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited"*.

[9] See Mill (1869), Roemer (1994) or Gilabert (2012) for discussions on the issue of equal opportunities for different traditions of thought.

lower errors than more conventional regression splines (Aguilera and Aguilera-Morillo, 2013). In doing so, it has been assumed that the time-series of each raw indicator k for each country i can be represented by means of a smooth function f of a time trend, such that:

$$y_{it}^{k} = f\left(t\right) + \varepsilon_{it} \tag{1}$$

where ε_{it} is a random error. Cubic smoothing splines can be used to estimate f by minimizing:

$$E_{\lambda} = \sum_{t}^{T} \left(y_{it} - f\left(t\right)\right)^{2} + \lambda \int \left(f\left(t\right)^{''}\right)^{2} dt \tag{2}$$

where λ controls the variance-bias trade-off between data fitting and smoothness of f; the term $\left(y_{it} - f\left(t\right)\right)^{2}$ is a mean squared error which pushes the spline as close as possible to the data points; and the second term acts as a wiggliness penalty that attempts to keep the spline as free of curvature as possible.[10]

The general solution of $\hat{f}$ for the problem in Equation (2) is given by Wood (2003).[11] With the estimate of $\hat{f}\left(t\right)$, the fitted time-series $\hat{y}_{it}$ is replaced wherever there are missing data points. This procedure makes it possible to consistently fill in 92.8% of the missing values in the sample, reducing the need for regression imputation to just 0.43% of the 143,865 data points employed in the analysis.[12]

[10] Note that as λ goes to infinity the smoothing spline approaches a linear least squares fit, whereas when λ goes to 0, f becomes an interpolating spline.

[11] The default configuration of the *gam* function of the *mgcv* R software package is used, which automatically selects λ using a cross-validation criterion and avoids knot placement issues. Thus, the interpolation of missing values within the range of the data behaves as a smoothed natural cubic spline, allowing the researcher to retain model complexity in f, but as a linear trend model outside the range of the data.

[12] Unfortunately, in a few exceptional cases the whole time series of a given raw indicator y_{it}^{k} is missing for a given country. In such cases, natural cubic smoothing splines cannot be applied and, therefore, regression imputation is used instead, following Stern *et al.* (2018). In a first step, the link between the indicator y_{it}^{k} and the set of indicators in component c other than k is estimated for the sample of countries, excluding i that belong to that specific component (i.e., we run a regression of the form $y_{-i,t}^{k} = \sum_{\neq k} y_{-i,t}^{\neq k}\beta_{\neq k} + u_{-i,t}$ for all $-i \neq i$). In a second step, the fitted $\hat{\beta}_{\neq k}$ and the data on $y_{i,t}^{\neq k}$ are used to produce $\hat{y}_{i,t}^{k}$. This procedure was applied for 6 countries for undernourishment, for 12 countries in the gender parity index and 9 countries in the tertiary gross enrollment ratio.

2.3 Standardization

Each raw indicator in the dataset is measured with a different unit. In order to convert all indicators y_{it}^k into a common scale, a two-step procedure has been followed. First, the indicators that exhibit a negative relationship with social progress have been multiplied by -1 to invert their polarity and ensure that higher values always represent better performance.[13] Second, the data have been standardized into z-scores to ensure comparability. To account for both cross-sectional and temporal dimensions of the dataset, the means and standard deviations required for standardization have been computed using the 3,197 observations available for each indicator (139 countries and 23 years). In formal terms:

$$z_{it}^{(k)} = \frac{y_{i,t}^{+,k} - \bar{y}^k}{\sigma_{y,k}} \tag{3}$$

where $z_{it}^{(k)}$ denotes the z-score for the $k-th$ indicator in country i and time t; $y_{i,t}^{+,k}$ is the original value of the indicator k for country i and period t after being transformed, if necessary, to have a positive polarity; $\bar{y}^k$ denotes the sample mean for indicator k across countries and years; and $\sigma_{y,k}$ stands for its standard deviation.

2.4 Selection of weights and aggregation

The issue of aggregation, i.e., the selection of the weights representing the relative importance of the indicators, plays a key role in building the SPI (see Greco *et al.*, 2019). Existing literature offers a menu of aggregating methods to choose from (see OECD, 2008). In this research, principal components analysis (PCA) is employed, as in Porter *et al.* (2014). PCA aggregates the set of indicators within each component into a single factor or principal component that captures the maximum amount of variance in the data while reducing redundancy between indicators (see Rencher and Christensen, 2012; OECD, 2008).

Let Z^c be the $NT \times K$ matrix of standardized indicators after stacking observations $Z^c = \left(z_{it}^{(1)}, \ldots, z_{it}^{(K)}\right)$, forming a given component c of the SPI. Σ_c is the

[13] There are 13 indicators (out of 45) with a negative polarity, as shown in Table (1). The polarity is determined according to how each indicator is defined in the original source, without considering whether the concept itself is positive or negative for social progress.

$K \times K$ matrix of covariances of the standardized indicators, with μ_k denoting its $k-th$ eigenvalue and ν_k standing for its corresponding eigenvector of size $NT \times 1$. The first principal component of the indicators in Z^c is obtained as their normalized linear combination with the highest variance such that:[14]

$$P^c_{1,it} = Z^c_{it}\nu_1 = \nu_{1,1}z^{(1)}_{it} + \ldots + \nu_{K,1}z^{(K)}_{it} \tag{4}$$

where $\sum_{k=1}^{K} \nu^2_{k,1} = 1$ because of normalization. The loadings $\nu_{1,k}$ in this context can be understood as the weight that each indicator k contributes to the component P^c. In order to ensure the validity of the dimensionality reduction, and prior to calculating these principal components, the sampling adequacy has been assessed with the Kaiser-Meyer-Olkin (KMO) test, which provides a measure of the proportion of variance among indicators that might be common variance. The KMO statistics for all 11 components of the SPI are shown in Table (2). In all cases, this score is above the critical value of 0.5 (Kaiser, 1974), indicating that the set of indicators chosen for the components of social progress provides an acceptable measure of the underlying construct.

INSERT TABLE (2) ABOUT HERE

Once each principal component $P^c_{1,it}$ has been estimated for $c = 1, \ldots, 11$ these are transformed into a scale of 0 to 1 using the following min-max formula:

$$y^c_{it} = \frac{P^c_{it} - minP^c}{maxP^c - minP^c} \tag{5}$$

where y^c_{it} stands for the normalized component c; P^c_{it} is the value for the unnormalized principal component c estimated for country i at period t; $minP^c$ and $maxP^c$ denote, respectively, the minimum and maximum values of the unnormalized estimated component across all countries $i = 1, \ldots, n$ and years $t = 1995, \ldots, 2017$. It is worth noting here that normalized components in Equation (5) permit both cross-country

[14] The variance of $P^c_{1,it}$ is maximum as ν_1 is chosen to be the solution of the maximization problem given by $max_{\nu_1} F = P^c_{1,it\prime}P^c_{1,it} = \nu_1 Z_{it\prime}Z_{it}\nu_1$, subject to the normalization condition $\nu_{1\prime}\nu_1 = 1$. Also, note that the share of variance captured by the first principal component is given by the eigenvalue or characteristic root $V\left(P^c_{1,it}\right) = \mu_1$.

and cross-year comparability, as minimum and maximum scores in the normalization process are computed using all countries and years in the sample (see Koronakos *et al.*, 2020).

Again following Porter *et al.* (2014), the scores for the 3 pillars of the SPI have been calculated for each country i and year t as the arithmetic average of the components included in each pillar, i.e., using equal weightings (EW). Thus, the pillar score is given by $y_{it}^{p} = \sum_{c=1}^{C} \frac{1}{C} y_{it}^{c}$. Analogously, the SPI has been computed as the arithmetic average of its 3 pillars. Accordingly, the indexes of social progress and its pillars all range between 0 and 1 so that the higher the score, the greater the social progress. This procedure is labeled PCA-EW. Scores of the SPI in the years 1995 and 2017 for all 139 countries in the sample are provided in Table (A1) of the Appendix; the scores for the intervening years are not reported but they are available on request.

2.5 Robustness checks

In order to assess the robustness of the SPI and its pillars to the aggregation method used in their computation, they have been recalculated using some alternatives to the baseline PCA-EW approach. These include: (i) factor analysis (FA) in all stages of the aggregation process (components, pillars and SPI); and (ii) equal weighting (EW), also in all aggregation stages.[15] The Spearman rank correlations of the indexes obtained with these approaches and those from the PCA-EW range from 0.953 to 0.998, and are all statistically significant at the 1% level (see Table A2 in the Appendix). These results indicate the strong association between the scores of social progress computed with different aggregating methods. These alternative indices are used to check the robustness of the empirical analysis carried out in the following sections.

[15]The results for the SPI and its pillars from these alternative composite indexes are not provided in the paper, but are available to readers on request.

3 Evolution and distribution of social progress

3.1 General trends

What were the main trends in social progress between 1995 and 2017? In order to answer this question, Table (3) reports basic descriptive statistics for the SPI and its pillars in the first and last years of this period. The basic human needs pillar scores the highest, followed by foundations of well-being and opportunities. In this regard, it is likely that only after basic necessities have been reasonably met can the focus shift to foundations of well-being and then opportunities; however, this does not necessarily mean that societies cannot work to improve all three pillars of social progress simultaneously.

INSERT TABLE (3) ABOUT HERE

The evolution of social progress from 1995 to 2017 is depicted in the three panels of Figure (2). Panel (a) displays a positive trend in social progress over the period (black solid line), with the pillar of basic human needs (red dashed line) showing the highest level, as mentioned above, and also a more sustained trend. Foundations of well-being (green dotted line) started out from a lower score but improved remarkably between 2000 and 2012, at which point this growth slowed. Lastly, opportunities slightly improved up until 2011, after which this pillar stagnated and even moderately declined. As a result, social progress rose at a slower pace in the last years of the period.

Panel (b) describes the evolution of the SPI for different groups of countries, according to the World Bank geographical classification. Although logically there are disparities across countries included in the same group, geographical aggregations share common features and trends. The highest levels of social progress are found in North America (the USA and Canada in this sample), followed by Europe and Central Asia. Somewhat below are East Asia and Pacific countries, with similar scores and evolution as in Latin American and Caribbean countries. At the bottom of the ranking are the MENA, South Asian and Sub-Saharan African countries, which display the lowest scores of social progress. Whereas differences are still large in 2017,

the gap in social progress seems to be closing as a result of the comparatively faster growth of the lowest-ranked groups.

The last panel (c) displays a scatter plot for the SPI index in 1995 and 2017. The size of the bubbles corresponds to countries' populations and the color represents the group they belong to, according to the World Bank classification. It is worth highlighting how the geographical component plays a significant role, as points of the same group are scattered relatively close together in the chart. In this regard, the USA and Canada, together with several European economies, are located in the upper-right corner because of their higher levels of social progress in both years. The Sub-Saharan countries are in the lower-left corner, although most of them have improved in the period; similar gains are seen in highly populated countries such as China, India and especially in Indonesia. Other countries with low or medium levels of social progress in 1995 have also experienced notable advances.

INSERT FIGURE (2) ABOUT HERE

To provide additional perspective, Table (4) reports the top and bottom 10 countries according to their level of social progress in both 1995 and 2017, and the change recorded in the period. In levels, the ranking in both years is headed by the Nordic countries, Canada, Australia, New Zealand and Western European countries including Switzerland, Austria and Germany. The composition of the bottom 10 group is not as stable, although in both years it includes Sub-Saharan countries and Afghanistan; this last country presented the worst social progress score in 1995, but has experienced the greatest improvement over the period, spurred by the overthrow of the Taliban regime in 2001. Other countries making important gains in social progress include Sub-Saharan ones such as Angola, Sierra Leone and Rwanda, and South East Asian countries such as Indonesia and Laos. At the opposite extreme, the group with the lowest growth rates of social progress growth is headed by Venezuela, which shows a marked negative trend, and whose situation has deteriorated most acutely in recent years. Burundi, the Central African Republic, Syria and Ukraine—all countries experiencing social tension and escalating violence in the period—also exhibit a negative trend. This group of countries with the lowest rates of progress also includes Turkey and advanced economies such as the USA and Canada, which show positive but slow change over the period. The low levels of change in social progress in these last two countries could be partly explained by the high level

already reached in 1995, although most Western European countries were in a similar situation and kept improving more quickly.

It is noteworthy that the top and bottom 10 countries according to their SPI only represent a marginal share of the sample population, with cumulative shares below 3.5% in both 1995 and 2017. As such, it is advisable not to constrain the analysis of social progress to the tails of the distributions, but to analyze the entire distributions. This is done in the next section.

INSERT TABLE (4) ABOUT HERE

3.2 Distribution of social progress in the world

3.2.1 How is social progress distributed across countries?

The entire distribution of social progress across countries in the sample is represented in panel (a) of Figure (3), and shows a markedly bimodal world in both 1995 (black solid line) and 2017 (red dashed line). As already suggested by the trends presented in the previous section, some improvement has taken place over this 23-year period; i.e., the distribution of social progress has moved to the right. However, polarization is persistent. The mode on the left is more prominent in both years, meaning that there is a higher density of countries with low levels of social progress. In order to understand this global dynamic, the three pillars of social progress are separately analyzed.

Regarding the distributions for basic human needs depicted in panel (b), in 1995, the main mode is around the score of 0.9, grouping together advanced countries that have entirely covered basic human needs; however, there is marked dispersion. In contrast, in 2017, the distribution has become strongly bimodal. The mode on the right remains stable, although it now includes more countries. Apart from the highly developed economies, several developing economies have joined, including East Asian and Latin American and Caribbean countries. The new left-hand mode is around the score of 0.6 and is represented almost entirely by underdeveloped Sub-Saharan countries, which despite a remarkable improvement still have relatively low scores in comparison with the advanced countries. Summing up, the group of countries with

basic human needs fully covered has grown, although polarization has increased, creating a duality between Sub-Saharan countries and the rest of the world.

Panel (c) shows the distributions for foundations of well-being, and also points to a bimodal world, with a main mode in 1995 around the score of 0.5 and a smaller one close to 0.7. Whereas the world has progressed in terms of foundations of well-being, i.e., the distribution has also shifted to the right, there is greater polarization in 2017. The more advanced mode on the right includes the European countries, Japan, Australia, New Zealand and Canada, and slightly behind, the USA. The main mode on the left groups together a mixture of developing economies from all over the world, although there are differences, with Latin American and Caribbean countries and Central Asian ones displaying higher scores than MENA and Sub-Saharan countries.

The last panel (d) reveals that the distribution for the opportunities pillar is comparatively more stable, in the sense that improvements have not been as marked as in the case of foundations of well-being and basic human needs, i.e., the shift to the right of the distribution is much more moderate. The distribution is bimodal in both 1995 and 2017, and the most numerous group is that of countries with lower scores for opportunities. In addition, differences between the two modes are larger than for the other two pillars, and the gap remains virtually unaltered over the period. The higher stability found for this pillar might imply that a large proportion of countries in the world are progressing in basic needs and foundations of well-being, whereas opportunities are still limited in most countries.

INSERT FIGURE (3) ABOUT HERE

3.2.2 How is social progress distributed among people?

Analyzing the distribution of social progress across countries is highly interesting, but it is perhaps even more striking to evaluate how the distributions are affected when countries' population are taking into account. In this regard, countries in the sample differ widely in population size; e.g., Bahrain had a population of under 600,000 inhabitants in 1995, while that of China was over 1,200,000,000. These huge differences have remained fairly stable over the period studied. As commented above, social progress is high in the Nordic countries, Switzerland, Austria and New

Zealand; however, these countries are relatively sparsely populated. In contrast, highly populated countries such as China, India, Pakistan, Indonesia and Brazil perform unmistakably worse. That said, this section looks for a different picture of social progress by analyzing how the distributions of the SPI and its pillars change when people are accounted for. With this purpose, densities are weighted by population so that each country is assigned a weight proportional to the share of the population it represents in the sample, as in Peiró-Palomino and Picazo-Tadeo (2018). The results are shown in the four panels of Figure (4).

Panel (a) shows that the bimodality found in the distribution of social progress across countries is exacerbated when population is accounted for, revealing that the majority of the world's people enjoy low levels of social progress. In 1995 (black solid line), the mode on the right at the score of 0.8 mostly comprises relatively highly populated advanced economies such as the USA, Japan, the UK, Germany, France and Italy. Conversely, China and India, whose populations are about 10 times bigger, in addition to other heavily populated countries such as Russia, Pakistan, Brazil, Indonesia and Mexico, are all included in the mode on the left, which registers a level of social progress of nearly 0.5. In 2017 (red dashed line), the entire distribution has moved to the right, although the shift is more pronounced for the left-hand mode, which represents a substantial advance for a large share of the world population. However, despite the improvement in the period, most people still enjoy low levels of social progress.

Regarding the pillars of social progress, panel (b) displays the population-weighted distributions for basic human needs in 1995 and 2017. The results show a sizable improvement for the most populated countries in the period. Indeed, in 2017, a main mode arises close to 0.8, which includes highly populated developing countries along with the less populated advanced ones. In addition, a small mode is located around the score of 0.6, made up of underdeveloped countries, mostly Sub-Saharan countries, that did not manage to improve in terms of basic human needs.

The distributions for foundations of well-being are in panel (c). In this case, the bimodality is more persistent and the weighted distributions are more closely aligned to the corresponding unweighted ones. Again, the group with the poorest performance corresponds to the most populated countries. The distributions are more peaked in the population-weighted case, showing more similarity between countries within the same group. The dispersion is greater in 2017, indicating that whereas some highly populated countries reduced the gap with the group enjoying better

foundations of well-being, others stagnated. In spite of this, and unlike the basic human needs pillar, disparities remain more stable, and most of the world population still live in countries with low scores for the foundations of well-being.

Finally, panel (d) presents the distributions for the pillar of opportunities. Countries are clustered in three groups in both 1995 and 2017. There is one mode on the left around very low scores, and another one around intermediate scores, which are similar in terms of population. The left-hand mode is formed by some MENA countries, and particularly China and Indonesia, whereas the intermediate mode includes Latin American countries, some Sub-Saharan countries, and especially India, the country that gives this second peak its remarkable size. There is also a third mode with a much higher opportunities score, which represents a comparatively smaller share of the world population and includes all the advanced countries, mostly European ones, the USA and Canada, and Australia and New Zealand. Additionally, population-weighted distributions for opportunities are fairly stable over the period. Only a small advance can be observed in the left-hand mode between 1995 and 2017 (from 0.3 to nearly 0.4), which mostly corresponds to an improvement of opportunities in a highly-populated country, Indonesia. Summing up, only a small proportion of the world population enjoys such opportunities.

INSERT FIGURE (4) ABOUT HERE

4 Convergence in social progress

According to the results commented on in Section 3, social progress and its pillars have exhibited a sustained rise in practically all countries in the sample between 1995 and 2017. However, this finding does not necessarily mean that the differences across countries narrowed over the period, thus contributing to a more equalitarian world. In order to find out whether this did in fact happen, in this section convergence in social progress and its three pillars over the period 1995-2017 is tested through the concepts of β-convergence and σ-convergence.

4.1 Assessing β-convergence

The concept of β-convergence was developed by Barro and Sala-i-Martin (1992); in the context of this research, it would measure the extent to which countries that are lagging behind in terms of social progress catch-up with leading ones as time goes by. In more formal terms, the β-convergence hypothesis tests if $Cov\left(y_{i0}, \frac{y_{iT}-y_{i0}}{T}\right) < 0$, where $\frac{y_{iT}-y_{i0}}{T}$ is the long run average growth rate of social progress and y_{i0} is the initial score. β-convergence is first visually inspected in Figure (5) for social progress and its pillars, and then formally tested.

Panel (a) of the abovementioned Figure (5) shows a negative correlation between the average annual growth rate of the SPI in 1995-2017 and its observed level in 1995, suggesting a β-convergence pattern. The greatest advances are seen in Sub-Saharan countries, which had the lowest levels of social progress at the beginning of the period. At more moderate rates, social progress also improved in Latin American and Caribbean and Asian countries. Particularly notable is the annual improvement in highly populated countries such as Indonesia (above 2%), and India and China (0.5% and 1%, respectively). In most European countries, North America and Japan, social progress barely increased. Finally, as already shown in Table (4), social progress declined in some countries, including Venezuela, Burundi, the Central African Republic, Syria and Ukraine.

The results for basic human needs are depicted in panel (b), displaying a much steeper negative slope than for the aggregate SPI, thus pointing to a stronger convergence pattern. Convergence seems to be especially high in Sub-Saharan countries, some of which have annual growth rates close to 5% (Angola, Ethiopia and Rwanda). With annual improvements between 1% and 2%, highly populated countries such as Indonesia and India stand out, while the growth in China has been lower. The score in basic human needs decreased in Syria, Ukraine, Saudi Arabia, and especially Venezuela, all countries that had intermediate or relatively high levels in 1995.

Panel (c) displays the results for foundations of well-being. Convergence in this pillar has been more limited, as already suggested by the study of its distribution. Again, Sub-Saharan countries are among those with the highest growth rates, slightly above 1% per year and always below 3%. Similar improvements are seen in almost all MENA countries and Indonesia. The rest of the countries in the sample have growth rates of around 0.5% per year, with the exception of three countries where foundations of well-being declined in the period; namely, Venezuela, the Central African Republic

and Burundi.

Finally, panel (d) shows the results for the pillar of opportunities, again registering more moderate catching-up. Afghanistan is the country that improved the most, with an annual growth rate of 5.8%, followed by Indonesia (4%). Opportunities grew in most countries at annual rates of between 0% and 2%, but declined in some countries, including India, Thailand, Turkey and Russia, in addition to Venezuela, the Central African Republic and Burundi, countries that also displayed a negative trend in the other two pillars. While still recording high scores in 2017, the USA and Canada stand out for their slightly negative trend in opportunities, whereas in Western European countries opportunities keep growing despite the initial high levels in 1995.

INSERT FIGURE (5) ABOUT HERE

In order to formally test the hypothesis of β-convergence, the following dynamic two-way fixed effects regression has been run:

$$\ln y_{i,[t]} = b_{0,i} + a_t + (1 + b_1) \ln y_{i,[t-1]} + \varepsilon_{it} \tag{6}$$

where $b_{0,i}$ captures country-fixed effects; a_t time-period fixed effects; and $(1 + b_1)$ measures the effect of an increase in the log of SPI (or its pillars) in $t-1$ on current log values. This regression is a panel analog to the Barro regression and the coefficient of the lagged SPI term can naturally be interpreted as a function of the speed of convergence. This dynamic formulation has been employed in Islam (1995) in the context of economic growth and it is equivalent to the Barro and Sala-i-Martin (1992) framework. Inference on the convergence speed γ is obtained as $\gamma = -\frac{\ln(b_1)}{\tau}$, where τ measures the years/periods between t and $t-1$.[16]

Columns (2) and (3) in Table (5) report the estimated parameters and the corresponding convergence speed for a restricted specification of Equation (6) in which it is assumed that $b_0 = b_{0,i} + a_t$ for all i and t; i.e., the pooled OLS regression. Columns (4) and (5) report the estimates obtained from a country-fixed effects specification that allows $b_{0,i} \neq b_0$ for some i; finally, columns (6) and (7) report the results

[16] In the empirical work yearly data are used. Thus, τ is set to 1 in order to estimate the convergence speed.

for a two-way fixed effects model in which both country and time heterogeneity are allowed to avoid omitted variable bias. It is important to mention that including control variables in these estimations is a really difficult task, as the left-hand side of the equation involves many variables captured in the SPI and its pillars, and so a serious problem of reverse causality could arise. Hence, instead of conditional β-convergence, the more restrictive absolute β-convergence hypothesis is tested; this hypothesis is equivalent to state that countries' social progress converges in the long-run, independently of their initial conditions and structural characteristics. Nevertheless, the fixed-effects specifications allow to capture the transition speeds towards long-run equilibrium values of social progress in a hypothetical context in which the initial conditions would have not been different across countries.

In all the specifications, a positive and significant value of $\beta = (1 + b_1) > 0$ is found, with the speed of convergence ranging from 1.28% (opportunities) to 2.92% (basic human needs) in the pooled OLS specification; from 3.98% (foundations of well-being) to 10.96% (opportunities) in the country-fixed effects model; and from 7.52% (basic human needs) to 12.4% (opportunities) in the two-way fixed effects specification. Thus, correcting for the bias from unobserved heterogeneity leads to higher rates of convergence. Regarding the SPI, the convergence speed in the pooled OLS model is about 1.66% per year, whereas in the two-way fixed effects specification it is 8.40%. These large differentials in the convergence speed are in line with previous results in the context of growth regressions (see Islam, 1995; Abreu et al., 2005). They can be explained by the fact that in models including country and/or time fixed effects, the estimated convergence speeds are those that would exist if there were no cross-country differentials in the initial conditions affecting social progress' long-run trajectories. Furthermore, the outcome of β-convergence in the SPI and its pillars is robust to the aggregation method employed to build the aggregate indicator, and its components and pillars, as shown in Table (A3) of the Appendix.

INSERT TABLE (5) ABOUT HERE

4.2 Assesing σ-convergence

The analysis carried out in Section 4.1 suggested a process of catching-up across countries in the sample in terms of social progress and its pillars. However, Sul (2019)

criticizes the concept of β-convergence as (i) it may be the by-product of a temporary statistical illusion; and (ii) because it is a necessary but not a sufficient condition for a decrease in the cross-sectional dispersion of social progress or its pillars across countries. In this regard, Phillips and Sul (2007, 2009), Kong *et al.* (2019) and Sul (2019) consider that true convergence implies that cross-sectional dispersion should decrease over time, which is not guaranteed by β-convergence.[17]

In the specialized literature, the reduction of dispersion is known as σ-convergence. (Phillips and Sul, 2007) developed a flexible test for modeling σ-convergence in relative transition curves by means of the so-called *log-t* regression, which in this research would hold if the ratio of social progress (or its pillars) scores across sample countries was converging to unity in the long run ($plim_{t\to\infty}\frac{y_{it}}{y_{jt}} = 1$). As explained by Sul (2019), this notion of convergence can only be tested when panel data show an unequivocal trending behavior, which is not the case for many of the countries in the sample.[18] Thus, Kong *et al.* (2019) developed a more general test of σ-convergence, termed *weak σ-convergence*, which provides a rigorous asymptotic theory on the implementation of a simple trend regression approach. Letting K_t denote the cross-sectional variance in a panel setting, the weak σ-convergence test is equivalent to verifying if $Cov\left(K_t, t\right) \leq 0$.

Figure (6) displays the evolution of the cross-sectional dispersion of the SPI and its pillars from 1995 to 2017, thus providing a graphical depiction of the notion of σ-convergence; at first glance, the picture is rather different to that observed in Figure (5) regarding β-convergence. While the dispersion for the SPI and the basic human needs pillar has clearly decreased over time, this is not the case for foundations of well-being and opportunities. Consequently, σ-convergence in social progress appears to be driven by the rapid convergence in basic human needs, whereas a fluctuating or even divergent trend is observed for the dispersion of the other two pillars.

INSERT FIGURE (6) ABOUT HERE

[17] To see intuitively why β-convergence may not be enough for a reduction in differentials, note that countries can be β-converging toward one another while, at the same time, random shocks could be pushing them apart such that the dispersion might be increasing. Another case in which β-convergence would not decrease disparities is the following. Consider that countries i and $i\prime$ both start from a similar SPI, but $i\prime$ is on its long run trajectory while i is far below its own trajectory. Initially, the dispersion of social progress will be low, but it will grow over time as i evolves faster than $i\prime$ and approaches its long run trajectory.

[18] Sul (2019) shows that *log-t* regressions are not well defined unless the panel data of the variable of interest satisfies (i) $y_{it} \geq 0$; and (ii) the panel data does not display an unequivocal trend behavior.

As commented above, the Phillips and Sul (2007, 2009) relative transition curves cannot be used in this research, since the results of trend regressions of the type $y_{it} = \alpha_i + \beta_i t + u_t$ show that there is no unequivocal trending behavior in the panel for any of the pillars, nor in the aggregate SPI. Accordingly, the notion of relative convergence is not well defined because of weak trending behavior (see Sul, 2019, pp 128-130), and a weak σ-convergence test needs to be carried out.[19]

As described in Sul (2019) and Kong *et al.* (2019), this test is given by the t-statistic of the OLS estimate ϕ based on the Newey-West HAC estimator with lag length $L = int(T^{1/3})$ from the following simple trend regression:

$$K_t^y = \alpha + \phi t + u_t \tag{7}$$

where K_t^y is the cross-sectional sample variance. In this context, (i) if $t_{\hat{\phi}} < -1.65$ or $t_{\hat{\phi}} \to -\infty$ then y_{it} is weakly σ-converging; (ii) if $t_{\hat{\phi}} > 1.65$ or $t_{\hat{\phi}} \to +\infty$ then y_{it} is diverging; and (iii) if $t_{\hat{\phi}} \to^d N(0,1)$ then y_{it} is fluctuating.

The results for the full period 1995-2017 and the sub-periods 1995-2008 and 2009-2017, which differentiate between pre-, during, and post-Great Recession years, are presented in Table (6). They show that disparities in social progress across countries have decreased significantly in the whole period, with this reduction being especially pronounced between 2009 and 2017. The results for each pillar reveal that this result is mainly driven by the marked reduction in differentials in basic human needs; indeed, a consistent decrease of dispersion is found for this pillar in both subperiods, and also in the entire period. Conversely, fluctuations are observed in foundations of well-being and opportunities, and a clear significant negative/positive trend is not found in the cross-sectional variance when considering the full period. Fluctuations in the cross-country dispersion of foundations of well-being can be explained by a significant increase in disparities during the sub-period 1995-2008, followed by a decrease in 2009-2017. In contrast, differentials in opportunities reduced during the sub-period 1995-2008 and increased afterwards.

INSERT TABLE (6) ABOUT HERE

[19]Since clustering algorithms that allow the researcher to determine the formation of sub-convergent clubs rely on *log-t* regressions, and sub-sample relative convergence tests are not reliable in this context, club convergence is not tested in this research.

Summing up, the results from the weak σ-convergence test provide evidence in line with the preliminary intuition from Figure (6), as convergence is found for the basic human needs pillar and the aggregate SPI, whereas both foundations of well-being and opportunities show fluctuating trends. Furthermore, the robustness of these results is investigated in Table A3 in the Appendix, the main finding being that weak σ-convergence holds irrespective of how the index employed to measure social progress and its pillars is built.

5 Conclusions and prospects for future research

This research deals with the challenging issue of the measurement of social progress. Grounded on the earlier index produced by Porter *et al.* (2014), the paper proposes one of the most comprehensive frameworks in the current literature in this field. A composite index of social progress is built for 139 countries over the period 1995-2017. It considers three pillars of social progress; namely, basic human needs, foundations of well-being and opportunities, which in turn are represented by 11 components and 45 raw indicators. Notably, the index allows for comparisons both across countries and over time, which constitutes a contribution to prior literature and makes it possible to conduct a convergence analysis.

The results show that, since the mid-1990s, social progress has improved in virtually all the countries analyzed. However, they also paint a picture of a highly polarized world, with a group of countries that enjoy high levels of social progress and another with much lower levels. Generally speaking, the greatest social progress is found in sparsely populated countries. The evolution of the pillars of social progress has been unequal, with large improvements in basic human needs and much more moderate advances in foundations of well-being and opportunities. In spite of the abovementioned polarization, some evidence is found of a reduction in cross-country disparities in social progress, spurred by the catching-up of highly populated Asian and Latin American economies. Furthermore, convergence in social progress has mainly been driven by the narrowing of disparities in basic human needs, since fluctuations are observed in foundations of well-being and opportunities. These results highlight the need for stronger efforts to achieve a more egalitarian world.

Social progress can improve the social inclusion of the most vulnerable groups by making societies more cohesive and resilient, and by reinforcing the links between

people and institutions. A sound institutional setting is essential for long-run social progress, although there are other actors involved besides governments, including civil society and the private sector. There is a need to undertake major initiatives in the laggard countries to achieve social progress beyond basic human needs. In doing so, aspects such as guaranteeing access to knowledge and information and communication technologies, protecting the environment, improving health and wellness and aspects related to personal freedom, tolerance, inclusion and gender parity should be considered as key elements in development policies. Indeed, some of the strategies of the World Bank Social Development Program acknowledge the importance of these issues, and have a focus on reducing conflict, gender-based violence and promoting citizen engagement. All these spheres are considered in the index of social progress developed in this research.

This paper has contributed to improving the understanding of disparities in social progress around the world, and trends therein; however, it is not without its limitations. On the one hand, population should be assigned an even more prominent role. In this regard, looking at country averages, as this research does, is informative, but a closer look at within-country inequality is needed in order to better understand how social progress reaches people. Unfortunately, current databases do not allow for such an analysis but future improvements should be aimed at making it possible. On the other hand, another issue that calls for further exploration is the analysis of the factors that enable social progress. It is important to know which are the key elements behind the successful cases and also the specific factors that impede social progress. These are, however, just a couple of the topics awaiting analysis in a promising research agenda in this burgeoning field of the literature.

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Table 1: The architecture of the Social Progress Index

Pillar	Component	#	Indicator	Source	Polarity	Observations	Missing
(I) Basic human needs	(I.1) Nutrition and basic medical care	1	Prevalence of undernourishment	WDI	Negative	2382	25.49%
		2	Depth of the food deficit	WDI	Negative	3019	5.57%
		3	Maternal mortality ratio	WDI	Negative	2502	21.74%
		4	Mortality rate under-5	WDI	Negative	3197	0.00%
		5	Death from infectious diseases	GBD	Negative	3197	0.00%
	(I.2) Acces to clean water, sanitation and shelter	6	People using at least basic drinking water services	WDI	Positive	2502	21.74%
		7	People with access to electricity	WDI	Positive	2903	9.20%
		8	People using at least basic sanitation services	WDI	Positive	2488	22.18%
		9	People practicing open defecation	WDI	Negative	2465	22.90%
		10	Access to clean fuels and technologies for cooking	WDI	Positive	2468	27.15%
	(I.3) Personal safety	11	Homicide rate	GBD	Negative	3197	0.00%
		12	Traffic deaths	GBD	Negative	3197	0.00%
		13	Physical violence	VDEM	Positive	3197	0.00%
		14	Political stability and abscence of terrorism	WGI	Positive	2641	17.39%
(II) Foundations of wellbeing	(II.1) Access to basic knowledge	15	Literacy rate	WB, CNTS	Positive	2783	12.95%
		16	Gender parity	WDI	Negative	2701	15.51%
		17	Access to basic education	VDEM	Positive	3197	0.00%
	(II.2) Access to information and communications	18	Mobile cellular subscriptions	WDI	Positive	3193	0.16%
		19	Population using the Internet	WDI	Positive	3109	2.75%
		20	Media corruption	VDEM	Positive	3197	0.00%
		21	Government censorship effort-media	VDEM	Positive	3197	0.00%
	(II.3) Health and wellness	22	Life expectancy at birth	WDI	Positive	3197	0.00%
		23	Health equality	VDEM	Positive	3197	0.00%
	(II.4) Environmental quality	24	CO_2 emissions	WDI	Negative	2780	13.04%
		25	Renewable energy consumption	WDI	Positive	2914	8,85%
		26	Forest conservation	WDI	Positive	3058	4.35%
		27	Terrestrial biome protection	EPI	Positive	3197	0.00%
		28	Species protection	EPI	Positive	3197	0.00 %
(III) Oportunities	(III.1) Personal rights	29	Political rights	FH	Negative	3272	1.21%
		30	Freedom of expression	VDEM	Positive	3197	0.00%
		31	Freedom of religion	VDEM	Positive	3197	0.00%
		32	Access to justice	VDEM	Positive	3197	0.00%
		33	Respect of woman property rights	VDEM	Positive	3197	0.00%
	(III.2) Personal freedom and choice	34	Freedom of foreign movement	VDEM	Positive	3197	0.00%
		35	Freedom from slave work	VDEM	Positive	3197	0.00%
		36	Political corruption	VDEM	Negative	3197	0.00%
		37	Public sector corruption	VDEM	Negative	3197	0.00%
		38	Women empowerment	VDEM	Positive	3197	0.15%
	(III.3) Tolerance and inclusion	39	Equality of political power by gender	VDEM	Positive	3197	0.00%
		40	Equality of political power by socioeconomic position	VDEM	Positive	3197	0.00%
		41	Equality of political power by social group	VDEM	Positive	3197	0.00%
	(III.4) Access to advanced education	42	Average years of education	GBD	Positive	3197	0.00%
		43	University students	CNTS	Positive	2759	16.79%
		44	School enrollment in tertiary education	WDI	Positive	2385	26.27 %
		45	Scientific production	Scimago	Positive	3168	4.35%

Notes: WDI: World Development Indicators, GBD: Global Burden of Disease, VDEM: Varieties of Democracies, WGI: World Governance Indicators, EPI: Environmental Performance Index, FH: Freedom House, CNTS: Cross National Time Series Database, Scimago: SCImago Journal and Country Ranks. The polarity is determined according to how each indicator is defined in the original source, without considering whether the concept itself is positive or negative for social progress.

Table 2: Kaiser-Meyer-Olkin (KMO) tests of sample adequacy

Pillar and components	KMO score
I. Basic human needs	
I1. Nutrition and basic medical care	0.794
I2. Basic sanitation and shelter	0.880
I3. Personal safety	0.543
II. Foundations of well-being	
II1. Access to basic knowledge	0.613
II2. Access to information and communications	0.564
II3. Health and wellness	0.500
II4. Environmental quality	0.529
III. Opportunities	
III1. Personal rights	0.864
III2. Personal freedom and choice	0.762
III3. Tolerance and inclusion	0.710
III4. Access to advanced education	0.553

Notes: The Kaiser-Meyer-Olkin (KMO) test is a measure of the suitability of the variables for the PCA. It assesses the proportion of variance among variables that might be common variance. As a rule of thumb, values of the KMO > 0.5 indicate that the sample is adequate.

Table 3: Social Progress Index and its pillars, descriptive statistics

	Social Progress Index		Basic human needs		Foundations of well-being		Opportunities	
	1995	2017	1995	2017	1995	2017	1995	2017
Minimum	0.186	0.340	0.193	0.322	0.225	0.406	0.068	0.155
1st quartile	0.458	0.553	0.541	0.676	0.448	0.569	0.337	0.396
Median	0.567	0.665	0.753	0.850	0.529	0.654	0.453	0.511
Mean	0.572	0.668	0.705	0.807	0.538	0.665	0.474	0.532
3rd quartile	0.714	0.792	0.891	0.935	0.638	0.751	0.632	0.680
Maximum	0.850	0.920	0.990	0.994	0.747	0.879	0.828	0.908
Standard deviation	0.160	0.142	0.219	0.150	0.120	0.122	0.185	0.190
Coefficient of variation	0.279	0.213	0.311	0.185	0.222	0.184	0.390	0.357
Kurtosis	-0.827	-0.898	-0.779	-0.171	-0.800	-0.865	-0.785	-0.870
Asymmetry coefficient	0.036	0.021	-0.546	-0.778	0.026	-0.024	0.126	0.097

Table 4: Social Progress Index, top and bottom 10 countries in 1995 and 2017

1995				2017				Annual variation 1995–2017			
Top ten	SPI	Bottom ten	SPI	Top ten	SPI	Bottom ten	SPI	Top ten	△ SPI	Bottom ten	△ SPI
Norway	0.850	Guinea-Bissau	0.346	Norway	0.920	Syrian Arab Rep.	0.470	Afghanistan	0.038	Russian Federation	0.002
Sweden	0.847	Laos	0.334	Denmark	0.920	Angola	0.465	Sierra Leone	0.031	Thailand	0.002
Denmark	0.847	Rwanda	0.312	Switzerland	0.909	Mauritania	0.455	Rwanda	0.028	Canada	0.002
Finland	0.840	Ethiopia	0.303	Finland	0.899	Haiti	0.436	Angola	0.026	United States	0.001
Canada	0.837	Congo, Dem. Rep.	0.297	Sweden	0.897	Afghanistan	0.428	Liberia	0.022	Turkey	0.001
Germany	0.831	Chad	0.282	Netherlands	0.894	Sudan	0.412	Indonesia	0.021	Ukraine	-0.000
Belgium	0.824	Sierra Leone	0.267	New Zealand	0.892	Congo, Dem. Rep.	0.409	Ethiopia	0.021	Syrian A.R.	-0.000
Switzerland	0.824	Angola	0.265	Australia	0.889	Burundi	0.405	Sudan	0.021	Central African Rep.	-0.001
Austria	0.818	Sudan	0.260	Belgium	0.883	Central African Rep	0.362	Morocco	0.020	Burundi	-0.002
Australia	0.816	Afghanistan	0.186	Germany	0.883	Chad	0.340	Laos	0.018	Venezuela, RB	-0.004
Mean	0.833		0.285		0.899		0.418		0.024		0.000
Population share	0.032		0.032		0.024		0.035		0.064		0.119
Relative mean	1.456		0.498		1.346		0.626		3.400		0.007

Notes: Relative means are computed by dividing the average social progress of the corresponding top or bottom 10 by the global average of social progress. The same procedure was followed for the variations of social progress but using average changes instead of levels.

Table 5: β-convergence tests

	Pooled OLS		Country-fixed effects		Two-way fixed effects	
	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$
Social Progress Index	0.983***	0.0166	0.9508***	0.0505	0.9194***	0.0840
	(801.61)		(225.01)		(148.02)	
Basic human needs	0.971***	0.0292	0.9471***	0.0543	0.9276***	0.0752
	(836.16)		(257.24)		(205.84)	
Foundations of well-being	0.986***	0.0132	0.9609***	0.0398	0.8990***	0.1064
	(615.84)		(227.04)		(114.62)	
Opportunities	0.987***	0.0128	0.8962***	0.1096	0.8833***	0.1240
	(528.45)		(125.75)		(110.78)	

Notes: In all cases, the dependent variable is the logarithm of the indicators in period t. The results are obtained using the specification in Equation (6). $\hat{\gamma}$ is the implied convergence speed. In parentheses is the t-statistic. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 6: Weak σ -convergence tests

	1995–2017		1995–2008		2009–2017	
	$100 \times \hat{\phi}$	$t_{\phi}(3)$	$100 \times \hat{\phi}$	t_{ϕ} (2)	$100 \times \hat{\phi}$	t_{ϕ} (2)
Social Progress Index	-0.024***	-10.464	-0.015***	-6.754	-0.043***	-19.961
Basic human needs	-0.119***	-36.947	-0.132***	-53.903	-0.098***	-35.343
Foundations of well-being	0.002	0.409	0.027***	7.452	-0.031***	-16.815
Opportunities	0.000	0.428	-0.029**	-2.495	0.000	0.613

Notes: Results correspond to the estimation of Equation (7), where the dependent variable is the cross-sectional dispersion of the SPI and its pillars over time defined as: $K_t = \frac{1}{n}\sum_{i=1}^{n}(y_{it} - \bar{y}_t)^2$. The t-statistic corresponding to parameter ϕ, $t_{\phi} = \frac{\hat{\phi}}{\sqrt{\hat{\Omega}_u^2 / \sum_{t=1}^{T}\left(t - T^{-1}\sum_{t=1}^{T} t\right)^2}}$ where $\hat{\Omega}_u^2 = \frac{1}{T}\sum_{t=1}^{T}\hat{u}_t^2 + 2\frac{1}{T}\sum_{l=1}^{L}\varphi_{l,L}\sum_{t=1}^{T-l}\hat{u}_t'\hat{u}_{t+l}$ and $\varphi_{l,L}$ is Bartlett lag kernel weight and $L = int\,(T)^{1/3}$.

Figure 1: Social Progress Index in 2017

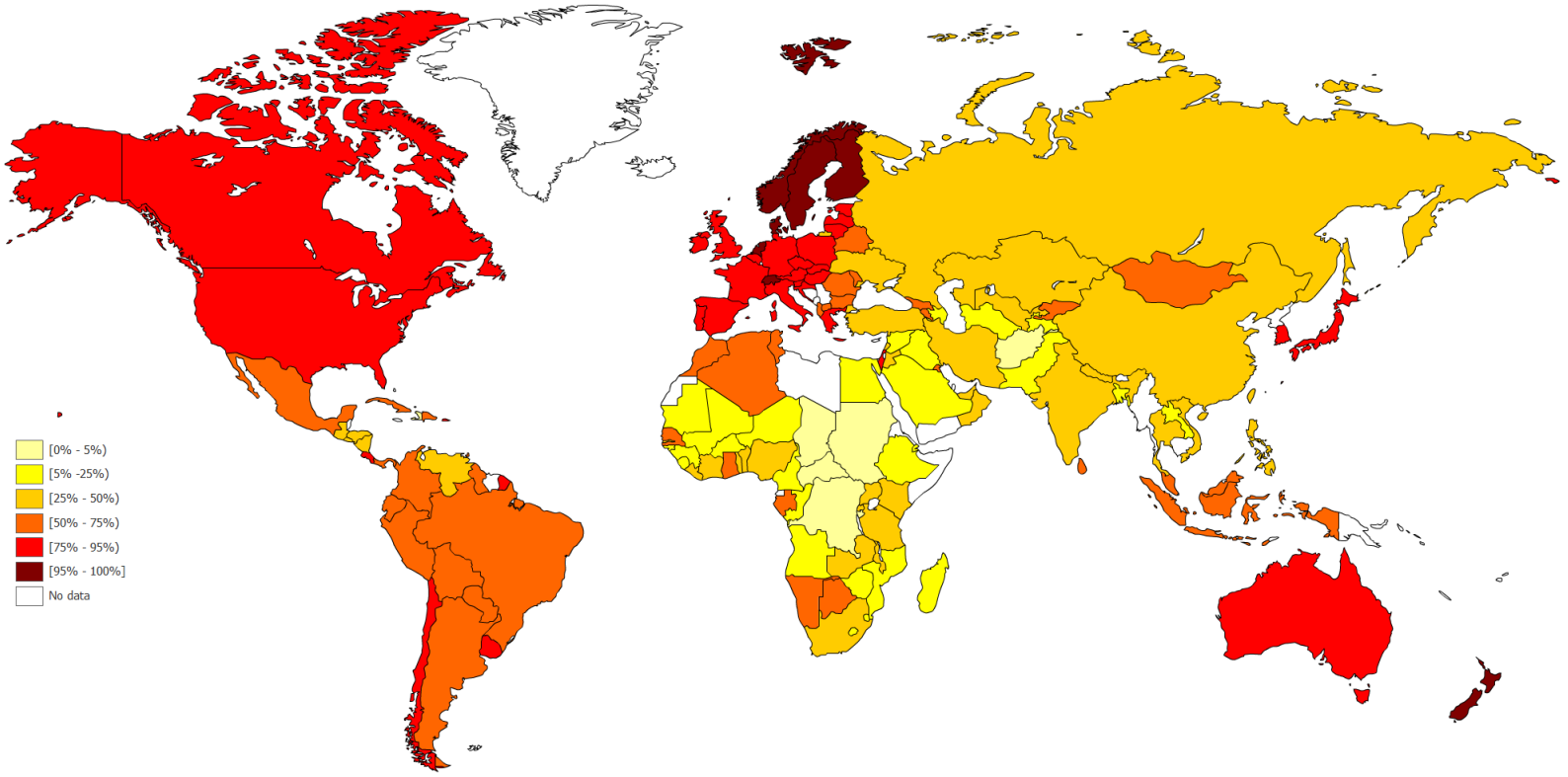
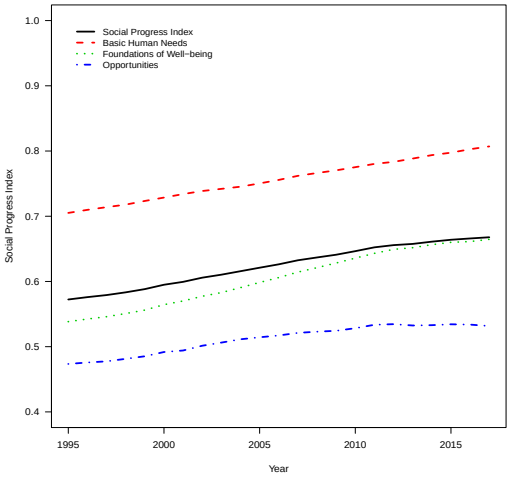
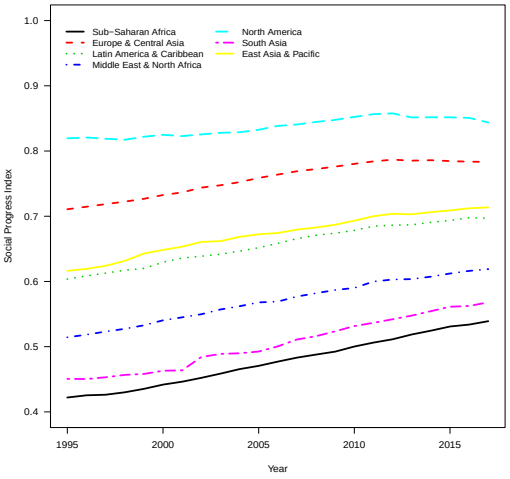


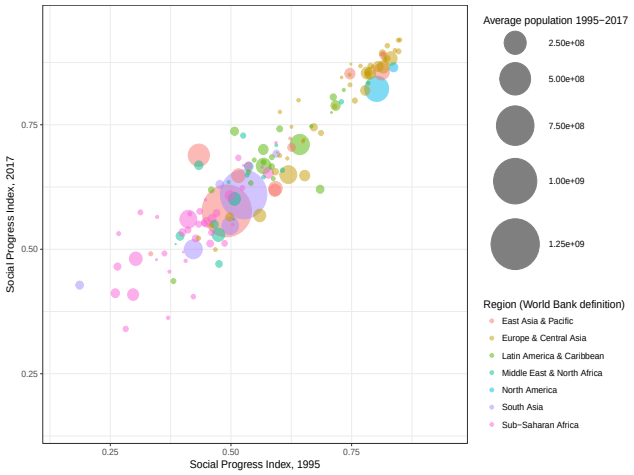
Figure 2: Evolution of social progress, 1995-2017



(a) Social progress and its pillars

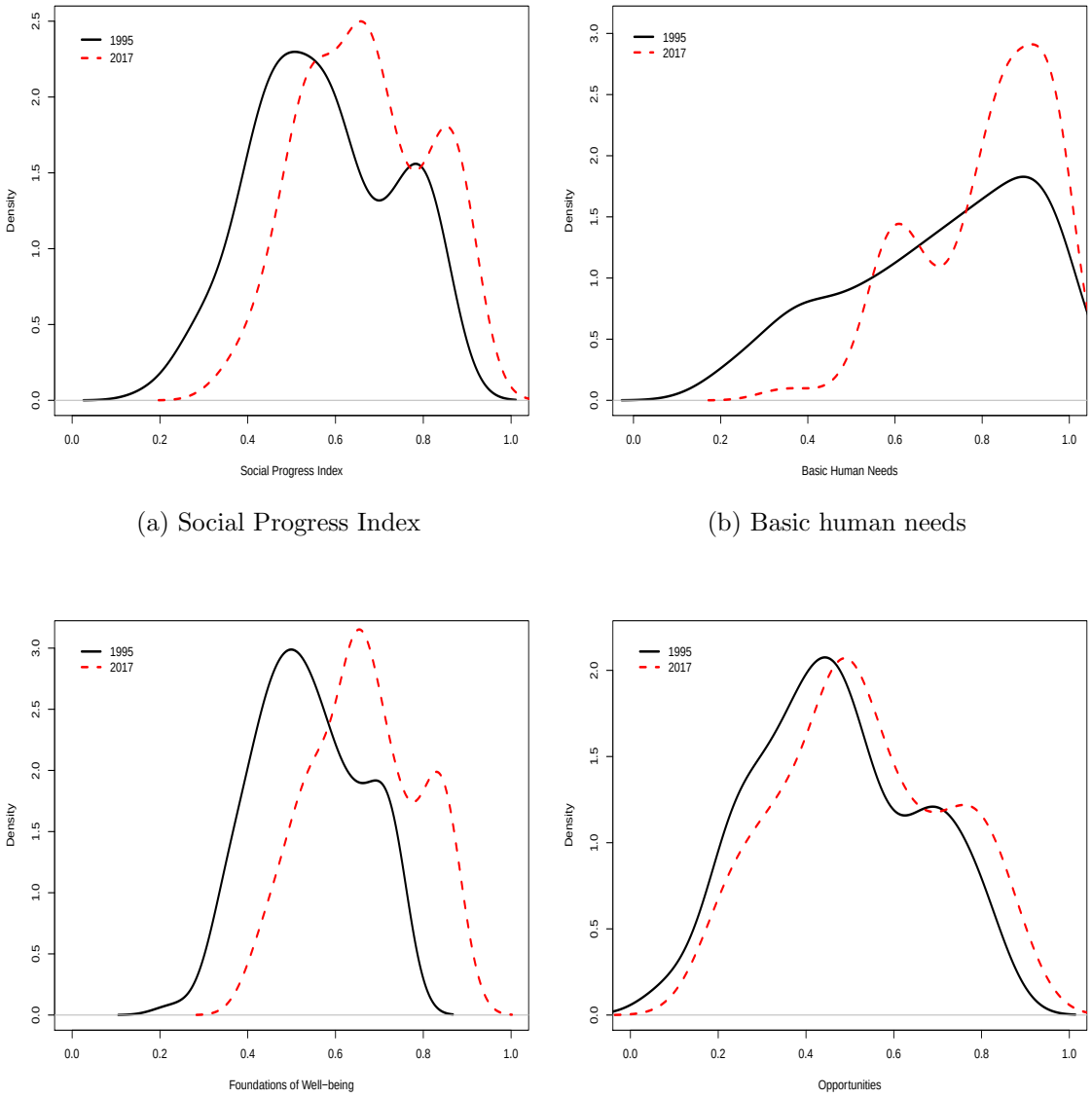


(b) Social progress by country groups



(c) Social progress, 1995 vs. 2017

Figure 3: Distribution of social progress, unweighted densities



(a) Social Progress Index

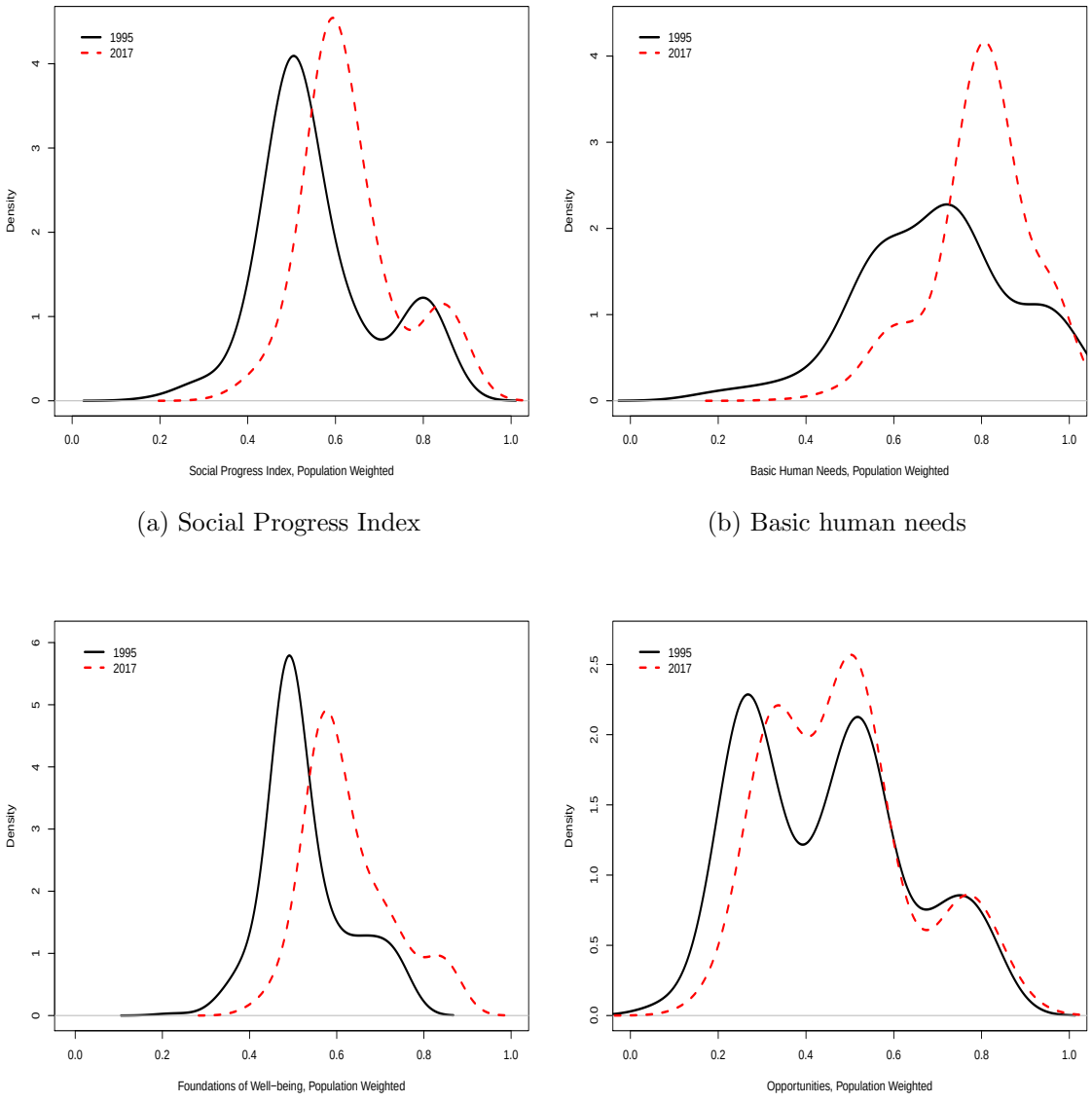
(b) Basic human needs

(c) Foundations of well-being

(d) Opportunities

Notes: Kernel density estimatimations are computed as $\hat{f}(x)_t = \frac{1}{nh}\sum_{i=1}^{n} G\Big(\frac{y-y_{it}}{h}\Big)$, where y_{it} stands for social progress or pillar in country i in year t; G is a Gaussian kernel function of the form $G(y) = \Big(\sqrt{2\pi}\Big)^{-1} exp\Big(-\frac{1}{2}y^2\Big)$ and h is a bandwidth parameter computed using the proposal of Silverman (1986).

Figure 4: Distribution of social progress, population weighted densities



(a) Social Progress Index

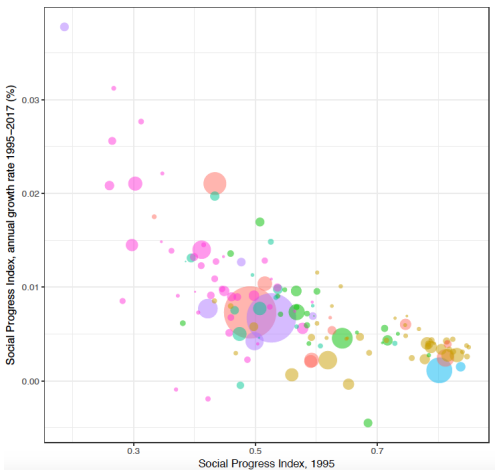
(b) Basic human needs

(c) Foundations of well-being

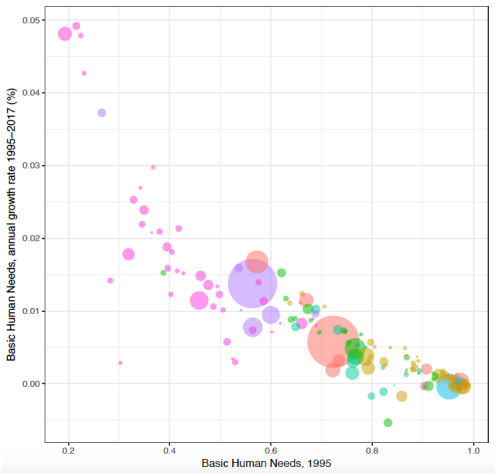
(d) Opportunities

Notes: Kernel density estimatimations are computed as $\hat{f}(x)_t = \frac{1}{nh}\sum_{i=1}^{n}\omega_i G\Big(\frac{y-y_{it}}{h}\Big)$, where y_{it} stands for social progress or pillar in country i and year t; ω_i stands for the weighting for country i in year t, corresponding to the share of total sample population living in that country, G is a Gaussian kernel function of the form $G(y) = \Big(\sqrt{2\pi}\Big)^{-1} exp\Big(-\frac{1}{2}y^2\Big)$ and h is a bandwidth parameter computed using the proposal of Silverman (1986).

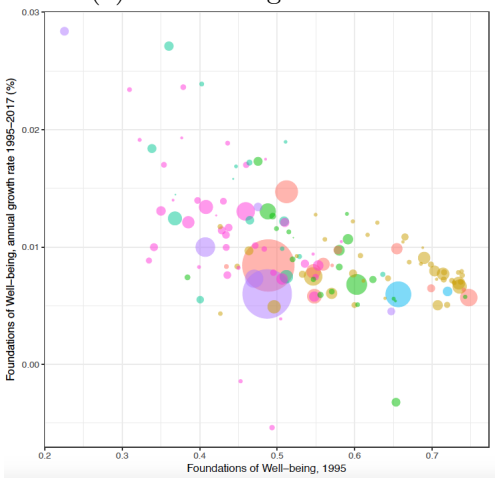
Figure 5: Social progress and its pillars, 1995 vs. average growth 1995-2017



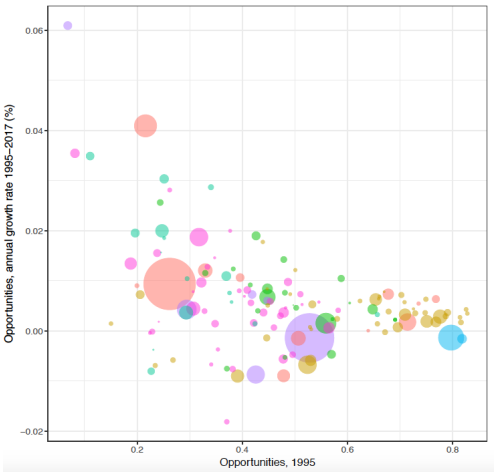
(a) Social Progress Index



(b) Basic human needs



(c) Foundations of well-being



(d) Opportunities

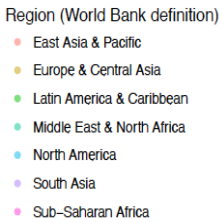
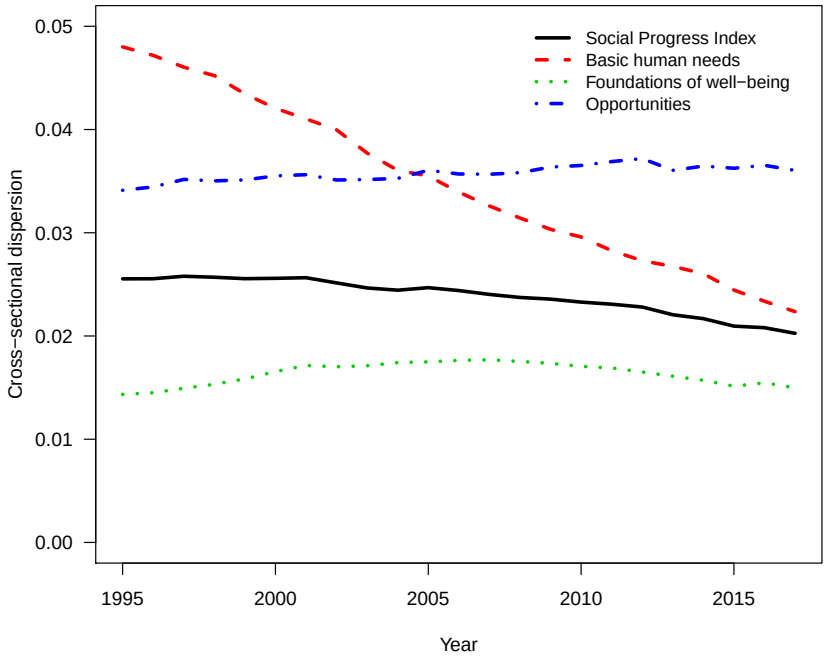


Figure 6: Evolution of cross-sectional dispersion



Appendix

Table A1: Social Progress Index and pillar scores, 1995 and 2017

Country	SPI		BHN		FWB		OPP		Country	SPI		BHN		FWB		OPP	
	1995	2017	1995	2017	1995	2017	1995	2017		1995	2017	1995	2017	1995	2017	1995	2017
Afghanistan	0.186	0.428	0.266	0.603	0.225	0.421	0.068	0.260	Kuwait	0.594	0.709	0.892	0.920	0.511	0.775	0.380	0.431
Albania	0.626	0.746	0.836	0.933	0.550	0.728	0.491	0.577	Kyrgyz Rep.	0.601	0.688	0.793	0.853	0.562	0.710	0.448	0.502
Algeria	0.537	0.666	0.732	0.862	0.509	0.665	0.370	0.470	Lao PDR	0.334	0.491	0.368	0.707	0.434	0.522	0.200	0.243
Angola	0.265	0.465	0.216	0.636	0.341	0.425	0.238	0.335	Latvia	0.729	0.845	0.866	0.943	0.662	0.833	0.659	0.759
Argentina	0.717	0.789	0.911	0.906	0.591	0.748	0.648	0.712	Lebanon	0.568	0.645	0.821	0.862	0.506	0.629	0.376	0.444
Armenia	0.649	0.717	0.805	0.900	0.611	0.715	0.531	0.535	Lesotho	0.504	0.550	0.524	0.565	0.505	0.549	0.482	0.534
Australia	0.816	0.889	0.980	0.979	0.699	0.806	0.768	0.884	Liberia	0.347	0.565	0.342	0.619	0.322	0.491	0.377	0.585
Austria	0.818	0.881	0.982	0.986	0.726	0.849	0.748	0.810	Lithuania	0.746	0.850	0.891	0.955	0.686	0.828	0.661	0.768
Azerbaijan	0.459	0.548	0.662	0.869	0.448	0.539	0.268	0.236	Madagascar	0.457	0.512	0.513	0.583	0.436	0.515	0.422	0.437
Bahrain	0.506	0.560	0.844	0.840	0.443	0.628	0.231	0.212	Malawi	0.435	0.576	0.418	0.668	0.472	0.589	0.416	0.471
Bangladesh	0.499	0.547	0.600	0.739	0.470	0.552	0.426	0.351	Malaysia	0.626	0.705	0.903	0.897	0.578	0.717	0.396	0.500
Belarus	0.687	0.734	0.880	0.919	0.600	0.670	0.580	0.612	Mali	0.460	0.534	0.486	0.614	0.397	0.540	0.496	0.446
Belgium	0.824	0.883	0.971	0.960	0.715	0.850	0.787	0.839	Mauritania	0.373	0.455	0.494	0.664	0.399	0.479	0.224	0.222
Benin	0.524	0.623	0.505	0.632	0.483	0.600	0.582	0.637	Mexico	0.568	0.667	0.767	0.833	0.488	0.650	0.448	0.520
Bolivia	0.568	0.675	0.630	0.815	0.570	0.654	0.502	0.556	Moldova	0.617	0.682	0.797	0.866	0.525	0.644	0.529	0.538
Botswana	0.593	0.714	0.683	0.831	0.583	0.734	0.514	0.577	Mongolia	0.623	0.723	0.658	0.840	0.571	0.687	0.639	0.640
Brazil	0.643	0.710	0.766	0.853	0.603	0.700	0.559	0.578	Morocco	0.433	0.669	0.688	0.862	0.360	0.654	0.251	0.490
Bulgaria	0.715	0.787	0.881	0.938	0.607	0.745	0.657	0.678	Mozambique	0.399	0.534	0.329	0.574	0.429	0.551	0.440	0.477
Burkina Faso	0.433	0.550	0.396	0.562	0.431	0.585	0.472	0.505	Namibia	0.565	0.665	0.602	0.704	0.546	0.672	0.546	0.619
Burundi	0.422	0.405	0.403	0.528	0.493	0.438	0.370	0.249	Nepal	0.477	0.630	0.537	0.761	0.475	0.638	0.419	0.491
Cameroon	0.427	0.522	0.498	0.653	0.434	0.553	0.348	0.359	Netherlands	0.814	0.894	0.986	0.981	0.665	0.844	0.790	0.857
Canada	0.837	0.865	0.973	0.980	0.720	0.825	0.818	0.790	New Zealand	0.814	0.892	0.968	0.994	0.741	0.852	0.735	0.829
Central Afr. Rep.	0.370	0.362	0.303	0.322	0.453	0.439	0.354	0.326	Nicaragua	0.588	0.642	0.678	0.822	0.604	0.675	0.481	0.428
Chad	0.282	0.340	0.283	0.386	0.335	0.406	0.229	0.228	Niger	0.411	0.539	0.346	0.560	0.434	0.541	0.453	0.516
Chile	0.712	0.806	0.925	0.945	0.624	0.731	0.588	0.740	Nigeria	0.412	0.560	0.458	0.590	0.459	0.612	0.318	0.479
China	0.491	0.577	0.724	0.821	0.489	0.588	0.262	0.322	Macedonia	0.651	0.720	0.867	0.898	0.639	0.724	0.447	0.538
Colombia	0.567	0.700	0.673	0.844	0.580	0.719	0.448	0.539	Norway	0.850	0.920	0.985	0.988	0.738	0.879	0.828	0.894
Congo, Dem. Rep.	0.297	0.409	0.319	0.472	0.385	0.503	0.188	0.252	Oman	0.495	0.635	0.787	0.879	0.447	0.648	0.251	0.378
Congo, Rep.	0.406	0.477	0.427	0.597	0.450	0.539	0.341	0.294	Pakistan	0.422	0.500	0.564	0.669	0.407	0.507	0.294	0.323
Costa Rica	0.785	0.834	0.921	0.933	0.743	0.843	0.691	0.725	Panama	0.667	0.747	0.778	0.903	0.650	0.736	0.571	0.602
Cote d'Ivoire	0.470	0.573	0.564	0.663	0.437	0.565	0.409	0.490	Paraguay	0.548	0.679	0.747	0.875	0.515	0.660	0.383	0.503
Croatia	0.640	0.799	0.865	0.963	0.617	0.786	0.439	0.649	Peru	0.507	0.737	0.621	0.868	0.475	0.695	0.426	0.647
Cuba	0.585	0.666	0.868	0.941	0.556	0.633	0.329	0.425	Philippines	0.592	0.622	0.722	0.753	0.548	0.623	0.507	0.491
Czech Republic	0.784	0.851	0.958	0.976	0.715	0.838	0.678	0.739	Poland	0.778	0.819	0.931	0.960	0.707	0.790	0.696	0.707
Denmark	0.847	0.920	0.980	0.980	0.734	0.872	0.826	0.908	Portugal	0.789	0.868	0.940	0.975	0.698	0.842	0.729	0.788
Djibouti	0.385	0.510	0.542	0.677	0.369	0.507	0.245	0.346	Romania	0.672	0.745	0.884	0.927	0.598	0.709	0.533	0.599
Dominican Rep.	0.585	0.685	0.753	0.853	0.520	0.633	0.481	0.569	Russia	0.619	0.650	0.786	0.854	0.546	0.644	0.524	0.452
Ecuador	0.601	0.742	0.744	0.874	0.580	0.696	0.479	0.655	Rwanda	0.312	0.574	0.225	0.643	0.379	0.637	0.334	0.442
Egypt	0.474	0.529	0.761	0.786	0.368	0.484	0.293	0.318	Saudi Arabia	0.466	0.550	0.822	0.803	0.465	0.609	0.110	0.238
El Salvador	0.537	0.655	0.696	0.813	0.499	0.644	0.415	0.508	Senegal	0.515	0.684	0.576	0.782	0.460	0.669	0.510	0.600
Estonia	0.749	0.872	0.888	0.964	0.688	0.856	0.670	0.796	Sierra Leone	0.267	0.531	0.231	0.590	0.309	0.518	0.262	0.486
Eswatini	0.401	0.494	0.541	0.675	0.421	0.557	0.241	0.251	Slovak Republic	0.747	0.830	0.946	0.967	0.670	0.812	0.624	0.712
Ethiopia	0.303	0.481	0.193	0.556	0.408	0.548	0.307	0.338	Slovenia	0.794	0.867	0.950	0.975	0.706	0.828	0.725	0.799
Finland	0.840	0.899	0.977	0.985	0.728	0.849	0.814	0.864	South Africa	0.577	0.653	0.661	0.793	0.506	0.594	0.565	0.573
France	0.816	0.866	0.961	0.960	0.734	0.855	0.751	0.783	Spain	0.805	0.867	0.944	0.964	0.703	0.838	0.768	0.799
Gabon	0.526	0.668	0.690	0.822	0.485	0.712	0.404	0.470	Sri Lanka	0.594	0.692	0.688	0.850	0.647	0.715	0.447	0.511
Gambia	0.448	0.599	0.618	0.742	0.377	0.576	0.347	0.479	Sudan	0.260	0.412	0.349	0.591	0.350	0.467	0.082	0.178
Georgia	0.601	0.776	0.706	0.892	0.598	0.781	0.501	0.654	Sweden	0.847	0.897	0.990	0.985	0.737	0.860	0.816	0.847
Germany	0.831	0.883	0.981	0.971	0.736	0.851	0.776	0.827	Switzerland	0.824	0.909	0.984	0.992	0.739	0.873	0.749	0.861
Ghana	0.536	0.668	0.586	0.752	0.536	0.647	0.487	0.604	Syria	0.475	0.470	0.799	0.769	0.401	0.452	0.227	0.190
Greece	0.784	0.855	0.929	0.939	0.719	0.804	0.702	0.823	Tajikistan	0.433	0.522	0.637	0.813	0.426	0.552	0.234	0.201
Guatemala	0.459	0.619	0.640	0.777	0.494	0.653	0.244	0.429	Tanzania	0.498	0.608	0.461	0.639	0.553	0.666	0.479	0.519
Guinea	0.362	0.492	0.405	0.602	0.354	0.514	0.328	0.358	Thailand	0.591	0.618	0.734	0.787	0.559	0.675	0.479	0.393
Guinea-Bissau	0.346	0.479	0.365	0.576	0.366	0.497	0.306	0.364	Togo	0.415	0.571	0.415	0.584	0.436	0.660	0.394	0.470
Guyana	0.596	0.694	0.770	0.866	0.521	0.660	0.497	0.557	Trin. and Tobago	0.708	0.775	0.868	0.906	0.653	0.735	0.604	0.683
Haiti	0.381	0.436	0.388	0.542	0.384	0.452	0.371	0.314	Tunisia	0.525	0.728	0.771	0.867	0.464	0.678	0.340	0.640
Honduras	0.541	0.633	0.648	0.789	0.547	0.641	0.429	0.469	Turkey	0.560	0.568	0.792	0.831	0.496	0.553	0.391	0.321
Hungary	0.757	0.799	0.956	0.972	0.643	0.756	0.671	0.668	Turkmenistan	0.468	0.499	0.826	0.874	0.427	0.469	0.150	0.155
India	0.526	0.610	0.564	0.763	0.487	0.556	0.528	0.512	Uganda	0.461	0.562	0.395	0.597	0.510	0.665	0.478	0.422
Indonesia	0.433	0.689	0.572	0.828	0.512	0.708	0.216	0.531	Ukraine	0.653	0.648	0.858	0.827	0.570	0.651	0.530	0.466
Iran	0.507	0.601	0.762	0.817	0.512	0.603	0.247	0.384	United Arab Em.	0.534	0.649	0.903	0.895	0.403	0.681	0.295	0.371
Iraq	0.395	0.526	0.649	0.771	0.338	0.507	0.196	0.302	United Kingdom	0.782	0.854	0.977	0.965	0.714	0.846	0.654	0.751
Ireland	0.768	0.868	0.967	0.980	0.629	0.821	0.709	0.804	United States	0.802	0.822	0.952	0.944	0.656	0.749	0.797	0.774
Israel	0.729	0.796	0.894	0.930	0.636	0.753	0.657	0.706	Uruguay	0.734	0.820	0.921	0.951	0.590	0.782	0.691	0.726
Italy	0.788	0.853	0.965	0.956	0.690	0.842	0.709	0.762	Uzbekistan	0.497	0.565	0.823	0.880	0.464	0.574	0.206	0.241
Japan	0.812	0.857	0.974	0.981	0.747	0.847	0.714	0.743	Venezuela, RB	0.685	0.621	0.831	0.739	0.653	0.609	0.570	0.514
Jordan	0.607	0.659	0.867	0.891	0.529	0.647	0.424	0.438	Vietnam	0.515	0.648	0.670	0.863	0.547	0.651	0.329	0.429
Kazakhstan	0.592	0.656	0.797	0.903	0.533	0.631	0.446	0.433	Zambia	0.445	0.552	0.380	0.602	0.495	0.588	0.460	0.467
Kenya	0.449	0.554	0.476	0.642	0.548	0.622	0.322	0.399	Zimbabwe	0.487	0.512	0.529	0.565	0.550	0.647	0.382	0.323
Korea, Rep.	0.746	0.853	0.907	0.948	0.654	0.813	0.678	0.796									

Notes: SPI: Social Progress Index; BHN: Basic human needs; FWB: Foundations of well-being; OPP: Opportunities.

Table A2: Robustness checks (I). Spearman rank correlations with alternative indices

	EW index	FA index
Social Progress Index	0.997	0.964
Pillar I. Basic human needs	0.998	0.985
Pillar II. Foundations of well-being	0.977	0.953
Pillar III. Opportunities	0.998	0.987

Notes: PCA-EW denotes Principal Components Analysis-Equally Weighting; EW: Equally Weighting; FA: Factor Analysis.

Table A3: Robustness checks (II). β-convergence tests with alternative indices

	Panel (a): Factor Analysis Index weights					
	Pooled OLS		Country-fixed effects		Two-way fixed effects	
	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$
Social Progress Index	0.980***	0.021	0.948***	0.053	0.902***	0.102
	(687.50)		(202.18)		(127.29)	
Basic human needs	0.958***	0.042	0.937***	0.065	0.918***	0.084
	(1029.26)		(405.90)		(331.18)	
Foundations of well-being	0.980***	0.0192	0.947***	0.054	0.896***	0.109
	(663.75)		(194.29)		(119.57)	
Opportunities	0.987***	0.0128	0.882***	0.124	0.876***	0.132
	(500.52)		(115.12)		(107.93)	
	Panel (b): Equal weights					
	Pooled OLS		Country-fixed effects		Two-way fixed effects	
	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$	$\hat{\beta}$	$\hat{\gamma}$
Social Progress Index	0.983***	0.0167	0.951***	0.0498	0.919***	0.0841
	(799.67)		(230.39)		(149.60)	
Basic human needs	0.971***	0.0289	0.945***	0.0562	0.921***	0.0824
	(757.50)		(229.13)		(180.22)	
Foundations of well-being	0.986***	0.0140	0.954***	0.0470	0.890***	0.1162
	(593.16)		(219.10)		(114.19)	
Opportunities	0.986***	0.0133	0.896***	0.1096	0.881***	0.1257
	(528.48)		(126.23)		(110.19)	

Each panel corresponds to one of the alternative social progress indexes built with the alternative approaches described in Section 2.5. In all cases, the dependent variable is the logarithm of the SPI and its pillars' scores in period t. The results are obtained using the specification in Equation (6). $\hat{\gamma}$ is the implied convergence speed. The t-statistic is in parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table A4: Robustness checks (III). Weak σ-convergence tests with alternative indices

	Panel (a): Factor Analysis Index weights					
	1995-2017		1995-2008		2009-2017	
	$100 \times \hat{\phi}$	$t_\phi(3)$	$100 \times \hat{\phi}$	t_ϕ (2)	$100 \times \hat{\phi}$	t_ϕ (2)
Social Progress Index	-0.0399***	-4.075	0.0023	0.4222	-0.1100***	-27.342
Basic human needs	-0.2347***	-40.417	-0.2589***	-81.770	-0.1909***	-53.909
Foundations of well-being	-0.0304***	-2.933	0.0145**	2.566	-0.1045***	-25.723
Opportunities	-0.0286***	-12.622	-0.0336***	-6.551	-0.0291***	-7.540
	Panel (b): Equal weights					
	1995-2017		1995-2008		2009-2017	
	$100 \times \hat{\phi}$	$t_\phi(3)$	$100 \times \hat{\phi}$	t_ϕ (2)	$100 \times \hat{\phi}$	t_ϕ (2)
Social Progress Index	-0.0244***	-12.442	-0.0171***	-6.323	-0.039***	-20.645
Basic human needs	-0.0001	-0.1267	-0.0680*	-1.913	0.0008	1.127
Foundations of well-being	-0.0003	-0.7689	-0.0238**	-2.2299	-0.0000	-0.012
Opportunities	0.0002	0.4519	-0.0284**	-2.442	0.0003	0.608

Each panel corresponds to one of the alternative social progress indexes built with the alternative approaches described in Section 2.5. The estimates reported correspond to Equation (7), where the dependent variable is the cross-sectional dispersion of the SPI and its pillars over time defined as $K_t = \frac{1}{n}\sum_{i=1}^{n}\left(y_{it} - \bar{y}_t\right)^2$. The t-ratios t_ϕ(L) indicate whether or not y_{it} is weakly σ-converging ($t_{\hat{\phi}} < -1.65$), fluctuating ($t_{\hat{\phi}} \rightarrow^d N(0,1)$), or diverging ($t_{\hat{\phi}} > 1.65$). * significant at 10% level; ** significant at 5% level; *** significant at 1% level.