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Accessing Inclusive Well-being to Leave No One Behind

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Abstract
The world has continued to seek prosperity by reducing poverty and improving well-being, but it is vital to examine whether this improvement is inclusive. This paper presents a quantile-based assessment of trends based on absolute changes and allows for robust examination of the inclusiveness of multidimensional well-being changes. The overall change in inclusive well-being can be decomposed into two components: the change in the overall average; and the *inclusivity premium* capturing the extent to which the change in well-being benefits the poorer quantiles. For our empirical illustration, we employ a multidimensional measure of well-being that is closely linked to the flagship global Multidimensional Poverty Index (MPI). We examine the inclusiveness of multidimensional well-being changes for 75 developing countries across six geographic regions. We observe robust improvements in well-being levels for most countries, but only around three-fifths of these countries overall have positive robust inclusivity premiums, and fewer than one-third in sub-Saharan Africa. Our examination of the relationship between inclusivity premium in multidimensional well-being and the World Bank's shared prosperity premium in monetary space does not yield any monotonic relationship across countries. Furthermore, despite the close link between our inclusive well-being measure and the global MPI, a successful absolute reduction in the global MPI does not necessarily imply that the corresponding well-being improvement is inclusive. Our proposed framework could play an important role in jointly monitoring the Sustainable Development Goals' targets of reducing inequality within countries and reducing poverty in multiple dimensions.

Keywords: well-being, shared prosperity, inclusive growth, inequality, counting approach, multidimensional poverty

JEL classification: I3, I31, D63, O1

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The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

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I. Introduction

The world has witnessed significant reductions in monetary and multidimensional poverty, as well as interest in innovations that draw upon multidimensional indicators of well-being. Indeed, the Beyond GDP initiative of the United Nations, which seeks additional innovative metrics for measuring well-being, explicitly considers building on multidimensional poverty indices among others.[1] To fulfil the United Nations' pledge to leave no one behind, it also stresses that well-being improvements (and development overall) need to be inclusive; that is, evenly shared by all, with greater improvements among poorer people. Various targets related to inclusion have been set in the Sustainable Development Goals (SDGs) agenda. SDG target 10.1 on 'reduc[ing] inequality within and among countries' requires progressively achieving and sustaining 'income growth of the bottom 40% of the population at a rate higher than the national average'.[2] However, poverty and well-being have been acknowledged – by academics and policymakers alike – to be multifaceted and to have many interlinked dimensions (see Atkinson and Bourguignon, 1982; Sen, 1999; Narayan et al., 2000; Stiglitz et al., 2009; Alkire and Foster, 2011). SDG target 1.2 justifiably requires reducing 'poverty in all its dimensions according to national definitions', in addition to reducing extreme (monetary) poverty (SDG target 1.1).

In this paper, we propose a practical and integrated framework for capturing and tracking the inclusiveness of well-being changes over time using readily available and repeated cross-sectional datasets. We justify the use of a quantile-based framework that involves segmenting a distribution of individual performances (which we refer to as *adequacies*) into a fixed number of quantiles and then analysing the inclusiveness of well-being by comparing the quantile-wise average adequacies across periods. Our proposed framework aims to integrate two goals: multidimensional well-being and equity. Our framework and empirical example directly build upon the well-known global Multidimensional Poverty Index (MPI) related to SDG target 1.2. The framework also complements the monetary focus of SDG target 10.1 by capturing the inclusiveness of the progress in non-monetary multidimensional well-being. To be precise, we propose a way of measuring inclusivity that includes an analogous term to the 'shared prosperity' (i.e., growth of the

1 The High-Level Committee on Programmes (HLCP) Core Group on Beyond GDP (HLCP 2022, point 120.iv, p.32) suggests that initiatives build upon current 'multidimensional indices of poverty, vulnerability (and) human development'.

2 The target is analogous to how the World Bank tracks shared prosperity by comparing the average income growth rates of the poorest 40% of each country's population to the overall average income growth rate (World Bank, 2018), where the overall prosperity assessed by the growth in average income per capita is considered 'inclusive' whenever the income growth rate of the poorest 40% is no slower than the country's overall growth rate.

bottom 40% of the population in a country) premium, but it is more general and includes a broader definition of inclusion.

Technically, to ascertain whether well-being changes are inclusive between two periods, we propose that overall well-being be assessed as a *quantile-weighted* sum of average adequacy levels across all quantiles and the overall well-being *change* can be presented as a quantile-weighted sum of absolute *changes* in quantile averages.[3] In essence, our approach can be understood as assessing an *equally distributed equivalent* well-being index and its trends. To capture the extent of inclusiveness of well-being changes, we conveniently decompose (additively) the overall change in well-being into two components: (1) a change in the overall average adequacy; and (2) an extent of inclusiveness – that could be thought of as the extent of pro-poorness of the average change, referred to as the *inclusivity premium*. A positive value of the inclusivity premium signifies that the overall improvement in well-being has, strictly speaking, not left the poorer population behind. Notably, while the SDGs have focused only upon the bottom 40%,[4] our proposed framework is more general, permitting the evaluation of inclusivity according to different quantiles and quantile weights.[5] To be able to compare inclusivity premiums and identify the best performance, we additionally propose using a measure of bound-adjusted absolute change, which is the absolute change in inclusive well-being divided by its maximum feasible improvement.

We analyse the inclusiveness of well-being changes in 75 developing countries using a counting-based multidimensional measure of well-being. The well-being measure uses the same set of dimensions, indicators and weights as the global MPI, and the same datasets. In the global MPI framework, a person living in a household is considered to be *deprived* in an indicator if their achievement fails to meet the deprivation cutoff for that indicator. A *deprivation score* for each person is obtained by taking a weighted sum of the indicators in which they are deprived, where the weights sum to 1. In this paper, we consider the complement of the deprivation score to be an *attainment score*, which captures a person's breadth of non-deprived indicators. A higher attainment score, which we refer to in this paper as an *adequacy level*,

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3 We should clarify that there is a key motivational difference between our proposal and that by Sakamoto and Mori (2021). A key motivating axiom, in addition to other standard axioms, of Sakamoto and Mori (2021) is *rank-separability* requiring 'social welfare orderings to ignore well-being information about the same well-being in the same ranks between two profiles'. Our key motivation, on the contrary, is driven by the bounded nature of the underlying variable and consistency requirement.

4 In all the comparisons where we count countries it would be appropriate to publish the share of population; for reasons of space, in this paper we focus only on numbers of countries but, recognizing the population differences and the equal value of all human lives, would suggest that future studies should also report the share of population covered.

5 Beegle et al. (2014) argue that simply focusing on the average of the bottom 40% may shift focus away from the poorest people in lower middle-income countries, if the poorest people form only a small subset of the 40%.

corresponds to higher well-being.[6] For our analysis, we divide the entire distribution of attainment scores within each country and for each period into five quintiles.[7]

Our empirical analyses show that 73 of the 75 developing countries in our study satisfactorily register statistically significant increases in inclusive well-being. However, when we decompose the change in inclusive well-being for these countries into a change in the overall average and the inclusivity premium component, only 56 countries appear to register statistically significantly positive inclusivity premiums. Poorer quintiles in these countries with positive inclusivity premiums, have registered faster improvements than the overall average in absolute terms. For example, a comparison between Malawi and Côte d'Ivoire (Table 3) reveals that both countries register similar annual improvements in absolute inclusive well-being as well as in bound-adjusted inclusive well-being, but the decomposition of absolute improvements shows a positive inclusivity premium for Malawi and, in contrast, a negative inclusivity premium for Côte d'Ivoire. Nearly one-quarter (19) of all the countries in our study either register statistically significantly negative inclusivity premiums – meaning poorer quintiles in these countries register slower improvements than the overall average (11) – or inclusivity premiums are not statistically significantly different from zero (8). Geographic analyses show that 17 of these 19 countries that lack inclusive changes in well-being are in sub-Saharan Africa. On the other hand, the two countries with largest positive inclusivity premiums are Ghana and Lao PDR. Interestingly, we observe non-linear relationships between our inclusivity premium and the shared prosperity premium (World Bank, 2018) as well as with changes in the global MPI across countries, demonstrating that our proposed framework can provide novel insights over and above these existing measures.

As is customary in other applications, we apply a particular set of quantile-weights to analyse inclusiveness, but many other alternatives are also admissible. Drawing on Seth and McGillivray (2018), we introduce a methodology for checking the robustness of well-being changes as well as inclusivity premiums to alternative quantile-weight vectors. The robustness analyses show that the changes in well-being are robust with respect to plausible alternative quantile-weight vectors for 72 countries, but the inclusivity premiums (positive and negative) are robust for only 50 countries, while the other 25 countries do not pass the

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6 Unlike the global MPI, which identifies and focuses on poor people only, our paper uses the entire distribution of attainment scores within countries. Unlike the United National Development Programme (UNDP) Human Development Index and the Inequality-Adjusted Human Development Index, our counting-based multidimensional well-being measurement framework captures the joint distribution of attainments at the household level, aggregating first across dimensions then across people.

7 Our empirical illustration is based on existing surveys, applies the extensively used global MPI framework and uses a particular number of quantiles, but our framework can be easily adapted to a different set of indicators and quantiles.

inclusivity premium robustness test, of which 17 are from sub-Saharan Africa. Overall, only 43 of the 56 countries with positive inclusivity premiums register *robustly positive* inclusivity premiums.

The rest of the paper is organized as follows. The second section justifies the methodological framework for assessing absolute changes in well-being and its decomposition into two components. The third section presents the empirical well-being measure that we use for assessing inclusiveness, outlines the data for our analysis, and presents the national average attainment scores and quantile-wise averages across countries. In the fourth section, we analyse the inclusiveness of well-being changes across countries. The fifth section compares our inclusivity premiums to the shared prosperity premium (relative and monetary) reported by the World Bank, and to changes in the global MPI reported by the Oxford Poverty and Human Development Initiative (OPHI) and the United National Development Programme (UNDP). The sixth section presents the methodology for checking robustness and examines the robustness of well-being changes and inclusivity premiums to alternative quantile-weight vectors, while the final section provides concluding remarks.

II. A Framework for Assessing Inclusive Well-being

Assessments involving non-monetary variables are different from their monetary counterparts in two important ways. First, most social indicators (unidimensional or multidimensional) cannot register *unbounded* increases akin to their monetary counterparts – hence *relative* changes over time tend to become mechanically smaller as averages approach the upper bounds.[8] Second, many social indicators capturing well-being and deprivation are either presented in terms of *adequacies* (i.e., performance level) or in terms of *shortfalls* (i.e., the lack thereof). We propose pursuing an approach based on *absolute changes* to ensure *consistency* of evaluation, which ensures, similar to consistent inequality comparisons by Lambert and Zheng (2011), that well-being comparisons remain unaltered whether or not they are evaluated using adequacies shortfalls.[9] For example, in multidimensional evaluation exercises within the counting framework it is common to use either attainment scores (Ura et al., 2012; Seth and Alkire, 2017; Alkire and Foster, 2019; Dhongde et al., 2019) or deprivation scores (Atkinson, 2003; Alkire and Foster, 2011). It seems intuitive

8 Such concerns have also been raised for specific indicators of health and human development by Wagstaff (2005) and Prados de la Escosura (2021), respectively. A proposal for inequality measurement with bounded variables has been recently made by Permanyer et al. (2022).

9 In this paper, we consider adequacies and corresponding shortfalls to be cardinally measurable. Concerns and proposals for consistent inequality assessment for adequacies and shortfalls have been raised by Erreygers (2009), Lambert and Zheng (2011), Lasso de la Vega and Aristondo (2012) and Bosmans (2016).

that these evaluations should be invariant to whether one uses attainment or deprivation scores. Our approach fulfils this criterion.

While scrutinizing changes in well-being and poverty, most studies use one of the two prominent methods: *dominance approaches* (partial ordering) or *distribution-sensitive indices* (complete ordering). Dominance approaches rank well-being or poverty changes by comparing the entire distributions of a variable across two periods (see Aaberge et al., 2019; Azpitarte et al., 2020). If two cumulative distribution functions or their transformations do not overlap, then a robust conclusion about a change can be inferred. The key strength of dominance approaches is that they allow robust comparisons irrespective of the choices of parameters and the functional forms of measures. They have two key disadvantages though. First, if the distributions overlap, then no conclusion regarding changes can be inferred. Second, even if two distributions can be ranked, dominance comparisons cannot report any magnitude of these changes. Studies using distribution-sensitive indices, on the other hand, compute indices for each period separately and then compare these computed values to reach a conclusion about whether the overall change has been inclusive.[10] Comparisons based on these indices are often insightful, but eventually one may need to unpack the distribution to examine different parts of the distribution that are responsible for the overall changes.

Instead of one of these two common approaches, in this paper we pursue a quantile-based approach that involves segmenting the entire distribution into a fixed number of quantiles and then analysing inclusiveness by comparing these quantiles across two periods. Quantile-based approaches have been deployed since the 1970s. Chenery et al. (1974, p.39) proposed a welfare measure as a weighted sum of the income growth rates of five quintiles, where the income growth rates of poorer quintiles are assigned larger relative weights to capture the pro-poorness of the overall growth. The World Bank adopted a quantile-based approach to gauge shared prosperity, focusing on the income growth of the bottom 40%, which has been argued to be a pragmatic application of the Rawlsian maximin principle (Basu, 2013; Ferreira et al., 2018).[11] A quantile-based approach has also been employed as a foundation for the well-established growth incidence curve, to break down the overall growth rate between two periods by growth rates across quantiles to study pro-poor growth (Ravallion and Chen, 2003). Sakamoto and Mori (2021)

10 Examples of such indices may be found in Alkire et al. (2015, ch.3) and Aaberge and Brandolini (2015). See Alkire and Foster (2019) for a distribution-sensitive poverty measure, Aaberge et al. (2019) for a class of dual-deprivation measures and Dhongde et al. (2019) for a class of well-being measures.

11 For further discussions on the World Bank's twin goals on ending extreme (monetary) poverty and promoting shared prosperity, see World Bank (2013) and Cruz et al. (2015). For a recent measure of global prosperity gap by the World Bank, see Sabatino-Gonzalez et al. (2024).

recently used quantile mean comparison of incomes to demonstrate the usefulness of their novel class of stepwise rank-dependent social welfare orderings.

Formally, suppose a social planner aims to assess well-being in a hypothetical society using an indicator whose values – referred to as *adequacy levels* – are bounded between a lower bound of $L \in \mathbb{R}$ and an upper bound of $U \in \mathbb{R}$ such that U is strictly higher than L, that is, $U > L$. An example of adequacy levels could be attainment scores in the case of multidimensional poverty measurement, with $L = 0$ and $U = 1$ (Alkire and Foster, 2019). The adequacy levels of the society's population in two periods are summarized by the cumulative distribution functions (CDFs) $F_1, F_2 \in \mathcal{F}$, where $\mathcal{F}$ is the set of all possible distributions of adequacy levels. A distribution can be divided into $Q \geq 2$ quantiles. For strict comparisons across time periods, we assume Q to be fixed and denote the set of Q quantiles by $\mathcal{Q} = \{1, \ldots, Q\}$. By construction, all quantiles for a given distribution are mutually exclusive and collectively exhaustive, and each quantile has uniform population share, that is, $1/Q$. Let us denote the average adequacy level within the q^{th} quantile of distribution F_i by $\mu_q(F_i)$ for all $q \in \mathcal{Q}$ and for each time period $i = 1, 2$, and the overall average adequacy level within F_i by $\mu(F_i)$, such that $\mu(F_i) = \frac{1}{Q}\sum_{q=1}^{Q} \mu_q(F_i)$ for $i = 1, 2$.

A well-being measure, denoted by W, corresponding to distribution F_i is obtained from the quantile-wise averages using the following additively decomposable measure:

$$W(F_i; \omega) = \sum_{q=1}^{Q} \omega_q \mu_q(F_i)\,, i = 1, 2; \quad (1)$$

where $\omega = (\omega_1, \ldots, \omega_Q)$ is the Q-dimensional quantile-weight vector and $\omega_q \in \mathbb{R}$ is the quantile weight assigned to the q^{th} quantile average. For now, we do not assign any restriction on quantile weights, but we subsequently characterize desired restrictions through an axiomatic foundation. Let us denote the set of all possible Q-dimensional quantile-weight vectors by Ω. Consider the special case where all quantile weights are equal and denote $\bar{\omega} \in \Omega$ as the Q-dimensional *equal* quantile-weight vector, such that $\bar{\omega}_q = 1/Q$ for all $q \in \mathcal{Q}$. In this case, $W(F_i; \bar{\omega}) = \mu(F_i)$, or the well-being measure is equal to *overall average adequacy level* within F_i. This type of additive structure to study absolute changes is seen in the social welfare and social mobility literature. For example, Bossert and Dutta (2019) characterize additive measures to assess absolute changes in social welfare, while Palmisano and Van de Gaer (2016) and Seth and Yalonetzky (2021a) also do so in their assessment of absolute social mobility.

We now introduce some notation on changes between two periods. We denote the absolute *change in the* q^{th} *quintile average* between distributions F_1 and F_2 by $\Delta_q(F_1, F_2) = \mu_q(F_2) - \mu_q(F_1)$ for all $q \in \mathcal{Q}$ and the *change in the overall average* by $\bar{\Delta}(F_1, F_2) = \mu(F_2) - \mu(F_1)$. The well-being measure in Equation (1) can then be used to measure the absolute change in well-being between two periods, denoted by $\Delta : \mathcal{F} \times \mathcal{F} \times \Omega \mapsto \mathbb{R}$ – a mapping from the set of CDFs and the set of quantile-weight vectors Ω to the real line $\mathbb{R}$, as:

$$\Delta(F_1, F_2; \omega) = W(F_2; \omega) - W(F_1; \omega) = \sum_{q=1}^{Q} \omega_q \Delta_q(F_1, F_2). \quad (2)$$

Based on the fixed number of quantiles, the change in well-being measure, denoted by Δ in Equation (2), is the quantile-weighted sum of changes in quantile-wise averages. Again, for the equal quantile-weight vector $\bar{\omega}$, as a special case, the change in well-being is simply equal to the difference in the overall average between F_1 and F_2, that is, $\Delta(F_1, F_2; \bar{\omega}) = \bar{\Delta}(F_1, F_2)$.[12]

2.1 Axiomatic Foundation

To understand how our change measure Δ responds to different transformations in quantile averages, we expect the measure to satisfy the following properties. The first standard property is *weak monotonicity*, which requires that the overall well-being should not register a fall (i.e., $\Delta \geq 0$) when there is no deterioration in any quantile-wise averages (i.e., $\Delta_q \geq 0$ for all q) between two periods. This property ensures that Δ respects the directional changes in all quintile averages.

Weak monotonicity. For any $F_1, F_2 \in \mathcal{F}$ and $\omega \in \Omega$, $\Delta(F_1, F_2; \omega) \geq 0$ whenever $\Delta_q(F_1, F_2) \geq 0$ for all $q \in Q$.

We refer to the second property as *translation homogeneity*. The property requires that whenever there is an equal change in all quantile averages, then the same change should apply to the overall change. This property is similar in spirit to the linear homogeneity property elsewhere – requiring an overall well-being measure to change in the same proportion whenever all underlying components are scaled up or down by the same proportion (see Foster et al., 2013).

Translation homogeneity. For any $F_1, F_2 \in \mathcal{F}$ and $\omega \in \Omega$, $\Delta(F_1, F_2; \omega) = \gamma$ whenever $\Delta_q(F_1, F_2) = \gamma$ for all $q \in Q$.

We refer to the third property as *weak priority*, which requires that, with everything else unchanged, an improvement in the average within a poorer quantile (say, quantile q') should not lead to a lower well-

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12 The decomposition of change in well-being measure presented in Equation (2) is analogous in spirit to the quantile-based rate of increase in welfare measure proposed by Chenery et al. (1974, p.39). However, the rate of increase in welfare is a relative measure and is incapable of providing an exact decomposition as we do in Equation (2). An equally-weighted average of the quantile-specific growth rates is not equal to the overall growth rate.

being improvement than an equal amount of improvement in a less-poor quantile (say, quantile q'', such that $q' < q''$). This property is crucial for incorporating the (weak) inclusiveness of well-being changes and is important from both an egalitarian perspective (Sen, 1976) and a prioritarian perspective (Parfit, 1997). The property suggests providing no less priority to the improvements among those in the poorer quantiles.[13]

Weak priority. For any $F_1, F_2, F_2' \in \mathcal{F}$, for any $\omega \in \Omega$ and for some pair $\{q', q'' \mid q' < q''\} \in \mathcal{Q}$, $\Delta(F_1, F_2; \omega) \geq \Delta(F_1, F_2'; \omega)$ whenever $\Delta_{q'}(F_1, F_2) = \Delta_{q''}(F_1, F_2') = \eta > 0$, $\Delta_q(F_1, F_2) = 0$ for all $q \in \mathcal{Q} \setminus \{q'\}$ and $\Delta_q(F_1, F_2') = 0$ for all $q \in \mathcal{Q} \setminus \{q''\}$.

Based on the three properties – weak monotonicity, translation homogeneity and weak priority – Proposition 1 characterizes the restrictions on quantile weights that our change in well-being measure in Equation (2) should respect.

Proposition 1. A change in well-being measure $\Delta: \mathcal{F} \times \mathcal{F} \times \Omega \mapsto \mathbb{R}$ satisfies weak monotonicity, translation homogeneity and weak priority if and only if: (i) $\omega_q \geq 0$ for all $q \in \mathcal{Q}$, (ii) $\sum_{q=1}^{Q} \omega_q = 1$, and (iii) $\omega_{q'} \geq \omega_{q''}$ for all pairs $\{q', q'' \mid q' < q''\} \in \mathcal{Q}$.

Proof. See Appendix.

Proposition 1 requires that the quantile weights assigned to all quantiles are: (i) non-negative; (ii) sum up to one; and (iii) the quantile weights assigned to poorer quantiles are no lower than the quantile weights assigned to the less-poor quantiles, which ensures that the change in well-being measure is *weakly* inclusive.[14] A well-being index W satisfying the restrictions in Proposition 1 can be seen as an *equally distributed equivalent overall average adequacy level* which, if assigned to all quantiles, should result in the same level of well-being.[15] Similarly, a change in well-being measure Δ satisfying the restrictions in Proposition 1 can be seen as an *equally distributed equivalent change in overall average adequacy level* which, if assigned to all quantiles, should result in the same change in well-being.

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13 See Fleurbaey (2015) for a comparative philosophical discussion on these two views. For a recent operationalization of the prioritarian principle while measuring poverty with ordinal variables, see Seth and Yalonetzky (2021b).

14 The results obtained in Proposition 1 are analogous to those obtained by Donaldson and Weymark (1980) and Ebert (2004). We have presented all properties and the main result in the proposition in terms of weak inequalities, but it should be straightforward to establish the results with strict inequalities as and where required (e.g., strong inclusiveness). Moreover, our theoretical presentation in this section is based on adequacies, but many indicators may have shortfall representations in practice. Our approach is consistent and is robust to adequacy and shortfall representations.

15 The concept is analogous to the concept presented by Atkinson (1970).

2.2 Assessing Inclusiveness of Well-being Changes: Inclusivity Premium

To assess the inclusiveness of well-being changes, we decompose the change in well-being measure Δ in Equation (2) into two components as follows:

$$\Delta(F_1, F_2; \omega) = \overline{\Delta}(F_1, F_2) + \pi(F_1, F_2; \omega), \quad (3)$$

where $\pi(F_1, F_2; \omega) = \Delta(F_1, F_2; \omega) - \overline{\Delta}(F_1, F_2) = \sum_{q=1}^{Q} \omega_q \left[\Delta_q(F_1, F_2) - \overline{\Delta}(F_1, F_2)\right]$. The first term on the right-hand side of Equation (3) is the change in the overall average adequacy levels between two periods, and the second term, $\pi(F_1, F_2; \omega)$, is the quantile-weighted sum of the differences $\pi_q(F_1, F_2) = \Delta_q(F_1, F_2) - \overline{\Delta}(F_1, F_2)$ for all $q \in \mathcal{Q}$. Each difference $\pi_q(F_1, F_2)$ captures the change in the average within the q^{th} quantile compared to the change in the overall average adequacy level. We refer to $\pi(F_1, F_2; \omega)$ as the *inclusivity premium*. Note that the inclusivity premium is always equal to zero by construction at the equal quantile-weight vector and so we are more interested in situations where the inclusivity premium is (strictly) positive.

We consider a well-being change to be *strictly* inclusive whenever every poorer quantile registers strictly higher improvement than every less-poor quantile, that is $\Delta_q(F_1, F_2) > \Delta_{q+1}(F_1, F_2)$ for all quintiles except the least-poor quantile; that is, $q \in \mathcal{Q} \setminus \{Q\}$. Accordingly, in such a situation, the inclusivity premium should be *positive*, that is, $\pi(F_1, F_2; \omega) > 0$. Proposition 2 presents the restrictions on quantile weights that enable the inclusivity premium to be positive, while denoting the set of quantile-weight vectors characterized in Proposition 1 by $\Omega_0 \subset \Omega$, as follows.

Proposition 2. For any $F_1, F_2 \in \mathcal{F}$ such that $\Delta_q(F_1, F_2) > \Delta_{q+1}(F_1, F_2)$ for all $q \in \mathcal{Q} \setminus \{Q\}$ and for any $\omega \in \Omega_0$, $\pi(F_1, F_2; \omega) > 0$ if and only if $\omega_q \geq \omega_{q+1}$ for all $q \in \mathcal{Q} \setminus \{Q\}$ and $\omega_q > \omega_{q+1}$ for at least one $q \in \mathcal{Q} \setminus \{Q\}$.

Proof. See Appendix.

Proposition 2 shows that the restrictions, $\omega_q \geq \omega_{q+1}$ for all $q \in \mathcal{Q} \setminus \{Q\}$ (i.e., all elements in $\mathcal{Q}$ excluding the highest quantile Q) and $\omega_q > \omega_{q+1}$ for at least one lower quantile $q \in \mathcal{Q} \setminus \{Q\}$, are both necessary and sufficient for the inclusivity premium to be strictly positive whenever $\Delta_q(F_1, F_2) > \Delta_{q+1}(F_1, F_2)$ for all $q \in \mathcal{Q} \setminus \{Q\}$. Thus, according to Proposition 2, the set of quantile weights that are necessary and sufficient for the inclusivity premium to be positive is $\Omega_0 \setminus \{\overline{\omega}\}$, or the set of all quantile-weight vectors characterized in Proposition 1 excluding the equal quantile-weight vector. Note that the inclusivity premium becomes higher for any two given distributions across two periods whenever larger quantile weights are assigned to lower quantiles.[16]

2.3 An Example with Hypothetical Distributional Changes

Before moving on to the empirical illustration, here we demonstrate the efficacy of our methodology with an example using hypothetical distributional changes, where distributions are divided into four quartiles (Table 1). The 1st quartile represents the poorest quarter of the population; the 2nd quartile represents the second-poorest quarter of the population, and so on.

The overall change in well-being is computed as a quartile-weighted sum of changes in four quartiles. Following the restrictions in Proposition 1 and 2, we assign the weights of 5/9, 3/9, 1/9 and 0 to the 1st, 2nd, 3rd and 4th quartiles. We consider five different scenarios. In the first four scenarios, the overall average change ($\overline{\Delta}$) across four quartiles is 0.05 but changes in four quartiles are very different across the four scenarios. In Change Scenario 5, the change in inclusive well-being (Δ) is equal to the change in inclusive well-being in Change Scenario 2 but their overall average changes are different.

Table 1. Inclusive well-being changes and inclusivity premiums in hypothetical distributions

Quartile (Quartile-weight)	1st (5/9)	2nd (3/9)	3rd (1/9)	4th (0)	Δ	$\overline{\Delta}$	π
Change Scenario 1	0.05	0.05	0.05	0.05	0.05	0.05	0.00
Change Scenario 2	0.1	0.1	0	0	0.09	0.05	0.04
Change Scenario 3	0.2	0	0	0	0.11	0.05	0.06
Change Scenario 4	0	0	0	0.2	0.00	0.05	-0.05
Change Scenario 5	0.15	0.01	0	0	0.09	0.04	0.05

In Change Scenario 1, all four quartiles change by 0.05 and so their quartile-weighted sum is also equal to 0.05. In this scenario, poorer quartiles do not experience larger-than-average change and so the inclusivity premium (π) is equal to zero. In Change Scenario 2, changes of equal magnitudes occur in the two poorest quartiles, which experience larger than average changes. Thus, the inclusivity premium is positive and is equal to 0.4. In Change Scenario 3, the entire change occurs in the poorest quartile and so the inclusivity premium is even higher. In Change Scenario 4, the entire change takes place in the least-poor quartile, which is assigned a quartile-weight of zero. Thus, the overall inclusive well-being change is zero with a negative inclusivity premium. Finally, let us explain how the composition of the overall average change

16 Our inclusivity premium definition is conceptually analogous to the 'progressivity component' used in the social mobility literature to study egalitarian improvements in social mobility. See Palmasino and Van de Gaer (2016).

and the inclusivity premium could be different even with the same change in inclusive well-being. Change Scenarios 2 and 5 reflect the same magnitude of changes in inclusive well-being (0.09). When we decompose these changes, we observe that the share of the inclusivity premium is higher for Change Scenario 5. The key difference between these two scenarios is that the poorest quartile registers much larger improvement in Change Scenario 5 than that in Change Scenario 2.

2.4 Bound-adjusted Changes

Within our framework, in this paper uninhibited improvement is not feasible for an indicator with a strict upper bound. When the overall average gets closer to the upper bound U, the extent of possible progress becomes naturally smaller. To deal with such a situation, we also propose looking at the inclusive well-being change between two periods as a proportion of the maximum *feasible* change in inclusive well-being.[17] The maximum feasible well-being is the upper bound U itself, which is achieved when everybody in the society enjoys the highest level of adequacy U. Thus, the maximum feasible change in inclusive well-being between two periods is the shortfall of the first period's well-being level from the maximum feasible well-being level, that is, $U - W(F_1;\omega)$. Let us denote the boundary-adjusted change in well-being measure between distributions F_1 and F_2 for any quantile-weight vector $\omega \in \Omega_0$ as $\Delta_B(F_1, F_2;\omega)$, which can be expressed as:

$$\Delta_B(F_1, F_2;\omega) = \begin{cases} \dfrac{\Delta(F_1, F_2;\omega)}{U - W(F_1;\omega)} & \text{if } U - W(F_1;\omega) > 0 \\ 0 & \text{if } U - W(F_1;\omega) = 0 \end{cases}. \qquad (4)$$

Let us provide an illustration using one of the hypothetical change scenarios (Change Scenario 2), where $\Delta = 0.09$. Consider two countries, Country X and Country Y, with initial inclusive well-being levels of 0.55 and 0.82, respectively, where the minimum and maximum feasible well-being levels are 0 and 1 (i.e., $U = 1$), respectively. The maximum feasible improvements for Countries X and Y are then 0.45 (i.e., 1 – 0.55) and 0.18 (i.e., 1 – 0.82), respectively. Even if both register a change of 0.09 over time, Country X's

17 The idea is analogous in spirit to the idea proposed by Permanyer et al. (2022) for bounded variables, where normalized inequality indices are expressed as a proportion of maximum feasible inequality for a given mean. In our analysis, we mainly employ bound adjustments for improvements; that is, whenever $\Delta(F_1, F_2;\omega) \geq 0$. If one is interested in bound adjustments for deterioration, one may additionally divide by $W(F_1;\omega) - L$.

actual improvement is only one-fifth or 20% of its maximum feasible improvement, whereas Country Y's actual improvement is half or 50% of its maximum feasible improvement.

III. An Empirical Measure of Well-being

Well-being is intrinsically multidimensional (Atkinson and Bourguignon, 1982; Sen, 1999; Stiglitz et al., 2009). In this paper, we capture well-being by adopting a multidimensional counting approach (Atkinson, 2003; Alkire and Foster, 2011). Our approach is directly connected to the global MPI framework (Alkire et al., 2020a) – consisting of three dimensions and 10 indicators with weights of 1/6 for four indicators and 1/18 for the remainder.[18] Within the global MPI framework, a person living in a household is considered to be *deprived* in an indicator if their achievement fails to meet the deprivation cutoff for that indicator. Customarily, a *deprivation score* for each person is obtained by taking a weighted sum of the indicators in which they are deprived, where weights sum to 1. In this paper, we consider the *complement* of a deprivation to be an *attainment*, and the complement of the deprivation score, which lies between 0 and 1 and is equal to 1 minus the deprivation score, to be an *attainment score*.[19] The attainment score, which is our adequacy level in this paper, indicates a person's breadth of multiple attainments. A higher attainment score corresponds to higher well-being.[20] For the ease of interpreting small changes, we normalize the attainment scores so that they lie between 0 and 100, and thus each attainment score lies between a lower bound of $L = 0$ and an upper bound of $U = 100$. An attainment score equal to zero points signifies the lowest possible well-being (i.e., simultaneous deprivations in all 10 indicators) and an attainment score equal to 100 points signifies the largest possible well-being (i.e., no deprivation in any of the 10 indicators).

18 Table A1 (Appendix) summarizes the three dimensions, 10 indicators and their deprivation cutoffs and weights assigned to all indicators. We assume that all recorded attainments and deprivations are meaningful – an assumption that must be verified against each included indicator. For example, the global MPI indicator of solid cooking fuel (wood, charcoal or dung) has a high prevalence among non-poor people in some countries in which there are adequate ventilation and supply systems, so solid fuels are not associated with acute respiratory or eye infections, nor with extensive time spent in fuel collection. Solid cooking fuel still reflects a deprivation if one considers carbon footprint, but its link to poverty may be less direct. Hence indicators used in a full-distribution exercise such as this one must be critically assessed and 'spurious' measured deprivations that are not associated with lowered well-being must be minimized.

19 That is, the sum of the deprivation score and the attainment score is 1.

20 Previously, Peichl and Pestel (2013) have used the counting framework to assess affluence in Germany and the USA, where the affluent count can be interpreted as adequacy level. Although the approach can be related to well-being measurement, it does not capture inclusiveness as the poor population is assigned zero weight. Similarly, Makdissi and Yazbeck (2015) have proposed a measure of plutonomy based on top quantiles. This approach differs from our approach on two counts: the approach is relative, and it is developed for monetary indicators.

To study changes in well-being and inclusiveness, we divide the distribution of attainment scores for each country and for each year into five quintiles (i.e., $Q = 5$): *poorest*, *second poorest*, *middle*, *second richest* and *richest*.[21] We examine inclusiveness of well-being changes in 75 countries over two time periods by using 150 micro datasets (two datasets for each country), which include 87 Demographic Health Surveys (DHS), 56 Multiple Indicator Cluster Surveys (MICS), two China Family Panel Studies (CFPS), two Jamaica Surveys of Living Conditions (JSLC), two Mexico National Surveys of Health and Nutrition (ENSANUT) and the Peru Demographic and Family Health Survey (ENDES). For each country, the indicators have been harmonized across two periods so that a consistent comparison can be performed.[22] These datasets have been used to produce inter-temporal multidimensional poverty comparisons (Alkire et al., 2020b). While conducting statistical inferences, we incorporate the sampling design of these household surveys.

Table A2 (Appendix) presents the national overall average attainment scores (i.e., $\mu(F_1)$ and $\mu(F_2)$) and the average attainment scores within five quintiles for 75 countries over two periods as well as their annualized absolute changes (i.e., $\overline{\Delta}$ and $\Delta_1, \dots, \Delta_5$), which are the absolute changes between two periods divided by the differences of two survey years. The national overall average attainment scores and the average attainment scores within quintiles vary across and within six geographic regions. The national overall average attainment scores in the first period range between 31.9 points in Niger and 95.3 points in Montenegro, whereas the national overall average attainment scores in the second period range between 38.8 points in Niger and 97.1 points in Kazakhstan. National overall average attainment scores vary the most within sub-Saharan Africa and the least within Europe and Central Asia. However, when we look at the poorest quintile, the average attainment scores in the first period vary the most within the Arab States region, between 26.7 points in Sudan and 80.9 points in the State of Palestine. Overall, the average attainment scores within the poorest quintile vary globally in the first period between 6.9 points in Burkina Faso and 82.9 points in Montenegro.

Focusing on the absolute changes over time, we observe statistically significant improvements in the national overall average ($\overline{\Delta}$) for 73 countries.[23] For one country (Benin) we observe a statistically significant deterioration in the overall average, and for one other country (Montenegro) we do not observe any

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21 Owing to the discrete nature of the attainment scores, it is possible that the sample households with the same attainment scores need to be distributed across quintiles. We randomly distributed these attainment scores across quintiles. Practically, we set a particular seed in Stata so that the random distribution across quintiles is unique. Our standard error does not take into account this random selection of quintiles and bootstrapping may be required.

22 Out of the 75 countries in our analysis, 59 use all 10 indicators, 15 use a combination of nine indicators and one uses eight indicators.

23 We use a critical value of $\alpha = 10\%$ for statistical significance throughout this paper.

statistically significant change. Although, by construction, countries with high overall averages in the initial period cannot show large absolute improvements over time, changes across countries are certainly not monotonically related to the averages at the initial period but vary widely. The largest absolute annual improvements in the overall average attainment scores are observed for Mauritania and Sierra Leone – both registering around two points per annum improvements in their overall average attainment scores.[24] Chad, on the other hand, has one of the lowest levels of overall average (38 points) in the initial period and a low level of improvement (0.44 points per annum) in the overall average.

Looking at the changes in average attainment scores in different quintiles (i.e., Δ_q for $q = 1, \ldots, 5$), we observe that the average attainment scores for the poorest quintile show statistically significant improvements in 72 countries – all except Benin, Jamaica and Togo. Only Benin has a statistically significant deterioration in the average attainment for the poorest quintile; the other two countries show no change. For the second-poorest quintile, again 72 countries have statistically significant improvements. Moving up the quintiles, the average attainment scores are equal to 100 points for 18 countries in the second-richest quintile and for 24 countries in the richest quintile, meaning that no further improvements in well-being are possible in these countries' richer quintiles due to the boundedness of attainment scores.

IV. Have Changes in Well-being Been Inclusive?

To assess the inclusiveness of well-being changes, we select a quantile-weight vector to construct the well-being measure that assigns larger weights to lower quintiles. We use a set of rank-dependent quantile weights, $\omega^0 =$ (5/9, 3/9, 1/9, 0, 0), that satisfies the restrictions of both Proposition 1 and Proposition 2.[25] The quantile weights in ω^0 assign a weight of 5/9 to the poorest quintile, a weight of $3/9$ to the second-poorest quintile, a weight of $1/9$ to the middle quintile, and zero quantile weight to the two richest quintiles since the median average attainment scores within these quintiles at the first period are already more than 86 points. Note that the same set of quantile weights is applicable to changes in quintile-wise average attainment scores Δ_q's, as well as to the quantile-wise components of inclusivity premiums π_q's. Table 2 presents the *inclusive* well-being measures (W_1 and W_2) which are quantile-weighted sums of quintile averages that are available in Table A2 (see Appendix) and can be seen as *equally distributed equivalent*

24 The value of the global MPI for Mauritania was subsequently revised due to a recoding of Koranic schools to better align it with other countries' classifications; we use the 2020 value.

25 We present an approach to conduct robustness of inclusive well-being changes and inclusivity premiums with respect to the choice of quantile weights in Section 6.

Table 2. Annualized change in inclusive well-being, its decomposition and annualized bound-adjusted changes

		Year		Inclusive well-being measure			Decomposition		Bound-adjusted change
Country	Region	1st	2nd	W_1	W_2	Δ	$\bar{\Delta}$	π	Δ_B
Egypt	ARS	2008	2014	78.5	82.6	0.68***	0.32***	0.36***	3.16***
Iraq	ARS	2011	2018	73.9	79.0	0.73***	0.44***	0.30***	2.81***
State of Palestine	ARS	2010	2014	87.1	89.1	0.50***	0.26***	0.24***	3.84***
Sudan	ARS	2010	2014	37.7	41.6	0.97***	0.81***	0.16***	1.55***
Yemen	ARS	2006	2013	51.4	58.5	1.01***	0.79***	0.22***	2.09***
Cambodia	EAP	2010	2014	49.5	55.6	1.52***	1.26***	0.26***	3.02***
China	EAP	2010	2014	71.3	77.1	1.45***	0.97***	0.48***	5.06***
Indonesia	EAP	2012	2017	79.8	86.3	1.30***	0.70***	0.60***	6.42***
Lao PDR	EAP	2011–12	2017	48.0	62.5	2.64***	1.66***	0.98***	5.08***
Philippines	EAP	2013	2017	76.6	80.0	0.86***	0.57***	0.29***	3.67***
Thailand	EAP	2012	2015–16	85.9	87.6	0.48***	0.27***	0.21***	3.38***
Timor-Leste	EAP	2009–10	2016	38.6	52.1	2.07***	1.69***	0.38***	3.37***
Vietnam	EAP	2010–11	2014	78.8	80.3	0.44***	0.29***	0.15**	2.07***
Albania	ECA	2008–9	2017–18	85.3	89.1	0.42***	0.19***	0.23***	2.86***
Bosnia and Herzegovina	ECA	2006	2011–12	84.8	89.1	0.77***	0.17***	0.60***	5.07***
Kazakhstan	ECA	2010–11	2015	87.9	92.3	0.97***	0.47***	0.50***	8.06***
Kyrgyzstan	ECA	2005–6	2014	75.3	82.1	0.80***	0.53***	0.27***	3.23***
Macedonia	ECA	2005–6	2011	82.8	90.0	1.32***	0.59***	0.72***	7.63***
Moldova	ECA	2005	2012	88.1	89.6	0.21***	0.06***	0.15***	1.77***
Mongolia	ECA	2010	2013	66.6	70.8	1.39***	1.29***	0.10*	4.18***
Montenegro	ECA	2005–6	2013	88.5	89.4	0.12	-0.01	0.14**	1.07
Tajikistan	ECA	2012	2017	71.0	75.7	0.93***	0.65***	0.28***	3.20***
Turkmenistan	ECA	2006	2015–16	81.7	88.4	0.70***	0.41***	0.29***	3.82***
Belize	LAC	2011	2015–16	79.9	82.3	0.52***	0.23***	0.29***	2.61***
Bolivia	LAC	2003	2008	54.2	65.0	2.17***	1.78***	0.39***	4.74***
Colombia	LAC	2010	2015–16	82.5	84.8	0.41***	0.19***	0.22***	2.33***
Dominican Republic	LAC	2007	2014	78.1	86.1	1.14***	0.72***	0.42***	5.23***
Guyana	LAC	2009	2014	81.6	85.9	0.85***	0.43***	0.42***	4.64***
Haiti	LAC	2012	2016–17	48.3	52.2	0.87***	0.77***	0.11**	1.69***
Honduras	LAC	2005–6	2011–12	50.7	64.1	2.22***	1.49***	0.73***	4.51***
Jamaica	LAC	2010	2014	81.2	82.4	0.30**	0.12**	0.18*	1.59**
Mexico	LAC	2012	2016	82.9	84.1	0.29***	0.12***	0.17***	1.72***
Nicaragua	LAC	2001	2011–12	46.8	68.9	2.11***	1.33***	0.78***	3.96***
Peru	LAC	2012	2018	73.2	78.9	0.95***	0.55***	0.41***	3.55***
Suriname	LAC	2006	2010	76.9	81.9	1.26***	0.51***	0.75***	5.44***
Afghanistan	SAS	2010–11	2015–16	29.3	35.2	1.18***	1.44***	-0.27***	1.67***
Bangladesh	SAS	2014	2019	54.9	64.9	2.00***	1.33***	0.66***	4.42***
India	SAS	2005–6	2015–16	43.0	61.5	1.86***	1.39***	0.47***	3.25***
Nepal	SAS	2011	2016	51.2	60.7	1.91***	1.23***	0.68***	3.90***
Pakistan	SAS	2012–13	2017–18	46.0	49.7	0.75***	0.70***	0.05	1.39***
Benin	SSA	2014	2017–18	36.7	35.5	-0.33***	-0.34***	0.01	-0.52***
Burkina Faso	SSA	2006	2010	15.2	17.8	0.65***	0.81***	-0.16***	0.76***
Burundi	SSA	2010	2016–17	31.4	34.7	0.51***	0.64***	-0.13***	0.74***
Cameroon	SSA	2011	2014	42.4	44.1	0.59***	0.51***	0.08	1.02***
Central African Republic	SSA	2000	2010	20.2	26.8	0.67***	0.76***	-0.09***	0.84***
Chad	SSA	2010	2014–15	17.3	19.7	0.53***	0.44***	0.09**	0.64***
Congo, DR	SSA	2007	2013–14	31.7	37.4	0.89***	0.62***	0.27***	1.30***
Côte d'Ivoire	SSA	2011–12	2016	40.4	46.7	1.38***	1.53***	-0.14**	2.32***
Eswatini	SSA	2010	2014	60.4	67.1	1.68***	1.26***	0.42***	4.23***
Ethiopia	SSA	2011	2016	24.4	28.4	0.81***	0.92***	-0.11***	1.07***
Gabon	SSA	2000	2012	57.7	69.5	0.99***	0.64***	0.35***	2.34***
Gambia	SSA	2005–6	2013	32.1	43.4	1.51***	1.15***	0.36***	2.23***
Ghana	SSA	2011	2014	56.6	61.9	1.75***	0.91***	0.85***	4.04***

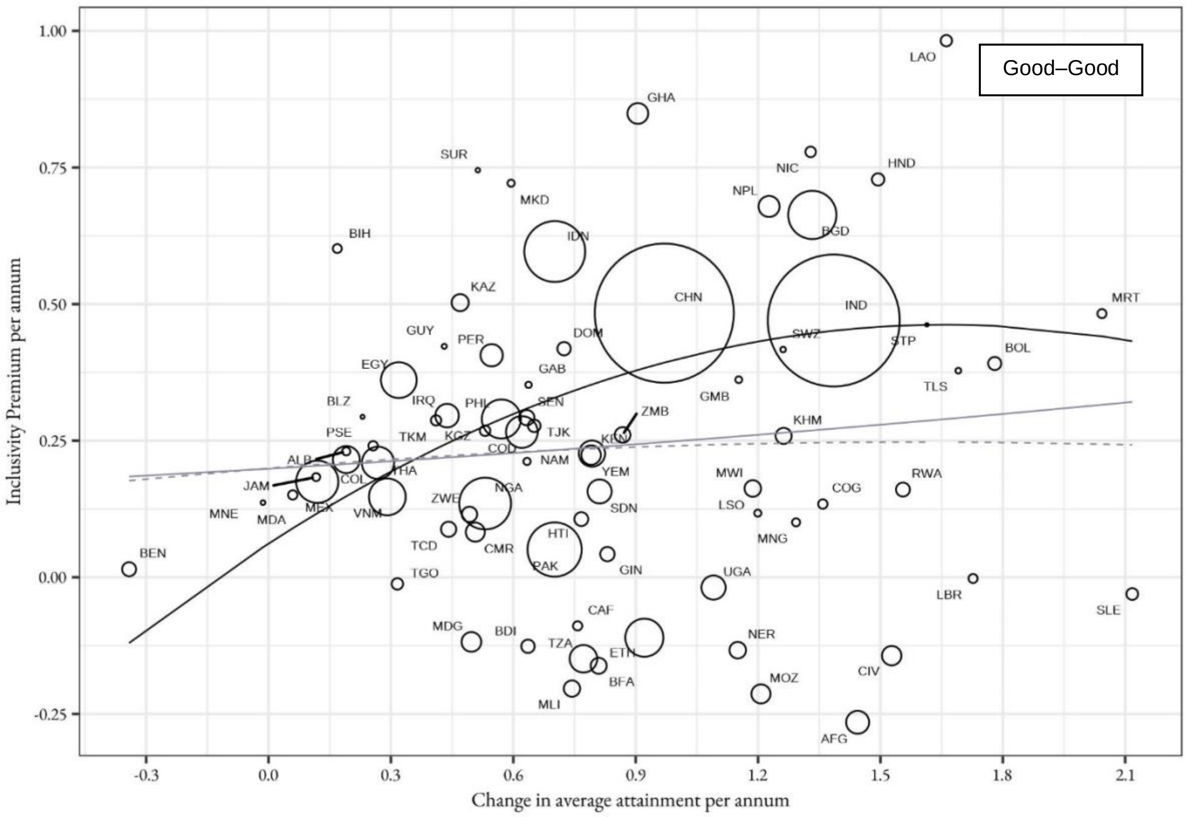
Guinea	SSA	2012	2018	28.8	34.0	0.87	***	0.83	***	0.04		1.23	***
Kenya	SSA	2008–9	2014	49.0	54.6	1.02	***	0.79	***	0.23	***	2.00	***
Lesotho	SSA	2009	2014	51.1	57.7	1.32	***	1.20	***	0.12	***	2.69	***
Liberia	SSA	2007	2013	30.7	41.0	1.72	***	1.73	***	0.00		2.49	***
Madagascar	SSA	2008–9	2018	31.9	35.5	0.38	***	0.50	***	-0.12	***	0.56	***
Malawi	SSA	2010	2015–16	42.1	49.5	1.35	***	1.19	***	0.16	***	2.33	***
Mali	SSA	2006	2015	27.1	32.0	0.54	***	0.74	***	-0.20	***	0.74	***
Mauritania	SSA	2011	2015	34.5	44.6	2.53	***	2.04	***	0.48	***	3.86	***
Mozambique	SSA	2003	2011	25.4	33.3	0.99	***	1.21	***	-0.21	***	1.33	***
Namibia	SSA	2006–7	2013	51.6	57.1	0.85	***	0.63	***	0.21	***	1.75	***
Niger	SSA	2006	2012	13.6	19.7	1.02	***	1.15	***	-0.13	***	1.18	***
Nigeria	SSA	2013	2018	38.8	42.1	0.67	***	0.53	***	0.13	***	1.09	***
Republic of Congo	SSA	2005	2014–15	47.5	61.7	1.49	***	1.36	***	0.13	***	2.84	***
Rwanda	SSA	2010	2014–15	40.7	48.4	1.72	***	1.56	***	0.16	***	2.89	***
São Tomé and Príncipe	SSA	2008–9	2014	54.7	66.1	2.08	***	1.61	***	0.46	***	4.58	***
Senegal	SSA	2005	2017	30.2	41.3	0.93	***	0.63	***	0.29	***	1.32	***
Sierra Leone	SSA	2013	2017	33.8	42.2	2.09	***	2.12	***	-0.03		3.15	***
Tanzania	SSA	2010	2015–16	41.4	44.8	0.62	***	0.77	***	-0.15	***	1.06	***
Togo	SSA	2010	2013–14	38.0	39.1	0.30	**	0.32	***	-0.01		0.49	**
Uganda	SSA	2011	2016	40.1	45.5	1.07	***	1.09	***	-0.02		1.79	***
Zambia	SSA	2007	2013–14	38.6	45.9	1.13	***	0.87	***	0.26	***	1.84	***
Zimbabwe	SSA	2010–11	2015	56.4	59.1	0.61	***	0.49	***	0.12	***	1.39	***

overall average adequacy levels. These tend to be highest in ECA countries like Kazakhstan, EAP as well as LAC. The absolute annualized change (the change in inclusive well-being divided by the difference between two survey years) in the inclusive well-being levels for each country across two periods is denoted by Δ. The well-being levels vary across countries globally as well as within regions. As before, in the case of the average attainment scores, 73 countries register statistically significant increases in inclusive well-being with the largest being in Lao PDR, Mauritania, Honduras, Bolivia, and Nicaragua. We now decompose the overall change in well-being based on Equation (3) and report its two components – the change in the national overall average attainment score ($\bar{\Delta}$) and the inclusivity premium (π). Recall that by construction $\Delta = \bar{\Delta} + \pi$, following Equation (3).

We observe that inclusivity premiums are statistically significantly negative for 11 countries: one from South Asia (Afghanistan) and 10 from sub-Saharan Africa (Burkina Faso, Burundi, Central African Republic, Côte d'Ivoire, Ethiopia, Madagascar, Mali, Mozambique, Niger and Tanzania).

We further observe inclusivity premiums (π) to be not statistically significantly different from zero for eight countries: one from South Asia (Pakistan) and seven from sub-Saharan Africa (Benin, Cameroon, Guinea, Liberia, Sierra Leone, Togo and Uganda). Thus, for one-quarter of the countries in our sample (19 out of 75), we do not observe a statistically significant positive inclusivity premium. Surprisingly, except for Benin, 18 of these 19 countries register statistically significant improvements in overall average attainment scores ($\bar{\Delta}$) over the respective study periods. Moreover, the majority of these 19 countries are from sub-Saharan Africa. Nearly half of all sub-Saharan African countries (17 out of 35) do not produce positive inclusivity premiums. Most of the countries in our sample do reflect positive inclusivity premiums, with wide variations. Out of the 56 countries that show statistically significant positive premiums, 22 countries register premiums (π) that are larger than 0 points but not larger than 0.25 points, 23 countries register premiums that are larger than 0.25 points but not larger than 0.5 points, eight countries register premiums that are larger than 0.5 points but not larger than 0.75 points, and only three countries (Ghana, Lao PDR and Nicaragua) register premiums of over 0.75 points per year. It appears that 20 countries register annualized improvements in average attainment scores ($\overline{\Delta}$) of 1.2 points or above and 20 countries register annualized inclusivity premiums (π) of 0.39 and above, but only 10 countries register both milestones.

Figure 1. Annualized changes in average attainment and inclusivity premium

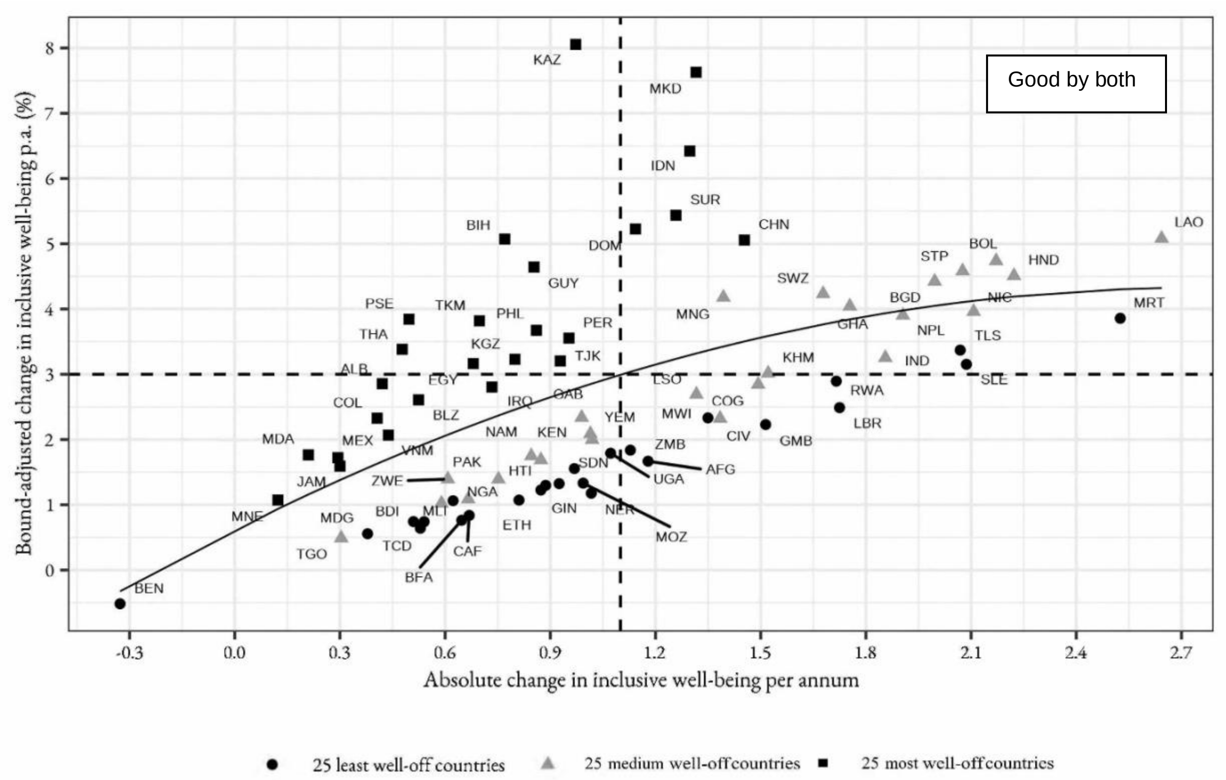


Source: Authors' computations based on the micro-datasets produced by Alkire et al. (2020a).

Notes: The solid black population weighted trend line corresponds to 75 countries. The solid grey population unweighted trend line corresponds to 75 countries. The dashed grey population unweighted trend line corresponds to 74 countries, with Lao PDR excluded. The size of each bubble reflects the average population size of the country across both periods. Country abbreviations: AFG: Afghanistan; ALB: Albania; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Côte d'Ivoire; CMR: Cameroon; COD: Congo, DR; COG: Republic of Congo; COL: Colombia; DOM: Dominican Republic; EGY: Egypt; ETH: Ethiopia; GAB: Gabon; GHA: Ghana; GIN: Guinea; GMB: Gambia; GUY: Guyana; HND: Honduras; HTI: Haiti; IDN: Indonesia; IND: India; IRQ: Iraq; JAM: Jamaica; KAZ: Kazakhstan; KEN: Kenya; KGZ: Kyrgyzstan; KHM: Cambodia; LAO: Lao PDR; LBR: Liberia; LSO: Lesotho; MDA: Moldova; MDG: Madagascar; MEX: Mexico; MKD: Macedonia; MLI: Mali; MNE: Montenegro; MNG: Mongolia; MOZ: Mozambique; MRT: Mauritania; MWI: Malawi; NAM: Namibia; NER: Niger; NGA: Nigeria; NIC: Nicaragua; NPL: Nepal; PAK: Pakistan; PER: Peru; PHL: Philippines; PSE: State of Palestine; RWA: Rwanda; SDN: Sudan; SEN: Senegal; SLE: Sierra Leone; STP: São Tomé and Príncipe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TZA: Tanzania; UGA: Uganda; VNM: Vietnam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

To visually demonstrate the relationship between the change in the average attainment and the inclusivity premium across countries, Figure 1 presents the relationship through a scatterplot. The horizontal axis shows the per annum change in overall average attainment score between two periods, whereas the vertical axis shows the annualized inclusivity premium between two periods. Each point on the scatterplot provides an interesting interpretation of the decomposition. The total change in well-being of a particular country is simply the sum of the two coordinates. For example, for Honduras (HND), the annual change in the average attainment is 1.49 points and the annualized inclusivity premium per annum is 0.73 points. Therefore, the annual change in inclusive well-being for Honduras is 2.22 points (1.49 + 0.73). Figure 1 shows a lack of a particular relationship between inclusivity premiums and average attainment scores across countries as inclusivity premiums vary widely for similar changes in average attainment scores.

Figure 2. Absolute changes vis-à-vis bound-adjusted changes in inclusive well-being



Source: Authors' computations based on the data in Table 2.

Notes: The solid black population unweighted trend line corresponds to 75 countries. Country abbreviations: AFG: Afghanistan; ALB: Albania; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Côte d'Ivoire; CMR: Cameroon; COD: Congo, DR; COG: Republic of Congo; COL: Colombia; DOM: Dominican Republic; EGY: Egypt; ETH: Ethiopia; GAB: Gabon; GHA: Ghana; GIN: Guinea; GMB: Gambia; GUY: Guyana; HND: Honduras; HTI: Haiti; IDN: Indonesia; IND: India; IRQ: Iraq; JAM: Jamaica; KAZ: Kazakhstan; KEN: Kenya; KGZ: Kyrgyzstan; KHM: Cambodia; LAO: Lao PDR; LBR: Liberia; LSO: Lesotho; MDA: Moldova; MDG: Madagascar; MEX: Mexico; MKD: Macedonia; MLI: Mali; MNE: Montenegro; MNG: Mongolia; MOZ: Mozambique; MRT: Mauritania; MWI: Malawi; NAM: Namibia; NER: Niger; NGA: Nigeria; NIC: Nicaragua; NPL: Nepal; PAK: Pakistan; PER: Peru; PHL: Philippines; PSE: State of Palestine; RWA: Rwanda; SDN: Sudan; SEN: Senegal; SLE: Sierra Leone; STP: São Tomé and Príncipe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TZA: Tanzania; UGA: Uganda; VNM: Vietnam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

4.1 Bound-adjusted Changes

The final column of Table 2 reports the annualized bound-adjusted changes (Δ_B) in inclusive well-being as it may not be feasible for countries with an already high level of inclusive well-being to register large improvements over time. In Figure 2, we plot the relationship between annualized absolute changes in inclusive well-being (horizontal axis) against the corresponding annualized bound-adjusted changes (vertical axis). We divide the 75 countries in our analysis into three groups based on the inclusive well-being levels in the initial period (i.e., W_1): the 25 least well-off countries (black circles), the 25 medium well-off countries (grey triangles) and the 25 most well-off countries (black squares). The two types of changes show a loose positive association represented by the solid black trend line. Absolute changes in inclusive well-being vary widely with each of the three groups, but it is interesting to observe that there is clear segregation of countries in terms of bound-adjusted changes along the trend line.

We divide the region within Figure 2 into four sub-regions, around the absolute change in inclusive well-being of 1.1 (signified by the dashed vertical line) and around the bound-adjusted change of 3% (signified by the dashed horizontal line). Countries such as Mauritania (MRT), Lao PDR and Eswatini (SWZ), fall in the high–high sub-region, whereas countries such as Pakistan (PAK), Ethiopia (ETH) and Colombia (COL), fall in the low–low sub-region. There are instances where countries reflect high absolute changes but low bound-adjusted changes (i.e., the high–low sub-region) and where countries reflect low absolute changes but high bound-adjusted changes (i.e., the low–high sub-region). The low–high sub-region mainly consists of the most well-off countries, whereas the high–low sub-region chiefly consists of medium and least well-off countries.

4.2 Further Insights with Specific Illustrations

Interesting insights may be drawn by looking at comparisons of specific countries. We compare a pair of South Asian countries (India and Nepal) and a pair of sub-Saharan African countries (Malawi and Côte d'Ivoire). Table 3 presents the values of changes for all four countries. Both India and Nepal have a similar level of inclusive well-being in the second period (61.5 points for India and 60.7 points for Nepal, as in Table 2) as well as similar annual changes in inclusive well-being over their respective study periods (1.91 points per annum for Nepal and 1.86 points per annum for India). A decomposition of their inclusive well-being changes shows that India's change in average attainment (1.39 points p.a.) is higher than that of Nepal (1.23 points p.a.), whereas Nepal's inclusivity premium (0.68 points p.a.) is higher than India's (0.47 points p.a.). Therefore, Nepal's progress can be claimed to have had a greater effective improvement in the poorer quintiles, which can be verified by examining the changes in five quintiles (i.e., $\Delta_1, \ldots, \Delta_5$) also included in Table 3.

Table 3. Comparisons of changes: India vs Nepal and Malawi vs Côte d'Ivoire

	Δ_1	Δ_2	Δ_3	Δ_4	Δ_5	Δ	Δ_B	$\bar{\Delta}$	π
India	1.99 ***	1.75 ***	1.51 ***	1.25 ***	0.43 ***	1.86 ***	3.25 ***	1.39 ***	0.47 ***
Nepal	2.23 ***	1.57 ***	1.31 ***	0.72 ***	0.31 ***	1.91 ***	3.90 ***	1.23 ***	0.68 ***
Côte d'Ivoire	1.28 ***	1.36 ***	1.96 ***	1.92 ***	1.12 ***	1.38 ***	2.32 ***	1.53 ***	-0.14 **
Malawi	1.50 ***	1.08 ***	1.41 ***	1.01 ***	0.94 ***	1.35 ***	2.33 ***	1.19 ***	0.16 ***

Nepal also registers higher annual bound-adjusted change than India. Similarly, both Malawi and Côte d'Ivoire register similar annual absolute changes and annual bound-adjusted changes over time. However, the inclusivity premium for Malawi is positive signifying inclusive progress, whereas that of Côte d'Ivoire is negative, signifying a lack of inclusiveness.[26]

V. Comparison of Inclusivity Premium to Other Well-known Measures

We now elaborate how our proposed framework compares with two well-known measures: the shared prosperity premium (SPP) produced by the World Bank and the global MPI produced by OPHI and UNDP. We first explore how the SPP, which is the difference between the (relative) growth of average income among the bottom 40% of the population of a country and the (relative) growth of the overall average income, compares with the well-being (absolute) inclusivity premium across countries associated with the multidimensional well-being measure presented in Section 4. Despite differences in space (monetary vs multidimensional) and measure of change (relative vs absolute), the SPP, like the inclusivity premium, is positive whenever the average income growth among the poorest 40% of the population is larger than the overall average income growth, and negative whenever growth among the poorest 40% is slower.

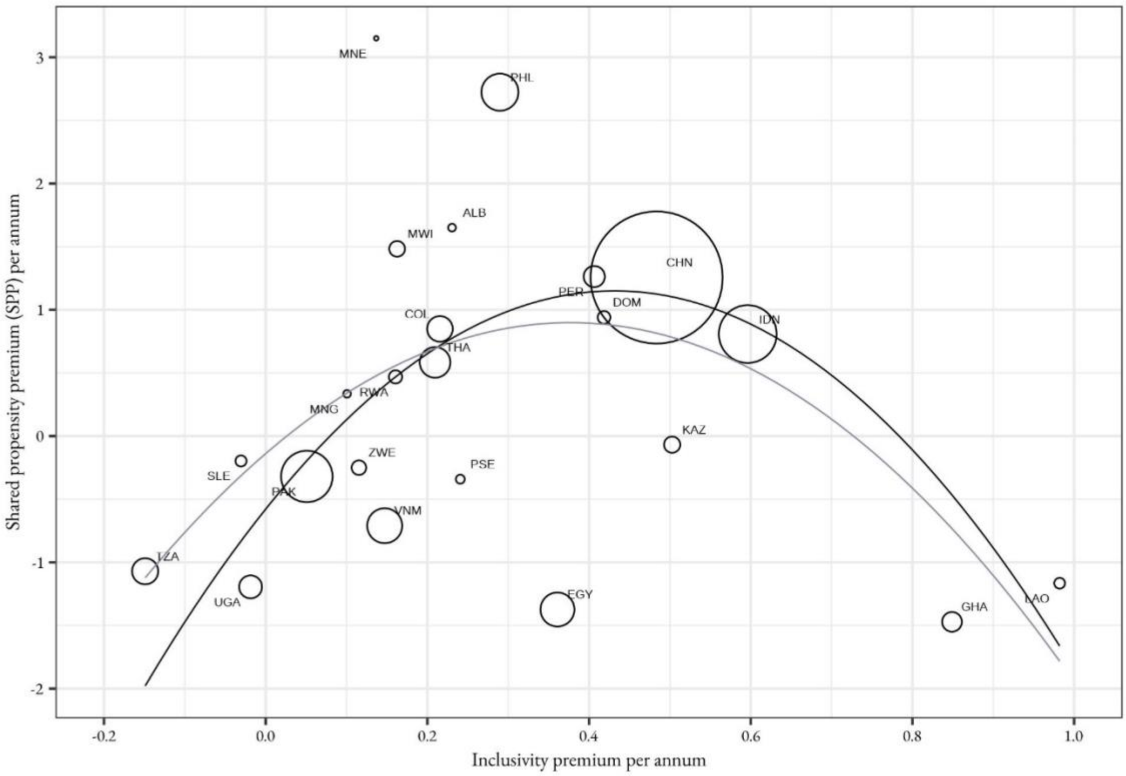
We are able to secure SPP data from the World Bank's global database on shared prosperity for only 28 of the 75 countries in our sample.[27] We use the 23 of these 28 countries for which the differences between the first and last periods of the surveys for computing SPPs and those for the surveys for computing inclusivity premiums were three years or less. Figure 3 presents the relationship between SPPs and inclusivity premiums across these 23 countries using a simple scatterplot. Although there are instances

26 We checked the statistical significance of the differences between the changes in annual average attainment scores, the annual shared prosperity premiums, and the changes in annual bound-adjusted inclusive well-being across countries.

27 Table A3 (see Appendix) reports the overall income growth rates, income growth rates of the poorest 40% of the population, and SPPs.

where some countries perform relatively similarly by both measures, overall we observe an inverted-U shaped relationship between these two measures, not, as we might have expected, an upward sloping relationship. Higher SPPs are therefore not necessarily associated with higher inclusivity premiums. Countries such as Pakistan, Sierra Leone, Tanzania and Uganda show unsatisfactory performance by both measures, whereas countries such as China and Indonesia perform moderately according to both measures. There are several instances, however, where a group of countries perform impressively by one measure but not by the other measure. For instance, Ghana and Lao PDR perform impressively in terms of inclusivity premiums but their SPPs are negative, whereas Malawi and Philippines register very high SPPs but their inclusivity premiums are less impressive.

Figure 3. Shared prosperity premiums (monetary, relative) and inclusivity premiums (multidimensional, absolute) across 25 countries

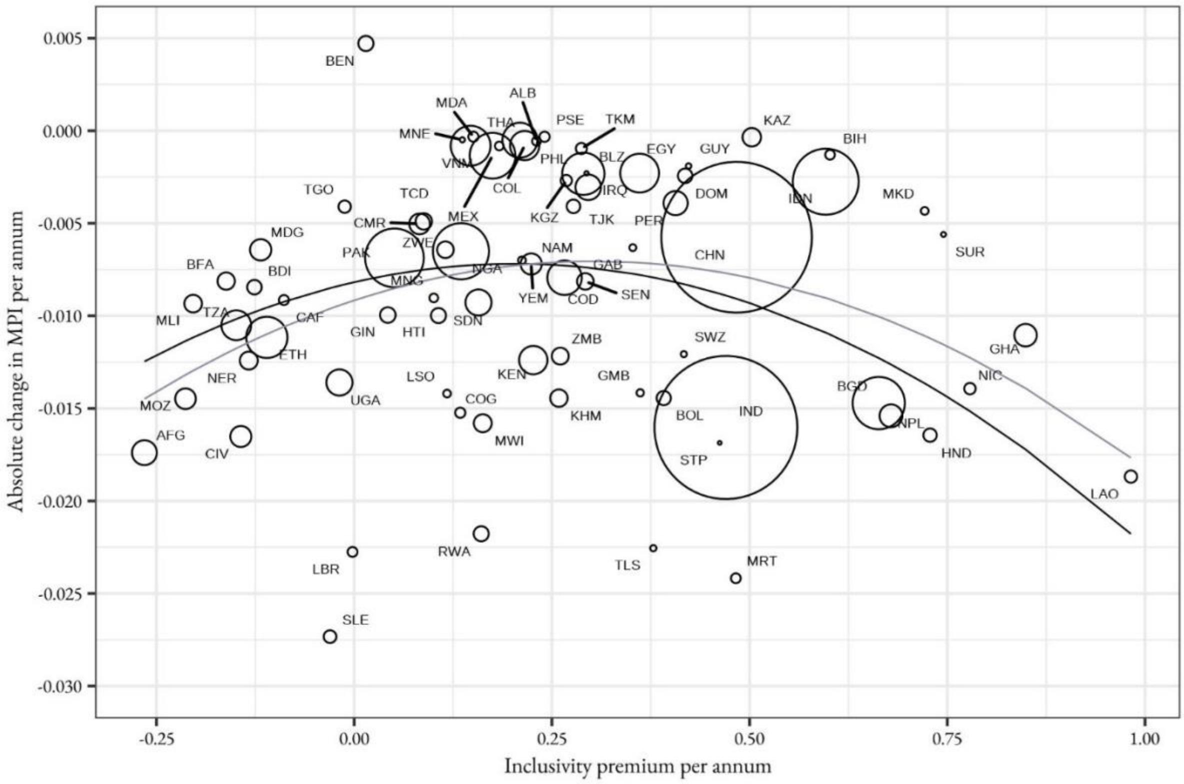


Source: Authors' computations for inclusivity premiums. SPP figures were accessed from World Bank (n.d.) in December 2021.

Notes: Both the solid black population weighted trend line and the solid grey population unweighted trend line correspond to 25 countries. The size of each bubble reflects the average population size of the country across both periods. Countries for SPP: Albania (ALB, 2014–17), China (CHN, 2013–16), Colombia (COL, 2014–19), Dominican Republic (DOM, 2011–16), Egypt (EGY, 2012–17), Ghana (GHA, 2012–16), Indonesia (IDN, 2015–19), Kazakhstan (KAZ, 2013–18), Lao PDR (LAO, 2012–18), Malawi (MWI, 2010–16), Mongolia (MNG, 2011–18), Montenegro (MNE, 2012–16), Pakistan (PAK, 2013–18), Peru (PER, 2014–19), Philippines (PHL, 2015–18), Rwanda (RWA, 2013–16), Sierra Leone (SLE, 2011–18), State of Palestine (PSE, 2011–16), Tanzania (TZA, 2011–18), Thailand (THA, 2015–19), Uganda (UGA, 2012–16), Vietnam (VNM, 2014–18) and Zimbabwe (ZWE, 2011–17).

We next compare the inclusivity premiums with the changes in the global MPI values. Given that our inclusive well-being measure based on the full distribution of attainments uses the same set of indicators and parameters as the global MPI (which focuses only on persons identified as poor), it is crucial to examine whether our inclusive well-being framework provides any additional insight into the changes in the MPIs. Figure 4 presents the relationship between inclusivity premiums and absolute changes in the MPIs across 75 countries. As with the SPP, the relationship is inverted-U shaped.[28] Countries such as Burkina Faso (BFA), Mali (MLI), Mozambique (MOZ) and Niger (NER) register statistically significant reductions in their MPIs, but also register statistically significantly negative inclusivity premiums. In contrast, countries such as Bangladesh (BDG), Nepal (NPL) and Honduras (HND) register statistically signficant reductions in their MPIs as well as statistically significantly positive inclusivity premiums. There are also instances, particularly in low-MPI countries, such as Colombia (COL) and Thailand (THA), where the absolute reductions in their MPIs are small and their inclusivity premiums are much larger.

Figure 4. Inclusivity premiums and absolute changes in the MPIs across countries



Source: Authors' computations based on the micro-datasets produced by Alkire et al. (2020a).
Notes: Figures for inclusivity premiums and absolute changes in the MPIs are reported in Table A3. The solid black line corresponds to the population weighted trend line for 75 countries. The solid grey line corresponds to the population unweighted trend line for 75 countries. The size of each bubble reflects the average population size of the country across both periods. Country abbreviations: AFG: Afghanistan; ALB: Albania; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Côte d'Ivoire; CMR: Cameroon; COD: Congo, DR; COG: Republic of Congo; COL: Colombia; DOM: Dominican Republic; EGY: Egypt; ETH: Ethiopia; GAB: Gabon; GHA: Ghana; GIN: Guinea; GMB: Gambia; GUY: Guyana; HND: Honduras; HTI: Haiti; IDN: Indonesia; IND: India; IRQ: Iraq; JAM: Jamaica; KAZ: Kazakhstan; KEN: Kenya; KGZ: Kyrgyzstan; KHM: Cambodia; LAO: Lao PDR; LBR: Liberia; LSO: Lesotho; MDA: Moldova; MDG: Madagascar; MEX: Mexico; MKD: Macedonia; MLI: Mali; MNE: Montenegro; MNG: Mongolia; MOZ: Mozambique; MRT: Mauritania; MWI: Malawi; NAM: Namibia; NER: Niger; NGA: Nigeria; NIC: Nicaragua; NPL: Nepal; PAK: Pakistan; PER: Peru; PHL: Philippines; PSE: State of Palestine; RWA: Rwanda; SDN: Sudan; SEN: Senegal;

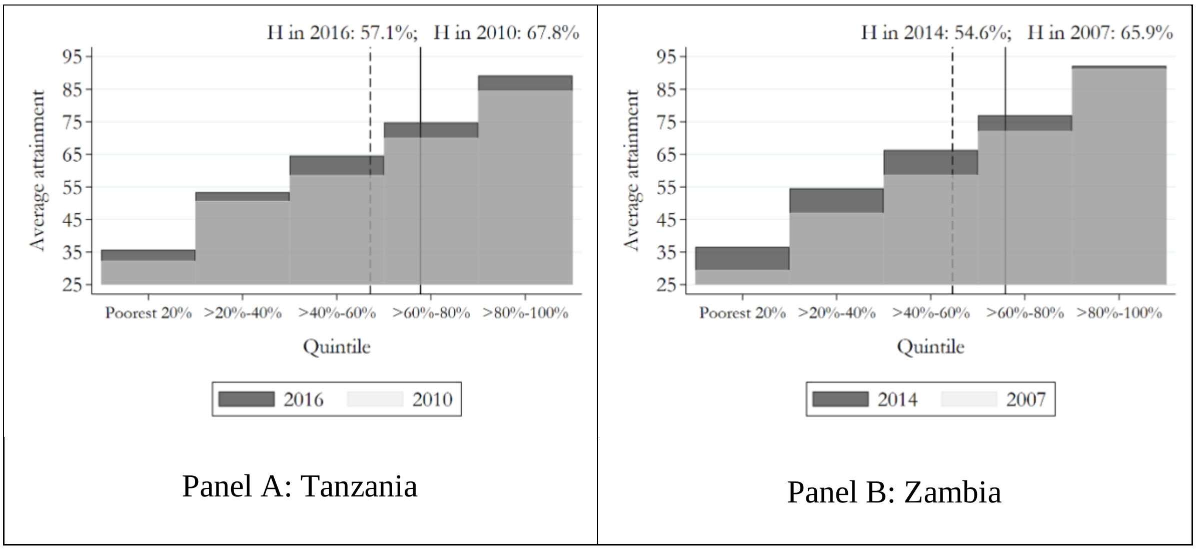
28 Table A3 (see Appendix) reports the MPI values and MPI headcount ratios for all 75 countries.

SLE: Sierra Leone; STP: São Tomé and Príncipe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TZA: Tanzania; UGA: Uganda; VNM: Vietnam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

To form a deeper understanding of their relationship, we examine two countries – Tanzania and Zambia. Both countries have similar MPIs in their respective initial periods (0.342 in 2010 for Tanzania and 0.349 in 2007 for Zambia) as well as similar levels of annual absolute reductions (-0.011 between 2010 and 2016 for Tanzania and -0.012 between 2007 and 2014 for Zambia). Tanzania's MPI headcount ratio is also similar to Zambia's in the initial period and they both show comparable annual reductions.

However, when we look at the inclusivity premiums, Tanzania has a statistically significantly negative inclusivity premium of -0.15, whereas Zambia has a statistically significantly positive inclusivity premium of 0.26.

Figure 5. Average attainment scores by quintile across two periods in Tanzania and Zambia



Source: Authors' computations based on Table A2 and Table A3.

Notes: The solid and dashed vertical lines correspond to the MPI headcount ratios for the first year and the second year, respectively.

Figure 5 presents the quintile-wise changes in average attainment scores for both countries in two panels using bar diagrams. The height of the lighter-shaded bar denotes the average attainment within each quintile for the first period, whereas the height of the darker-shaded bar denotes the average attainment within each quintile for the second period. The difference between the darker-shaded bar and the lighter-shaded bar denotes the improvement in average attainment within each quintile. Note that an attainment score is the complement of a deprivation score by our definition, and therefore the magnitude of absolute improvement in the average attainment score within a quintile is equivalent to the magnitude of the corresponding absolute reduction in the average deprivation score within that quintile.

Hence, the MPIs and corresponding headcount ratios have improved by similar magnitudes for both Tanzania and Zambia, but we observe a key difference in inclusivity between the two countries. For Tanzania, improvements in average attainment scores in poorer quintiles have been less than the improvements in richer quintiles, but for Zambia, improvements have been larger for poorer quintiles. Therefore, Zambia's improvement in well-being has been inclusive, but Tanzania's improvement in well-being has not. Clearly, our framework adds valuable information over and above the overall global MPI trends.

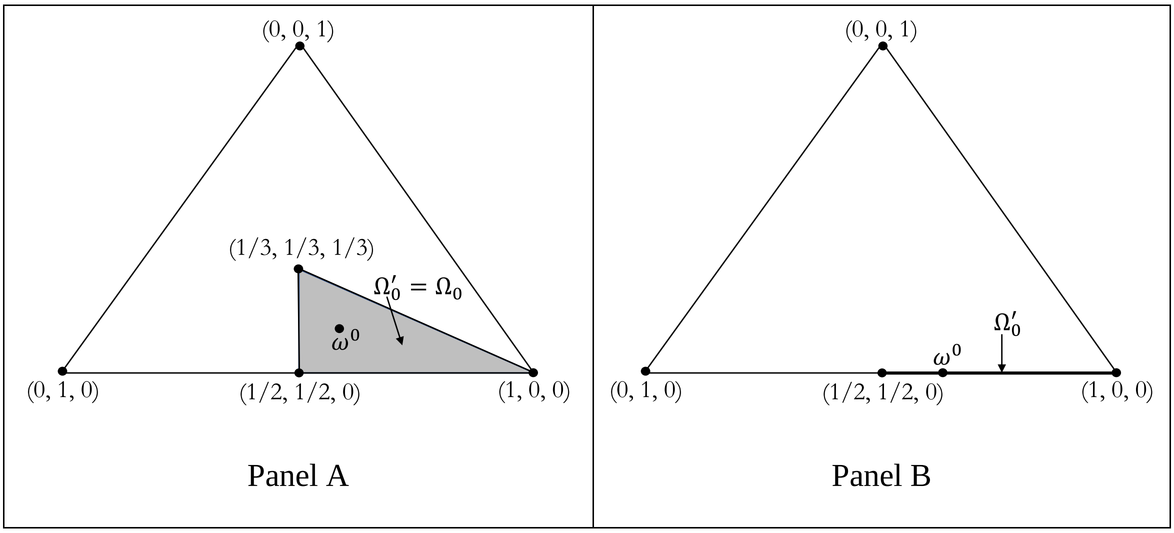
VI. Robustness of Inclusive Well-being Changes and Inclusivity Premiums

So far, we have chosen a quantile-weight vector $\omega^0 \in \Omega_0$ for assessing well-being changes and inclusivity premiums. How do we assess the robustness of our conclusions to alternative weighting structures? Corresponding to ω^0, let us denote the change in well-being and the inclusivity premium between F_1 and F_2 by $\Delta(F_1, F_2; \omega^0) = \sum_{q=1}^{Q} \omega_q^0 \Delta_q$ and $\pi(F_1, F_2; \omega^0) = \sum_{q=1}^{Q} \omega_q^0 \pi_q$. In other words, both are presented as weighted sums of Δ_q's and π_q's. However, any other quantile-weight vector $\omega \in \Omega_0' \subseteq \Omega_0$ could be an admissible alternative for assessing well-being and inclusivity premiums, where Ω_0' is the set of alternative quantile-weight vectors. Under different circumstances, Ω_0' could either be a subset of Ω_0 or be the entire set itself (i.e., $\Omega_0' = \Omega_0$).

Without loss of generality, suppose the overall well-being change at ω^0 is non-negative, $\sum_{q=1}^{Q} \omega_q^0 \Delta_q \geq 0$, and/or the inclusivity premium is positive, $\sum_{q=1}^{Q} \omega_q^0 \pi_q > 0$. For both these comparisons to be robust with respect to alternative quantile-weight vectors $\omega \in \Omega_0'$, we need to show that $\sum_{q=1}^{Q} \omega_q \Delta_q \geq 0$ and $\sum_{q=1}^{Q} \omega_q \pi_q > 0$ for all $\omega \in \Omega_0'$. There are an infinite number of alternative quantile-weight vectors in Ω_0', but we may invoke various results from Seth and McGillivray (2018) to obtain a finite number of tractable conditions. We can illustrate the concept using an example with $Q = 3$ in which the entire distribution is divided across terciles.

In both panels of Figure 6, all quantile-weight vectors with non-negative quantile weights that sum up to one in three dimensions are summarized by a simplex with three quantile-weight vectors (0, 0, 1), (0, 1, 0) and (0, 0, 1) as its three vertices. The quantile-weight vectors (0, 0, 1), (0, 1, 0) and (1, 0, 0) assign the entire

Figure 6. Set of alternative quantile-weight vectors for checking robustness



Source: Adapted from Figure 2b of Seth and McGillivray (2018).

quantile weight to the change in the richest tercile, to the change in the middle tercile, and to the change in the poorest tercile, respectively. Any quantile-weight vector within the simplex is a convex combination of these three vertices.

Proposition 1 requires that $\omega_1 \geq \omega_2 \geq \omega_3$ for all weights in Ω^0. Panel A of Figure 6 presents the most extreme case when $\Omega_0' = \Omega_0$, where all quantile weights are allowed to vary between 0 and 1.

In this case, the set of all alternative quantile-weight vectors are summarized by the shaded region within the simplex, where ω^0 is a component in the set. To check the robustness of well-being changes evaluated at ω^0, we need to compare the well-being changes at all quantile-weight vectors within the shaded region. Following Seth and McGillivray (2018, Proposition 1), the requirement boils down to only comparing well-being changes at three vertices of the shaded region: (1, 0, 0), (1/2, 1/2, 0) and (1/3, 1/3, 1/3). If the well-being changes are robust at these three quantile-weight vectors then, following Foster et al. (2012), it can be easily shown that they are robust for all quantile weights in the shaded region.

Panel B of Figure 6 presents another case where ω^0 is such that the two poorest terciles are assigned strictly positive quantile weight, but a zero quantile weight is assigned to the richest tercile (i.e., $\omega_1^0 \geq \omega_2^0 > \omega_3^0 = 0$). Then, following Seth and McGillivray (2018), the set of alternative quantile-weight vectors, $\Omega_0' \subset \Omega_0 \setminus \{\bar{\omega}\}$, is the linear segment between and including vertices (1/2, 1/2, 0) and (1, 0, 0). To test robustness with respect to Ω_0' then requires checking the robustness of well-being changes as well as the robustness of inclusivity premiums only at (1/2, 1/2, 0) and (1, 0, 0).

Formally, depending on particular cases, different tractable robustness criteria may be determined drawing from Seth and McGillivray (2018). However, we can provide a formal presentation of the case when $\Omega_0' =$

Ω_0. We introduce two additional vector notations: $\mathbf{1}_q$ denotes a q-dimensional vector of ones and $\mathbf{0}_q$ is a q-dimensonal vector of zeros for any $q \in \mathcal{Q}$. In order to ensure robustness, in this case one is required to show that $\sum_{q=1}^{Q} \omega_q \Delta_q \geq 0$ for the following Q quantile-weight vectors: $\omega^q = (\frac{1}{q}\mathbf{1}_q, \mathbf{0}_{Q-q})$ for all $q = 1, \ldots, Q-1$ and $\omega^Q = (\frac{1}{Q}\mathbf{1}_Q)$.

Let us link to the case with $Q = 3$. For $q = 1$, $\omega^1 = (\frac{1}{1}\mathbf{1}_1, \mathbf{0}_2)$ = (1, 0, 0); for $q = 2$, $\omega^2 = (\frac{1}{2}\mathbf{1}_2, \mathbf{0}_1)$ = (1/2, 1/2, 0); and for $q = 3$, $\omega^3 = (\frac{1}{3}\mathbf{1}_3)$ = (1/3, 1/3, 1/3). Let us provide some intuition behind what it means for checking robustness at the Q quantile-weight vectors. First, consider the case for $q = 1$, that is, $\omega^1 = (1, 0, \cdots, 0)$, where $\Delta(F_1, F_2; \omega^1) = \Delta_1$ is the change in the poorest quantile. Next, consider the other extreme of $q = Q - 1$, that is, $\omega^{Q-1} = (\frac{1}{Q-1}, \cdots, \frac{1}{Q-1}, 0)$, where, $\Delta(F_1, F_2; \omega^{Q-1}) = \frac{1}{Q-1}\sum_{q=1}^{Q-1} \Delta_q$ is the average of the change in the $Q - 1$ poorest quantiles. It is easy to check that for any $q \in \mathcal{Q} \setminus \{Q\}$ that $\omega^q = (\frac{1}{q}\mathbf{1}_q, \mathbf{0}_{Q-q})$ corresponds to the average of the changes in the bottom q quantiles, that is, $\Delta(F_1, F_2; \omega^q) = \frac{1}{q}\sum_{j=1}^{q} \Delta_j$. Finally, consider $\omega^Q = (\frac{1}{Q}\mathbf{1}_Q)$, which assigns equal quantile weights to all Q quantiles so that $\omega^Q = \bar{\omega}$ and $\Delta(F_1, F_2; \omega^Q) = \bar{\Delta}(F_1, F_2)$. Thus, the robustness test corresponds to checking the average of changes for every bottom q quantiles, that is, $\frac{1}{q}\sum_{q'=1}^{q} \Delta_{q'} \geq 0$ for all $q \in \mathcal{Q}$.[29]

6.1 Robustness of the Empirical Analysis

For our empirical analysis, we have used ω^0 = (5/9, 3/9, 1/9, 0, 0). With ω^0, we always provide zero quantile weights to the two richest quintiles and so the set of alternative quantile-weight vectors for checking robustness is $\Omega_0' = \{\omega \mid 1 \geq \omega_1 \geq \omega_2 \geq \omega_3 \geq \omega_4 = \omega_5 = 0 \;\&\; \sum_{q=1}^{Q} \omega_q = 1\} \subset \Omega_0 \setminus \{\bar{\omega}\}$. Then, following Seth and McGillivray (2018), we are required to compare well-being changes and inclusivity premiums at the following three quantile-weight vectors: ω^1 = (1, 0, 0, 0, 0), ω^2 = (1/2, 1/2, 0, 0, 0) and ω^3 = (1/3, 1/3, 1/3, 0, 0). Note that ω^1 requires comparing the changes and the inclusivity premium only for the poorest quintile, whereas ω^2 and ω^3 require comparing the average changes and

[29] Comparing the well-being changes for every bottom quantile is conceptually analogous to generalized Lorenz dominance (Shorrocks, 1983). Palmisano and Peragine (2015) have produced analogous results for growth across income quantiles.

inclusivity premiums for the bottom two (poorest and second poorest) and the bottom three (poorest, second poorest and middle) quintiles, respectively.[30]

We report the well-being levels and inclusivity premiums for ω^1, ω^2 and ω^3 in Table A4. The final two columns report whether the changes in inclusive well-being and the inclusivity premiums are robust or not for all 75 countries. Our robustness tests are more conservative than our theoretical framework. We refer to an increase in well-being as being robust if we observe statistically significant increases for all three quantile-weight vectors, ω^1, ω^2 and ω^3. Similarly, we refer to a reduction in well-being as being robust whenever we observe statistically significant reductions in well-being levels for all three quantile-weight vectors. Out of the 75 countries, we observe the changes in well-being to be robust for 72 countries, including Benin. The three countries for which the changes are not robust are Jamaica, Montenegro and Togo. Of these three non-robust changes, the change for Montenegro is not statistically significant even at ω^0. The changes for Jamaica and Togo, in contrast, are statistically significant but do not pass the robustness test.

We next analyse the robustness of the inclusivity premiums that are outlined in the final column of Table A4. We test whether the inclusivity premiums have the same sign as that for ω^0 and are statistically significantly different from zero at the three quantile-weight vectors: ω^1, ω^2 and ω^3. Unlike the changes in well-being, only around two-thirds of all inclusivity premiums (for 50 countries) are robust with respect to all alternative quantile-weight vectors in Ω_0', while the other 25 countries do not pass the robustness test. Of the 56 countries that register positive inclusivity premiums, 43 are robust with respect to all alternative quantile-weight vectors in Ω_0' and 13 are not robust. Similarly, of the 11 countries that register negative inclusivity premiums, seven are robust and four are not robust. Table A4 highlights in grey the countries that fail to satisfy the robustness test for inclusivity premium. Of the 25 countries that do not pass the robustness tests of inclusivity premium, eight in total are from the Arab States (1), East Asia and the Pacific (1), Europe and Central Asia (2), Latin America and Caribbean (2) and South Asia (2) regions, whereas 17 are from sub-Saharan Africa. In other words, for nearly half of the sub-Saharan African countries, we do not observe robust inclusivity premiums.

Some insights can be drawn by examining how some countries fail the robustness test. For example, Sudan and Vietnam have very different levels of well-being. Both countries register statistically significantly positive inclusivity premiums for ω^2 and ω^3, but both fail to show statistically significant inclusivity

30 The quantile weights in ω^2 are analogous to the World Bank's shared prosperity analysis, where the income growth among the bottom 40% of the population is compared to the overall income growth. See Section 2.

premiums for ω^1. Although the poorest quintiles in both countries show improvements, their improvements are not faster than the overall improvements.[31]

VII. Conclusions

In this paper, we first presented a quantile-based framework that generalizes the shared prosperity framework and measures whether the overall progress in well-being is inclusive of poorer people using multiple dichotomous indicators of well-being that are non-monetary in nature and summed into an overall deprivation or attainment score that is naturally bounded. To ensure consistent assessment of well-being changes as well as inclusiveness across attainment and deprivation scores, we examine absolute changes in well-being, where the well-being measure is a quantile-weighted sum of quantile average attainment scores. We characterized the restrictions on quantile weights based on certain key axioms and through additive decomposition showed that the overall change in well-being can be broken down into two components: change in the average attainment; and an inclusivity premium that captures the extent to which the overall change in well-being is shared by poorer people. We further proposed a methodology for checking the robustness of well-being changes and inclusivity premiums with respect to alternative sets of quantile weights.

For the empirical assessment of well-being, we drew upon the well-known counting framework that has been widely adopted for multidimensional poverty measurement. The measure of well-being we used is the complement of the global MPI. We used the complement of the deprivation score, which captures the breadth of deprivations in the multidimensional poverty measurement framework, namely the attainment score. Out of the 75 developing countries in our analysis, we observed statistically significant increase in inclusive well-being for 73 countries. Out of all the statistically significant improvements, we observed robust well-being increases for 71 countries. For one country, we observed robust well-being reduction. However, our analysis of inclusivity premium does not reflect such a rosy picture. Only three-quarters of all countries (56 out of 75) register a positive inclusivity premium. In other words, progress in average attainment has been inclusive for poorer people in only 56 countries. For the other 19 countries, the inclusivity premiums are either negative or not statistically significantly different from zero. Moreover, out of the 56 countries with statistically significantly positive inclusivity premiums, only 43 are robust to

31 It is interesting to note that a World Bank equivalent definition of inclusivity premium (i.e., at ω^2) would conclude inclusiveness, but our analyses reveal that such inclusiveness conclusion would not be robust either.

alternative quantile-weight vectors. Similarly, statistically significantly negative inclusivity premiums are robust in seven countries.

Geographical decomposition shows wide variation in inclusiveness across regions. Of the 75 countries in our analysis, 35 countries are from sub-Saharan Africa and the other 40 countries are distributed across the Arab States, East Asia and the Pacific, Europe and Central Asia, Latin America and Caribbean, and South Asian regions. Out of the 56 countries that have statistically significantly positive inclusivity premiums, only 18 are from sub-Saharan Africa and 38 are from the other five regions. Out of the 43 such robust comparisons, only 11 countries are from sub-Saharan Africa. While 80% of all countries (32 out of 40) from other five geographical regions show robust positive inclusiveness, fewer than one-third of all countries in sub-Saharan Africa show robust positive inclusiveness. All seven countries that register robust statistically significantly negative inclusivity premiums are from the sub-Saharan African region: Burkina Faso, Burundi, Madagascar, Mali, Mozambique, Niger and Tanzania.

We linked our approach to assessing the inclusiveness of well-being to that of the World Bank's monetary shared prosperity analysis as well as the global MPI. We observed a non-linear relationship with both these measures through cross-country analysis – meaning neither higher monetary shared prosperity nor faster absolute reduction in multidimensional poverty at the national level are necessarily associated with more inclusive improvement in well-being over time. We presented an illustration of two countries showing how an improvement in well-being may remain non-inclusive to poorer people in society despite successful poverty reduction. Our approach thus contributes by providing additional insights to the existing effective multidimensional poverty measurement framework.

Our empirical application in this paper analysed inclusiveness of well-being changes using five quintiles across different countries, but the framework may have wider applications and could be used to study and analyse the inclusiveness of well-being changes within different regions of a country: the data for such subnational analyses are present in the global MPI database and may be of considerable interest. Finally, we used a multidimensional counting framework as a measure of well-being as there is a strong justification that well-being and poverty are both multidimensional. However, our approach is equally applicable to any bounded indicator of well-being that may have attainment and deprivation representations.

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Appendix

Proof of Proposition 1

For some $F_1, F_2 \in \mathcal{F}$ and $\omega \in \Omega$, we know that $\Delta(F_1, F_2; \omega) = \sum_{q=1}^{Q} \omega_q \Delta_q(F_1, F_2)$. First, we prove the *sufficiency* part, showing that Δ satisfies weak monotonicity, translation homogeneity and weak priority if $\omega_q \geq 0$ for all q, $\sum_{q=1}^{Q} \omega_q = 1$ and $\omega_{q'} \geq \omega_{q''}$ for all pairs $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$. Provided $\omega_q \geq 0$, we clearly have $\Delta(F_1, F_2; \omega) \geq 0$ whenever $\Delta_q(F_1, F_2) \geq 0$ for all $q \in \mathcal{Q}$, and so Δ satisfies *weak monotonicity*. Provided $\sum_{q=1}^{Q} \omega_q = 1$, it can be seen that $\Delta(F_1, F_2; \omega) = \gamma$ whenever $\Delta_q(F_1, F_2) = \gamma$ for all $q \in \mathcal{Q}$, and so Δ satisfies *translation homogeneity*. Finally, for some $F_1, F_2, F_2' \in \mathcal{F}$ and for some $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$, suppose $\Delta_{q'}(F_1, F_2) = \Delta_{q''}(F_1, F_2') = \eta > 0$, $\Delta_q(F_1, F_2) = 0$ for all $q \neq q'$, $\Delta_q(F_1, F_2') = 0$ for all $q \neq q''$. Then for some ω, $\Delta(F_1, F_2; \omega) - \Delta(F_1, F_2'; \omega) = \omega_{q'} \Delta_{q'}(F_1, F_2) - \omega_{q''} \Delta_{q''}(F_1, F_2') = (\omega_{q'} - \omega_{q''})\eta$. Provided $\omega_q \geq \omega_{q'}$ for all $q < q'$, we certainly have $\omega_{q'} \geq \omega_{q''}$ and hence $\Delta(F_1, F_2; \omega) \geq \Delta(F_1, F_2'; \omega)$. Therefore, Δ satisfies *weak priority*.

Next, we prove the *necessity* part. First, suppose that Δ satisfies translation homogeneity, which requires $\Delta(F_1, F_2; \omega) = \gamma$ whenever $\Delta_q(F_1, F_2) = \gamma > 0$ for all $q \in \mathcal{Q}$. Thus, inserting the values in the equation $\Delta(F_1, F_2; \omega) = \sum_{q=1}^{Q} \omega_q \Delta_q(F_1, F_2)$ we obtain $\gamma = \sum_{q=1}^{Q} \omega_q \gamma$, which implies $\sum_{q=1}^{Q} \omega_q = 1$. Second, suppose that Δ satisfies weak monotonicity, which requires $\Delta(F_1, F_2; \omega) \geq 0$ whenever $\Delta_q(F_1, F_2) \geq 0$ for all $q \in \mathcal{Q}$. We need to show that $\omega_q \geq 0$ for all q. Without loss of generality, for an arbitrary q', suppose $\Delta_{q'}(F_1, F_2) > 0$ and $\Delta_q(F_1, F_2) = 0$ for all $q \neq q'$. Then, $\Delta(F_1, F_2; \omega) = \omega_{q'} \Delta_{q'}(F_1, F_2)$. Now, $\omega_{q'} < 0$ implies that $\Delta(F_1, F_2; \omega) < 0$, which contradicts the monotonicity property. Given that $\omega_{q'} \geq 0$ is necessary for an arbitrary q', it is necessary that $\omega_q \geq 0$ for all $q \in \mathcal{Q}$. Finally, for some $F_1, F_2, F_2' \in \mathcal{F}$ and for some arbitrary pair $\{q'', q''' | \, q'' < q'''\} \in \mathcal{Q}$, suppose $\Delta_{q''}(F_1, F_2) = \Delta_{q'''}(F_1, F_2') = \eta > 0$, $\Delta_q(F_1, F_2) = 0$ for all $q \neq q''$ and $\Delta_q(F_1, F_3) = 0$ for all $q \neq q'''$. Then, for some ω, $\Delta(F_1, F_2; \omega) - \Delta(F_1, F_3; \omega) = \omega_{q''} \Delta_{q''}(F_1, F_2) - \omega_{q'''} \Delta_{q'''}(F_1, F_2') = (\omega_{q''} - \omega_{q'''})\eta$. Now, $\omega_{q''} < \omega_{q'''}$ implies $\Delta(F_1, F_2; \omega) < \Delta(F_1, F_2'; \omega)$, violating the weak priority property. So, $\omega_{q''} \geq \omega_{q'''}$ is necessary for $\Delta(F_1, F_2; \omega) \geq \Delta(F_1, F_2'; \omega)$ and since this condition holds for any arbitrary pair $\{q'', q'''\}$, it holds for all pairs $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$. This completes our proof for the necessity part.

Proof of Proposition 2

From Equation (3), we obtain the inclusivity premium as $\pi(F_1, F_2; \omega) = \Delta - \overline{\Delta} = \sum_{q=1}^{Q} \omega_q \left(\Delta_q - \overline{\Delta}\right)$. For the ease of presentation in the proof, we supress the inputs of the functions. Then, using summation by parts, we may rewrite the right-hand side of the equation as:[32]

$$\pi(F_1, F_2; \omega) = \omega_Q \sum_{q=1}^{Q} \left(\Delta_q - \overline{\Delta}\right) + \sum_{q=1}^{Q-1} \left(\left[\omega_q - \omega_{q+1}\right] \left[\sum_{r=1}^{q} \left(\Delta_r - \overline{\Delta}\right) \right] \right). \quad (5)$$

By definition, $\overline{\Delta} = \left[\sum_{q=1}^{Q} \Delta_q\right]/Q$ and so $\sum_{q=1}^{Q}\left(\Delta_q - \overline{\Delta}\right) = 0$. Thus, the first term in Equation (5) equals to zero. Next, suppose $\omega_q \geq \omega_{q+1}$ for all $q \in \mathcal{Q} \setminus \{Q\}$ and $\omega_{q'-1} > \omega_{q'}$ for some $q' \in \mathcal{Q} \setminus \{Q\}$. Then, $\omega_q - \omega_{q+1} \geq 0$ for all $q \in \mathcal{Q} \setminus \{Q, q'\}$ and $\omega_{q'-1} - \omega_{q'} > 0$. Finally, whenever $\Delta_q > \Delta_{q+1}$ for all $q \in \mathcal{Q} \setminus \{Q\}$, then $\sum_{r=1}^{q}(\Delta_r - \overline{\Delta}) > 0$ for all $q \in \mathcal{Q} \setminus \{Q\}$. Hence, $\pi(F_1, F_2; \omega) > 0$.

We next prove the necessity part by showing that $\pi < 0$ whenever $\omega_q < \omega_{q+1}$ for some q and $\pi = 0$ whenever $\omega = \overline{\omega}$. For the first part, suppose $Q = 2$ and suppose further without loss of generality that $\Delta_1 > \Delta_2$ and $\overline{\Delta} = 0$. Then, $\pi = \omega_1\Delta_1 + \omega_2\Delta_2$. Given that $\overline{\Delta} = [\Delta_1 + \Delta_2]/2$, then $\Delta_1 = -\Delta_2$ or $-(\Delta_2/\Delta_1) = 1$. Now, suppose $\omega_1 < \omega_2$. Clearly, $\omega_1/\omega_2 < -(\Delta_2/\Delta_1) = 1$ or $\omega_1\Delta_1 + \omega_2\Delta_2 < 0$. Hence, $\pi < 0$. For the second part, by definition, $\overline{\Delta} = \left[\sum_{q=1}^{Q} \Delta_q\right]/Q$ and so $\pi(F_1, F_2; \overline{\omega}) = \sum_{q=1}^{Q} \overline{\omega}_q \left(\Delta_q - \overline{\Delta}\right) = \frac{1}{Q}\sum_{q=1}^{Q}\left(\Delta_q - \overline{\Delta}\right) = 0$, which completes our proof.

32 This is also known as Abel's lemma (Guenther and Lee, 1988) or Abel's formula (Fishburn and Lavalle, 1995, p.518).

Supplementary Tables

Table A1. Dimensions, indicators, relevant SDG areas and weights for the global MPI

Dimensions of poverty	Indicator	Deprived if ...	SDG area	Weight
Health	Nutrition	Any person under 70 years of age for whom there is nutritional information is undernourished.1	SDG 2	1/6
	Child mortality	A child under 18 has died in the household in the five-year period preceding the survey.2	SDG 3	1/6
Education	Years of schooling	No eligible household member has completed six years of schooling.3	SDG 4	1/6
	School attendance	Any school-aged child is not attending school up to the age at which he/she would complete class 8.4	SDG 4	1/6
Living standards	Cooking fuel	A household cooks using solid fuel, such as dung, agricultural crop, shrubs, wood, charcoal or coal.5	SDG 7	1/18
	Sanitation	The household has unimproved or no sanitation facility or it is improved but shared with other households.6	SDG 6	1/18
	Drinking water	The household's source of drinking water is not safe or safe drinking water is a 30-minute or longer walk from home, roundtrip.7	SDG 6	1/18
	Electricity	The household has no electricity.8	SDG 7	1/18
	Housing	The household has inadequate housing materials in any of the three components: floor, roof or walls.9	SDG 11	1/18
	Assets	The household does not own more than one of these assets: radio, TV, telephone, computer, animal cart, bicycle, motorbike or refrigerator, and does not own a car or truck.	SDG 1	1/18

Source: Alkire et al. (2020a).

Notes: The global MPI is related to the following SDGs: No Poverty (SDG 1), Zero Hunger (SDG 2), Good Health and Well-being (SDG 3), Quality Education (SDG 4), Clean Water and Sanitation (SDG 6), Affordable and Clean Energy (SDG 7) and Sustainable Cities and Communities (SDG 11).

[1] Children under 5 years old (60 months and younger) are considered undernourished if their z-score of either height-for-age (stunting) or weight-for-age (underweight) is below minus two standard deviations from the median of the reference population. Children 5–19 years old (61–228 months) are identified as deprived if their age-specific Body Mass Index (BMI) cutoff is below minus two standard deviations. Adults 19–70 years old (229–840 months) are considered undernourished if their BMI is below 18.5 m/kg².

[2] The child mortality indicator of the global MPI is based on birth history data provided by mothers aged 15 to 49. In most surveys, men have provided information on child mortality as well, but this lacks the date of birth and death of the child. Hence, the indicator is constructed solely from mothers. However, if the data from the mother are missing, and if the male in the household reported no child mortality, then we identify no child mortality in the household.

[3] If all individuals in the household are in an age group where they should have formally completed six or more years of schooling, but none have this achievement, then the household is deprived. However, if any individuals aged 10 years and older reported six years or more of schooling, the household is not deprived.

[4] Data sources for the age children start compulsory primary school are DHS or MICS survey reports, and the UNESCO Institute for Statistics (http://data.uis.unesco.org).

[5] If the survey report uses other definitions of solid fuel, we follow the survey report.

[6] A household is considered to have access to improved sanitation if it has some type of flush toilet or latrine, or ventilated improved pit or composting toilet, provided that they are not shared. If the survey report uses other definitions of adequate sanitation, we follow the survey report.

[7] A household has access to clean drinking water if the water source is any of the following types: piped water, public tap, borehole or pump, protected well, protected spring, or rainwater, and it is within a 30-minute walk, round trip. If the survey report uses other definitions of clean or safe drinking water, we follow the survey report.

[8] Several countries do not collect data on electricity because of 100% coverage. In such cases, we identify all households in the country as non-deprived in electricity.

[9] A household is considered deprived if its floor is made of natural materials or if the dwelling has no roof or walls, or if either the roof or walls are constructed using natural or rudimentary materials. The definition of natural and rudimentary materials follows the classification used in country-specific DHS or MICS questionnaires.

Table A2. Quintile-wise average attainment scores and national average attainment scores across countries

		Survey		Year		Overall				Poorest quintile				Second-poorest quintile				Middle quintile				Second-richest quintile				Richest quintile			
Country (ISO)	Region	1st	2nd	1st	2nd	μ_1	μ_2	$\bar{\Delta}$		μ_1^1	μ_2^1	Δ_1		μ_1^2	μ_2^2	Δ_2		μ_1^3	μ_2^3	Δ_3		μ_1^4	μ_2^4	Δ_4		μ_1^5	μ_1^5	Δ_5	
Egypt (EGY)	ARS	DHS	DHS	2008	2014	90.8	92.7	0.32	***	70.7	76.0	0.88	***	84.9	87.9	0.50	***	98.2	99.5	0.22	***	100.0	100.0	0.00		100.0	100.0	0.00	
Iraq (IRQ)	ARS	MICS	MICS	2011	2018	87.9	91.0	0.44	***	64.9	71.6	0.96	***	82.8	84.9	0.29	***	92.0	98.5	0.94	***	100.0	100.0	0.00		100.0	100.0	0.00	
State of Palestine (PSE)	ARS	MICS	MICS	2010	2014	94.3	95.3	0.26	***	80.9	84.1	0.80	***	94.4	94.4	0.00	***	96.0	97.9	0.48	***	100.0	100.0	0.00		100.0	100.0	0.00	
Sudan (SDN)	ARS	MICS	MICS	2010	2014	61.8	65.0	0.81	***	26.7	30.1	0.84	***	47.5	52.1	1.16	***	63.3	67.4	1.03	***	78.1	81.1	0.75	***	93.4	94.5	0.27	***
Yemen (YEM)	ARS	MICS	DHS	2006	2013	73.1	78.6	0.79	***	39.1	46.8	1.09	***	63.4	69.8	0.91	***	76.7	83.3	0.94	***	87.3	93.2	0.85	***	98.9	100.0	0.16	***
Cambodia (KHM)	EAP	DHS	DHS	2010	2014	68.9	73.9	1.26	***	39.3	45.8	1.61	***	59.4	65.1	1.43	***	71.0	76.4	1.36	***	80.8	85.9	1.30	***	93.8	96.3	0.62	***
China (CHN)	EAP	CFPS	CFPS	2010	2014	84.9	88.7	0.97	***	63.7	70.3	1.66	***	78.6	83.5	1.22	***	87.0	91.5	1.14	***	95.0	98.4	0.84	***	100.0	100.0	0.00	
Indonesia (IDN)	EAP	DHS	DHS	2012	2017	90.9	94.4	0.70	***	71.8	79.3	1.49	***	88.2	93.7	1.10	***	94.6	99.2	0.91	***	100.0	100.0	0.00		100.0	100.0	0.00	
Lao PDR (LAO)	EAP	MICS	MICS	2011–12	2017	71.0	80.1	1.66	***	35.2	51.1	2.89	***	60.1	73.8	2.50	***	75.5	85.6	1.83	***	89.0	94.3	0.97	***	95.2	95.8	0.11	***
Philippines (PHL)	EAP	DHS	DHS	2013	2017	88.6	90.9	0.57	***	67.3	71.9	1.16	***	86.7	88.7	0.49	***	92.6	94.4	0.46	***	96.5	99.5	0.74	***	100.0	100.0	0.00	
Thailand (THA)	EAP	MICS	MICS	2012	2015–16	94.2	95.1	0.27	***	79.0	80.6	0.45	***	93.0	95.1	0.58	***	98.9	100.0	0.31	***	100.0	100.0	0.00		100.0	100.0	0.00	
Timor-Leste (TLS)	EAP	DHS	DHS	2009–10	2016	58.2	69.1	1.69	***	29.6	43.2	2.11	***	47.1	60.7	2.09	***	58.5	70.3	1.81	***	69.9	79.6	1.49	***	85.8	91.9	0.95	***
Vietnam (VNM)	EAP	MICS	MICS	2010–11	2014	90.7	91.7	0.29	***	69.2	70.4	0.36	*	89.5	91.3	0.53	***	94.9	96.8	0.57	***	100.0	100.0	0.00		100.0	100.0	0.00	
Albania (ALB)	ECA	DHS	DHS	2008–9	2017–18	93.5	95.2	0.19	***	79.0	84.2	0.57	***	92.0	94.4	0.27	***	96.2	97.2	0.11	***	100.0	100.0	0.00		100.0	100.0	0.00	
Bosnia and Herzegovina (BIH)	ECA	MICS	MICS	2006	2011–12	93.1	94.0	0.17	***	77.7	84.7	1.29	***	93.5	94.4	0.17	***	94.4	94.4	0.00	***	99.8	96.5	-0.61	***	100.0	100.0	0.00	
Kazakhstan (KAZ)	ECA	MICS	MICS	2010–11	2015	95.0	97.1	0.47	***	82.0	87.0	1.11	***	94.2	98.6	0.97	***	98.8	100.0	0.26	***	100.0	100.0	0.00		100.0	100.0	0.00	
Kyrgyzstan (KGZ)	ECA	MICS	MICS	2005–6	2014	86.9	91.4	0.53	***	68.4	75.5	0.85	***	82.1	88.8	0.78	***	89.2	94.4	0.61	***	94.9	98.4	0.41	***	100.0	100.0	0.00	
Macedonia (MKD)	ECA	MICS	MICS	2005–6	2011	92.7	96.0	0.59	***	73.6	85.3	2.12	***	93.5	94.5	0.19	***	96.4	100.0	0.66	***	100.0	100.0	0.00		100.0	100.0	0.00	
Moldova (MDA)	ECA	DHS	MICS	2005	2012	95.1	95.5	0.06	***	82.1	84.9	0.40	***	94.4	94.4	0.00	***	98.9	98.2	-0.10	***	100.0	100.0	0.00		100.0	100.0	0.00	
Mongolia (MNG)	ECA	MICS	MICS	2010	2013	80.1	84.0	1.29	***	58.6	62.8	1.40	***	74.9	78.9	1.35	***	82.2	86.7	1.49	***	86.6	92.4	1.95	***	98.3	99.1	0.27	***
Montenegro (MNE)	ECA	MICS	MICS	2005–6	2013	95.3	95.2	-0.01		82.9	85.1	0.29	*	94.4	94.4	0.00	***	99.0	96.3	-0.36	***	100.0	100.0	0.00		100.0	100.0	0.00	
Tajikistan (TJK)	ECA	DHS	DHS	2012	2017	84.0	87.2	0.65	***	64.5	69.2	0.94	***	76.9	81.5	0.90	***	85.9	90.6	0.94	***	93.2	94.9	0.33	***	99.3	100.0	0.14	***
Turkmenistan (TKM)	ECA	MICS	MICS	2006	2015–16	91.6	95.5	0.41	***	75.6	81.7	0.63	***	87.6	95.6	0.85	***	94.6	100.0	0.57	***	100.0	100.0	0.00		100.0	100.0	0.00	
Belize (BLZ)	LAC	MICS	MICS	2011	2015–16	91.5	92.6	0.23	***	71.1	74.1	0.68	***	88.6	90.5	0.42	***	98.0	98.2	0.05		100.0	100.0	0.00		100.0	100.0	0.00	
Bolivia (BOL)	LAC	DHS	DHS	2003	2008	74.0	82.9	1.78	***	42.6	53.3	2.14	***	65.4	76.5	2.22	***	78.3	89.2	2.19	***	88.9	95.6	1.34	***	95.0	100.0	1.01	***
Colombia (COL)	LAC	DHS	DHS	2010	2015–16	93.1	94.1	0.19	***	73.3	75.6	0.42	***	92.2	95.0	0.51	***	99.9	100.0	0.02	***	100.0	100.0	0.00		100.0	100.0	0.00	
Dominican Republic (DOM)	LAC	DHS	MICS	2007	2014	89.5	94.5	0.72	***	69.5	78.5	1.30	***	87.2	94.2	1.00	***	94.3	100.0	0.81	***	96.4	100.0	0.52	***	100.0	100.0	0.00	
Guyana (GUY)	LAC	DHS	MICS	2009	2014	92.3	94.5	0.43	***	72.8	77.8	1.00	***	90.9	94.7	0.77	***	98.1	100.0	0.39	***	100.0	100.0	0.00		100.0	100.0	0.00	
Haiti (HTI)	LAC	DHS	DHS	2012	2016–17	67.9	71.3	0.77	***	38.7	41.7	0.68	***	56.8	62.1	1.17	***	70.3	74.6	0.96	***	81.5	84.8	0.73	***	92.1	93.4	0.30	***
Honduras (HND)	LAC	DHS	DHS	2005–6	2011–12	72.7	81.6	1.49	***	39.1	53.5	2.39	***	61.8	74.7	2.16	***	75.6	85.2	1.61	***	87.7	94.7	1.17	***	99.1	100.0	0.15	***
Jamaica (JAM)	LAC	JSLC	JSLC	2010	2014	91.4	91.9	0.12	**	74.2	75.8	0.39		88.2	89.2	0.26	***	94.5	94.4	-0.01	*	100.0	99.8	-0.05	***	100.0	100.0	0.00	
Mexico (MEX)	LAC	ENSANUT	ENSANUT	2012	2016	93.3	93.8	0.12	***	73.3	75.2	0.47	***	93.3	93.7	0.08	***	99.8	100.0	0.04	***	100.0	100.0	0.00		100.0	100.0	0.00	
Nicaragua (NIC)	LAC	DHS	DHS	2001	2011–12	71.3	85.3	1.33	***	33.6	57.8	2.30	***	58.9	80.0	2.01	***	76.4	91.1	1.40	***	89.0	97.4	0.80	***	98.7	100.0	0.12	***
Peru (PER)	LAC	DHS	ENDES	2012	2018	87.3	90.6	0.55	***	63.9	71.1	1.20	***	82.5	86.4	0.65	***	91.6	95.2	0.61	***	98.4	100.0	0.27	***	100.0	100.0	0.00	
Suriname (SUR)	LAC	MICS	MICS	2006	2010	91.0	93.1	0.51	***	62.8	70.5	1.93	***	92.8	94.9	0.52	***	99.5	100.0	0.11	***	100.0	100.0	0.00		100.0	100.0	0.00	
Afghanistan (AFG)	SAS	MICS	DHS	2010–11	2015–16	51.8	59.0	1.44	***	19.0	23.1	0.81	***	39.0	46.9	1.59	***	51.8	60.8	1.80	***	65.1	74.2	1.81	***	84.2	90.2	1.22	***

		Survey		Year		Overall				Poorest quintile				Second-poorest quintile				Middle quintile				Second-richest quintile				Richest quintile			
Country (ISO)	Region	1st	2nd	1st	2nd	μ_1	μ_2	$\bar{\Delta}$		μ_1^1	μ_2^1	Δ_1		μ_1^2	μ_2^2	Δ_2		μ_1^3	μ_2^3	Δ_3		μ_1^4	μ_2^4	Δ_4		μ_1^5	μ_1^5	Δ_5	
Bangladesh (BGD)	SAS	DHS	MICS	2014	2019	73.1	79.7	1.33	***	45.1	56.2	2.22	***	64.2	73.1	1.78	***	75.9	83.4	1.51	***	85.4	89.1	0.74	***	94.7	96.8	0.41	***
India (IND)	SAS	DHS	DHS	2005–6	2015–16	65.1	79.0	1.39	***	32.0	51.9	1.99	***	53.5	71.0	1.75	***	66.2	81.3	1.51	***	78.9	91.4	1.25	***	94.9	99.2	0.43	***
Nepal (NPL)	SAS	DHS	DHS	2011	2016	71.4	77.6	1.23	***	40.4	51.6	2.23	***	61.6	69.5	1.57	***	73.6	80.2	1.31	***	85.4	89.0	0.72	***	96.0	97.6	0.31	***
Pakistan (PAK)	SAS	DHS	DHS	2012–13	2017–18	70.1	73.6	0.70	***	33.5	36.6	0.62	***	57.6	61.8	0.84	***	73.4	79.1	1.13	***	87.2	90.5	0.66	***	98.7	100.0	0.25	***
Benin (BEN)	SSA	MICS	DHS	2014	2017–18	59.2	58.0	-0.34	***	26.5	25.5	-0.29	**	45.9	44.6	-0.38	***	60.0	58.7	-0.37	***	73.9	72.3	-0.46	***	89.6	88.8	-0.22	***
Burkina Faso (BFA)	SSA	MICS	DHS	2006	2010	37.1	40.4	0.81	***	6.9	9.5	0.65	***	22.3	24.8	0.62	***	35.0	37.8	0.71	***	48.8	52.1	0.84	***	72.7	77.5	1.22	***
Burundi (BDI)	SSA	DHS	DHS	2010	2016–17	49.9	54.1	0.64	***	23.5	26.0	0.38	***	38.1	42.6	0.69	***	50.5	54.4	0.60	***	59.8	65.8	0.92	***	77.7	81.6	0.59	***
Cameroon (CMR)	SSA	DHS	MICS	2011	2014	66.8	68.3	0.51	***	29.6	31.4	0.60	**	54.3	56.1	0.61	***	70.7	72.2	0.49	***	83.8	85.4	0.56	***	95.7	96.6	0.28	***
Central African Republic (CAF)	SSA	MICS	MICS	2000	2010	40.4	48.0	0.76	***	11.8	17.4	0.55	***	27.8	35.5	0.77	***	38.9	48.5	0.95	***	52.1	60.0	0.79	***	71.3	78.6	0.72	***
Chad (TCD)	SSA	MICS	DHS	2010	2014–15	38.0	40.0	0.44	***	9.5	11.6	0.47	***	24.1	27.1	0.68	***	36.0	37.8	0.38	***	49.5	51.6	0.45	***	70.7	71.7	0.22	
Congo, DR (COD)	SSA	DHS	DHS	2007	2013–14	51.8	55.8	0.62	***	24.2	28.4	0.65	***	37.5	46.6	1.39	***	51.4	55.1	0.57	***	63.8	67.4	0.55	***	81.9	81.6	-0.05	
Côte d'Ivoire (CIV)	SSA	DHS	MICS	2011–12	2016	62.4	69.3	1.53	***	30.0	35.8	1.28	***	50.3	56.4	1.36	***	63.1	71.9	1.96	***	76.2	84.8	1.92	***	92.4	97.4	1.12	***
Eswatini (SWZ)	SSA	MICS	MICS	2010	2014	77.2	82.2	1.26	***	50.9	58.3	1.84	***	69.6	75.5	1.49	***	80.0	85.8	1.45	***	88.2	93.2	1.24	***	97.2	98.4	0.29	***
Ethiopia (ETH)	SSA	DHS	DHS	2011	2016	43.3	47.9	0.92	***	16.0	20.7	0.94	***	32.9	35.0	0.41	***	40.3	47.2	1.39	***	52.9	58.5	1.12	***	74.5	78.2	0.75	***
Gabon (GAB)	SSA	DHS	DHS	2000	2012	77.5	85.2	0.64	***	46.6	59.1	1.04	***	68.4	79.7	0.94	***	80.8	91.1	0.86	***	92.6	96.1	0.29	***	99.4	100.0	0.05	***
Gambia (GMB)	SSA	MICS	DHS	2005–6	2013	55.8	64.4	1.15	***	21.3	33.4	1.61	***	41.8	52.6	1.44	***	56.8	66.0	1.23	***	71.2	78.0	0.90	***	87.6	91.9	0.57	***
Ghana (GHA)	SSA	MICS	DHS	2011	2014	75.2	77.9	0.91	***	45.3	52.3	2.33	***	67.8	71.3	1.18	***	79.4	81.2	0.61	***	87.9	88.8	0.31	***	95.7	96.1	0.11	
Guinea (GIN)	SSA	DHS	MICS	2012	2018	51.7	56.7	0.83	***	19.7	24.0	0.71	***	36.7	43.4	1.12	***	50.7	56.5	0.96	***	66.3	71.5	0.86	***	85.4	88.4	0.50	***
Kenya (KEN)	SSA	DHS	DHS	2008–9	2014	65.7	70.1	0.79	***	40.4	45.8	0.99	***	57.0	63.1	1.11	***	68.3	73.1	0.86	***	75.5	79.5	0.73	***	87.5	89.0	0.27	***
Lesotho (LSO)	SSA	DHS	DHS	2009	2014	68.7	74.7	1.20	***	42.8	49.0	1.26	***	58.9	66.1	1.44	***	69.5	75.7	1.25	***	79.8	85.9	1.22	***	92.6	96.8	0.83	***
Liberia (LBR)	SSA	DHS	DHS	2007	2013	49.7	60.1	1.73	***	22.9	31.3	1.40	***	37.2	50.8	2.27	***	50.2	60.5	1.73	***	60.3	72.6	2.05	***	78.1	85.2	1.19	***
Madagascar (MDG)	SSA	DHS	MICS	2008–9	2018	52.1	56.9	0.50	***	24.4	26.3	0.20	***	37.9	43.9	0.63	***	51.6	56.3	0.49	***	63.8	71.4	0.80	***	83.0	86.4	0.35	***
Malawi (MWI)	SSA	DHS	DHS	2010	2015–16	59.2	65.8	1.19	***	33.0	41.3	1.50	***	51.6	57.5	1.08	***	59.3	67.1	1.41	***	70.0	75.5	1.01	***	82.3	87.4	0.94	***
Mali (MLI)	SSA	DHS	MICS	2006	2015	47.0	53.7	0.74	***	19.4	23.2	0.42	***	34.2	40.1	0.65	***	44.5	51.7	0.80	***	57.4	66.8	1.05	***	79.4	86.6	0.80	***
Mauritania (MRT)	SSA	MICS	MICS	2011	2015	58.7	66.9	2.04	***	24.5	34.1	2.40	***	43.2	54.4	2.79	***	58.8	68.1	2.34	***	74.6	81.4	1.69	***	92.6	96.5	0.99	***
Mozambique (MOZ)	SSA	DHS	DHS	2003	2011	45.5	55.2	1.21	***	16.9	24.6	0.95	***	33.4	41.0	0.95	***	43.6	54.3	1.34	***	55.2	68.1	1.61	***	78.4	87.9	1.19	***
Namibia (NAM)	SSA	DHS	DHS	2006–7	2013	71.6	75.7	0.63	***	42.3	47.7	0.84	***	60.2	66.2	0.92	***	72.9	77.1	0.65	***	84.3	88.3	0.62	***	98.4	99.3	0.14	***
Niger (NER)	SSA	DHS	DHS	2006	2012	31.9	38.8	1.15	***	7.5	12.9	0.90	***	18.6	25.6	1.17	***	29.5	36.3	1.13	***	38.8	47.7	1.49	***	64.9	71.3	1.06	***
Nigeria (NGA)	SSA	DHS	DHS	2013	2018	64.1	66.7	0.53	***	25.8	28.6	0.57	***	50.8	54.9	0.81	***	67.9	71.4	0.70	***	81.8	83.8	0.40	***	94.1	94.9	0.17	***
Republic of Congo (COG)	SSA	DHS	MICS	2005	2014–15	66.1	79.0	1.36	***	38.7	51.1	1.30	***	55.3	72.4	1.80	***	68.1	82.8	1.54	***	77.1	91.4	1.50	***	91.1	97.3	0.65	***
Rwanda (RWA)	SSA	DHS	DHS	2010	2014–15	58.4	65.4	1.56	***	32.4	40.2	1.75	***	48.8	56.1	1.62	***	58.2	66.6	1.86	***	68.9	76.0	1.57	***	83.5	87.9	0.99	***
São Tomé and Príncipe (STP)	SSA	DHS	MICS	2008–9	2014	73.1	81.9	1.61	***	45.6	57.4	2.14	***	63.2	74.3	2.02	***	74.6	85.2	1.91	***	85.5	93.1	1.38	***	96.3	99.7	0.61	***
Senegal (SEN)	SSA	DHS	DHS	2005	2017	57.9	65.5	0.63	***	18.7	30.6	0.99	***	40.2	50.5	0.87	***	57.4	66.9	0.79	***	76.3	82.1	0.49	***	97.1	97.5	0.04	
Sierra Leone (SLE)	SSA	DHS	MICS	2013	2017	53.9	62.4	2.12	***	25.0	32.0	1.75	***	41.8	51.8	2.52	***	53.9	63.8	2.47	***	66.4	76.0	2.40	***	82.5	88.3	1.45	***
Tanzania (TZA)	SSA	DHS	DHS	2010	2015–16	59.3	63.5	0.77	***	32.3	35.7	0.62	***	50.8	53.4	0.48	***	58.6	64.6	1.08	***	70.1	74.7	0.85	***	84.6	89.2	0.83	***
Togo (TGO)	SSA	MICS	DHS	2010	2013–14	61.1	62.2	0.32	***	26.4	27.0	0.18		49.1	50.6	0.42	***	63.2	65.3	0.59	***	76.5	77.0	0.13	*	90.3	91.2	0.26	***
Uganda (UGA)	SSA	DHS	DHS	2011	2016	58.2	63.7	1.09	***	30.7	36.3	1.12	***	49.9	54.2	0.87	***	57.9	65.0	1.42	***	69.9	75.0	1.02	***	82.9	88.0	1.02	***
Zambia (ZMB)	SSA	DHS	DHS	2007	2013–14	59.7	65.4	0.87	***	29.5	36.6	1.10	***	47.1	54.6	1.16	***	58.7	66.4	1.18	***	72.1	77.0	0.75	***	91.2	92.2	0.15	*

Country (ISO)	Region	Survey 1st	Survey 2nd	Year 1st	Year 2nd	Overall μ_1	Overall μ_2	Overall $\bar{\Delta}$		Poorest quintile μ_1^1	μ_2^1	Δ_1		Second-poorest quintile μ_1^2	μ_2^2	Δ_2		Middle quintile μ_1^3	μ_2^3	Δ_3		Second-richest quintile μ_1^4	μ_2^4	Δ_4		Richest quintile μ_1^5	μ_2^5	Δ_5	
Zimbabwe (ZWE)	SSA	DHS	DHS	2010–11	2015	73.0	75.2	0.49	***	48.4	51.0	0.58	***	63.8	67.1	0.72	***	74.1	75.8	0.38	***	82.5	85.2	0.60	***	96.2	97.0	0.18	***

Source: Authors' computations based on the micro-datasets produced by Alkire et al. (2020a).

Notes: Statistical significance: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. $\mu_t = \mu(F_t)$ is the overall average attainment for period $t\ (= 1,2)$; $\bar{\Delta} = \mu_2 - \mu_1$ is the annual absolute change in overall average; $\mu_t^q = \mu_q(F_t)$ is the average attainment score within quintile $q\ (= 1,2,3,4,5)$ for period $t\ (= 1,2)$; and $\Delta_q = \mu_q(F_2) - \mu_q(F_1)$ is the annual absolute change in the q[th] quintile. Region abbreviations: ARS: Arab States; EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAC: Latin America and Caribbean; SAS: South Asia; SSA: sub-Saharan Africa. Survey abbreviations: DHS: Demographic Health Survey; MICS: Multiple Indicator Cluster Survey; CFPS: China Family Panel Study; JSLC: Jamaica Survey of Living Conditions; ENSANUT: Mexico National Survey of Health and Nutrition; ENDES: Peru Demographic and Family Health Survey.

Table A3. Inclusivity premiums, shared prosperity premiums and annualized changes in the MPIs and the MPI headcount ratios

Country	Region	Year 1st	Year 2nd	Well-being W_1	W_2	π		MPI MPI_1	MPI_2	ΔMPI		H H_1	H_2	ΔH (%pt)		Income growth Year1	Year2	G	G_{40}	SPP
Egypt	ARS	2008	2014	78.5	82.6	0.36	***	0.032	0.018	-0.002	***	8.0	4.9	-0.5	***	2012	2017	-1.1	-2.5	-1.4
Iraq	ARS	2011	2018	73.9	79.0	0.30	***	0.057	0.036	-0.003	***	14.4	9.3	-0.7	***					
State of Palestine	ARS	2010	2014	87.1	89.1	0.24	***	0.005	0.004	0.000		1.3	1.0	-0.1		2011	2016	-0.6	-0.9	-0.3
Sudan	ARS	2010	2014	37.7	41.6	0.16	***	0.317	0.280	-0.009	***	57.0	52.4	-1.2	**					
Yemen	ARS	2006	2013	51.4	58.5	0.22	***	0.189	0.139	-0.007	***	38.0	29.2	-1.3	***					
Cambodia	EAP	2010	2014	49.5	55.6	0.26	***	0.228	0.170	-0.014	***	47.7	37.2	-2.6	***					
China	EAP	2010	2014	71.3	77.1	0.48	***	0.041	0.018	-0.006	***	9.5	4.4	-1.3	***	2013	2016	7.1	8.4	1.3
Indonesia	EAP	2012	2017	79.8	86.3	0.60	***	0.028	0.014	-0.003	***	6.9	3.6	-0.7	***	2015	2019	3.8	4.6	0.8
Lao PDR	EAP	2011–12	2017	48.0	62.5	0.98	***	0.211	0.108	-0.019	***	40.4	23.1	-3.2	***	2012	2018	3.1	1.9	-1.2
Philippines	EAP	2013	2017	76.6	80.0	0.29	***	0.037	0.028	-0.002	***	7.1	5.6	-0.4	***	2015	2018	3.3	6.1	2.7
Thailand	EAP	2012	2015–16	85.9	87.6	0.21	***	0.005	0.003	-0.001	*	1.4	0.9	-0.2	**	2015	2019	0.1	0.7	0.6
Timor-Leste	EAP	2009–10	2016	38.6	52.1	0.38	***	0.362	0.215	-0.023	***	69.6	46.9	-3.5	***					
Vietnam	EAP	2010–11	2014	78.8	80.3	0.15	**	0.039	0.036	-0.001		9.3	8.8	-0.1		2014	2018	6.5	5.8	-0.7
Albania	ECA	2008–9	2017–18	85.3	89.1	0.23	***	0.008	0.003	-0.001	***	2.1	0.7	-0.2	***	2014	2017	0.8	2.5	1.7
Bosnia and Herzegovina	ECA	2006	2011–12	84.8	89.1	0.60	***	0.015	0.008	-0.001	***	4.0	2.2	-0.3	***					
Kazakhstan	ECA	2010–11	2015	87.9	92.3	0.50	***	0.003	0.002	0.000	**	0.9	0.5	-0.1	**	2013	2018	-0.2	-0.3	-0.1
Kyrgyzstan	ECA	2005–6	2014	75.3	82.1	0.27	***	0.036	0.013	-0.003	***	9.4	3.4	-0.7	***	2014	2019	2.7	1.8	-0.9
Macedonia	ECA	2005–6	2011	82.8	90.0	0.72	***	0.031	0.008	-0.004	***	7.8	2.0	-1.0	***	2013	2018	4.9	7.0	2.1
Moldova	ECA	2005	2012	88.1	89.6	0.15	***	0.006	0.003	0.000	**	1.5	0.9	-0.1	***	2013	2018	0.3	1.9	1.6
Mongolia	ECA	2010	2013	66.6	70.8	0.10	*	0.083	0.056	-0.009	***	20.2	13.5	-2.2	***	2011	2018	0.8	1.1	0.3
Montenegro	ECA	2005–6	2013	88.5	89.4	0.14	**	0.015	0.011	0.000		3.5	3.0	-0.1		2012	2016	3.2	6.3	3.2
Tajikistan	ECA	2012	2017	71.0	75.7	0.28	***	0.049	0.029	-0.004	***	12.2	7.4	-1.0	***					

		Year		Well-being				MPI				H				Income growth				
Country	Region	1st	2nd	W_1	W_2	π		MPI_1	MPI_2	ΔMPI		H_1	H_2	ΔH (%pt)		Year1	Year2	G	G_{40}	SPP
Turkmenistan	ECA	2006	2015–16	81.7	88.4	0.29	***	0.013	0.004	-0.001	***	3.4	1.0	-0.2	***					
Belize	LAC	2011	2015–16	79.9	82.3	0.29	***	0.030	0.020	-0.002	**	7.4	4.9	-0.5	**					
Bolivia	LAC	2003	2008	54.2	65.0	0.39	***	0.168	0.096	-0.014	***	34.3	20.8	-2.7	***	2014	2019	-0.9	3.1	4.0
Colombia	LAC	2010	2015–16	82.5	84.8	0.22	***	0.024	0.020	-0.001	***	6.0	4.8	-0.2	***	2014	2019	-0.5	0.4	0.8
Dominican Republic	LAC	2007	2014	78.1	86.1	0.42	***	0.032	0.015	-0.002	***	7.8	3.9	-0.6	***	2011	2016	4.3	5.2	0.9
Guyana	LAC	2009	2014	81.6	85.9	0.42	***	0.023	0.014	-0.002	*	5.5	3.3	-0.4	**					
Haiti	LAC	2012	2016–17	48.3	52.2	0.11	**	0.237	0.192	-0.010	***	48.4	39.9	-1.9	***					
Honduras	LAC	2005–6	2011–12	50.7	64.1	0.73	***	0.192	0.093	-0.016	***	37.9	20.0	-3.0	***	2014	2019	0.7	1.6	0.9
Jamaica	LAC	2010	2014	81.2	82.4	0.18	*	0.021	0.018	-0.001		5.3	4.7	-0.2						
Mexico	LAC	2012	2016	82.9	84.1	0.17	***	0.030	0.025	-0.001	**	7.5	6.4	-0.3	*					
Nicaragua	LAC	2001	2011–12	46.8	68.9	0.78	***	0.221	0.074	-0.014	***	41.7	16.5	-2.4	***					
Peru	LAC	2012	2018	73.2	78.9	0.41	***	0.053	0.029	-0.004	***	12.7	7.4	-0.9	***	2014	2019	1.4	2.7	1.3
Suriname	LAC	2006	2010	76.9	81.9	0.75	***	0.059	0.037	-0.006	***	12.8	8.4	-1.1	***					
Afghanistan	SAS	2010–11	2015–16	29.3	35.2	-0.27	***	0.439	0.352	-0.017	***	76.0	64.1	-2.4	***					
Bangladesh	SAS	2014	2019	54.9	64.9	0.66	***	0.175	0.101	-0.015	***	37.6	24.1	-2.7	***					
India	SAS	2005–6	2015–16	43.0	61.5	0.47	***	0.283	0.123	-0.016	***	55.1	27.9	-2.7	***					
Nepal	SAS	2011	2016	51.2	60.7	0.68	***	0.207	0.130	-0.015	***	43.3	29.9	-2.7	***					
Pakistan	SAS	2012–13	2017–18	46.0	49.7	0.05		0.233	0.198	-0.007	**	44.5	38.3	-1.2	**	2013	2018	1.5	1.1	-0.3
Benin	SSA	2014	2017–18	36.7	35.5	0.01		0.346	0.362	0.005		63.2	66.0	0.8	*					
Burkina Faso	SSA	2006	2010	15.2	17.8	-0.16	***	0.607	0.574	-0.008	*	88.7	86.3	-0.6						
Burundi	SSA	2010	2016–17	31.4	34.7	-0.13	***	0.464	0.409	-0.008	***	82.3	75.1	-1.1	***					
Cameroon	SSA	2011	2014	42.4	44.1	0.08		0.258	0.243	-0.005		47.7	45.5	-0.7						
Central African Republic	SSA	2000	2010	20.2	26.8	-0.09	***	0.574	0.482	-0.009	***	89.6	81.5	-0.8	***					
Chad	SSA	2010	2014–15	17.3	19.7	0.09	**	0.600	0.578	-0.005	**	90.0	89.4	-0.1						
Congo, DR	SSA	2007	2013–14	31.7	37.4	0.27	***	0.439	0.388	-0.008	***	77.6	73.7	-0.6	*					
Côte d'Ivoire	SSA	2011–12	2016	40.4	46.7	-0.14	**	0.310	0.236	-0.017	***	58.9	46.1	-2.8	***					
Eswatini	SSA	2010	2014	60.4	67.1	0.42	***	0.130	0.081	-0.012	***	29.3	19.2	-2.5	***					
Ethiopia	SSA	2011	2016	24.4	28.4	-0.11	***	0.545	0.489	-0.011	***	88.4	83.5	-1.0	***					
Gabon	SSA	2000	2012	57.7	69.5	0.35	***	0.145	0.069	-0.006	***	30.9	15.5	-1.3	***					
Gambia	SSA	2005–6	2013	32.1	43.4	0.36	***	0.387	0.281	-0.014	***	68.0	54.7	-1.8	***					
Ghana	SSA	2011	2014	56.6	61.9	0.85	***	0.149	0.116	-0.011	***	31.1	26.2	-1.7	***	2012	2016	1.3	-0.2	-1.5

		Year		Well-being				MPI				H				Income growth				
Country	Region	1st	2nd	W_1	W_2	π		MPI_1	MPI_2	ΔMPI		H_1	H_2	ΔH (%pt)		Year1	Year2	G	G_{40}	SPP
Guinea	SSA	2012	2018	28.8	34.0	0.04		0.433	0.373	-0.010	***	72.8	66.3	-1.1	***					
Kenya	SSA	2008–9	2014	49.0	54.6	0.23	***	0.247	0.179	-0.012	***	52.2	38.9	-2.4	***					
Lesotho	SSA	2009	2014	51.1	57.7	0.12	***	0.229	0.158	-0.014	***	49.8	35.9	-2.8	***					
Liberia	SSA	2007	2013	30.7	41.0	0.00		0.464	0.328	-0.023	***	81.6	63.9	-3.0	***					
Madagascar	SSA	2008–9	2018	31.9	35.5	-0.12	***	0.433	0.372	-0.006	***	75.7	67.4	-0.9	***					
Malawi	SSA	2010	2015–16	42.1	49.5	0.16	***	0.339	0.252	-0.016	***	68.1	54.2	-2.5	***	2010	2016	1.6	3.1	1.5
Mali	SSA	2006	2015	27.1	32.0	-0.20	***	0.501	0.417	-0.009	***	83.7	73.0	-1.2	***					
Mauritania	SSA	2011	2015	34.5	44.6	0.48	***	0.357	0.260	-0.024	***	63.0	50.5	-3.1	***					
Mozambique	SSA	2003	2011	25.4	33.3	-0.21	***	0.516	0.401	-0.014	***	84.3	71.2	-1.6	***					
Namibia	SSA	2006–7	2013	51.6	57.1	0.21	***	0.205	0.159	-0.007	***	43.0	35.4	-1.2	***					
Niger	SSA	2006	2012	13.6	19.7	-0.13	***	0.668	0.594	-0.012	***	92.9	89.9	-0.5	***					
Nigeria	SSA	2013	2018	38.8	42.1	0.13	***	0.287	0.254	-0.007	***	51.3	46.4	-1.0	***					
Republic of Congo	SSA	2005	2014–15	47.5	61.7	0.13	***	0.258	0.114	-0.015	***	53.8	24.7	-3.1	***					
Rwanda	SSA	2010	2014–15	40.7	48.4	0.16	***	0.357	0.259	-0.022	***	70.2	54.4	-3.5	***	2013	2016	-0.1	0.3	0.5
São Tomé and Príncipe	SSA	2008–9	2014	54.7	66.1	0.46	***	0.185	0.092	-0.017	***	40.7	22.1	-3.4	***					
Senegal	SSA	2005	2017	30.2	41.3	0.29	***	0.382	0.284	-0.008	***	64.3	52.5	-1.0	***					
Sierra Leone	SSA	2013	2017	33.8	42.2	-0.03		0.409	0.300	-0.027	***	74.1	58.3	-3.9	***	2011	2018	2.9	2.7	-0.2
Tanzania	SSA	2010	2015–16	41.4	44.8	-0.15	***	0.342	0.285	-0.011	***	67.8	57.1	-1.9	***	2011	2018	0.9	-0.2	-1.1
Togo	SSA	2010	2013–14	38.0	39.1	-0.01		0.316	0.301	-0.004		57.5	55.3	-0.6						
Uganda	SSA	2011	2016	40.1	45.5	-0.02		0.349	0.281	-0.014	***	67.7	57.2	-2.1	***	2012	2016	-1.0	-2.2	-1.2
Zambia	SSA	2007	2013–14	38.6	45.9	0.26	***	0.349	0.270	-0.012	***	65.9	54.6	-1.7	***					
Zimbabwe	SSA	2010–11	2015	56.4	59.1	0.12	***	0.176	0.147	-0.006	***	40.1	34.0	-1.4	***	2011	2017	-3.5	-3.7	-0.3

Source: Authors' own computations for W_1, W_2 and S. MPI and H were obtained from Table 6 available at https://ophi.org.uk/global-mpi/2020 and the shared prosperity figures were obtained from World Bank (n.d.).

Notes: W_1 and W_2: Well-being levels in periods 1 and 2; MPI_1 and MPI_2: MPI values for periods 1 and 2; H_1 and H_2: MPI headcount ratios for periods 1 and 2; S: Inclusivity premium; ΔMPI: Annualized absolute change in MPI; ΔH: Annualized absolute change in H in percentage points; G: Annualized growth in the average income; G_{40}: Annualized growth in the average income of the bottom 40%; SPP: Shared prosperity premium (G_{40} - G).

Table A4. Robustness of changes in well-being and of inclusivity premium for 75 countries

				Well-being (ω^1)				Well-being (ω^2)				Well-being (ω^3)				Robust	
Country	Region	Year1	Year2	W_1	W_2	Δ	π	W_1	W_2	Δ	π	W_1	W_2	Δ	π	Δ	π
Egypt	ARS	2008	2014	70.7	76.0	0.88***	0.56***	77.8	82.0	0.69***	0.37***	84.6	87.8	0.53***	0.21***	Yes	Yes
Iraq	ARS	2011	2018	64.9	71.6	0.96***	0.52***	73.8	78.2	0.63***	0.19***	79.9	85.0	0.73***	0.29***	Yes	Yes
State of Palestine	ARS	2010	2014	80.9	84.1	0.80***	0.54***	87.7	89.3	0.40***	0.14***	90.4	92.1	0.43***	0.17***	Yes	Yes
Sudan	ARS	2010	2014	26.7	30.1	0.84***	0.03	37.1	41.1	1.00***	0.19***	45.8	49.9	1.01***	0.20***	Yes	No
Yemen	ARS	2006	2013	39.1	46.8	1.09***	0.30***	51.3	58.3	1.00***	0.21***	59.7	66.6	0.98***	0.19***	Yes	Yes
Cambodia	EAP	2010	2014	39.3	45.8	1.61***	0.35***	49.4	55.5	1.52***	0.26***	56.6	62.4	1.46***	0.20***	Yes	Yes
China	EAP	2010	2014	63.7	70.3	1.66***	0.69***	71.2	76.9	1.44***	0.47***	76.4	81.8	1.34***	0.37***	Yes	Yes
Indonesia	EAP	2012	2017	71.8	79.3	1.49***	0.79***	80.0	86.5	1.30***	0.60***	84.9	90.7	1.17***	0.47***	Yes	Yes
Lao PDR	EAP	2011–12	2017	35.2	51.1	2.89***	1.23***	47.7	62.5	2.69***	1.03***	56.9	70.2	2.41***	0.75***	Yes	Yes
Philippines	EAP	2013	2017	67.3	71.9	1.16***	0.59***	77.0	80.3	0.83***	0.26***	82.2	85.0	0.71***	0.13***	Yes	Yes
Thailand	EAP	2012	2015–16	79.0	80.6	0.45***	0.18***	86.0	87.8	0.51***	0.25***	90.3	91.9	0.45***	0.18***	Yes	Yes
Timor-Leste	EAP	2009–10	2016	29.6	43.2	2.11***	0.42***	38.3	52.0	2.10***	0.41***	45.0	58.1	2.00***	0.31***	Yes	Yes
Vietnam	EAP	2010–11	2014	69.2	70.4	0.36*	0.07	79.3	80.9	0.44***	0.15**	84.5	86.2	0.49***	0.19***	Yes	No
Albania	ECA	2008–9	2017–18	79.0	84.2	0.57***	0.38***	85.5	89.3	0.42***	0.23***	89.1	91.9	0.32***	0.13***	Yes	Yes
Bosnia and Herzegovina	ECA	2006	2011–12	77.7	84.7	1.29***	1.12***	85.6	89.6	0.73***	0.56***	88.5	91.2	0.48***	0.32***	Yes	Yes
Kazakhstan	ECA	2010–11	2015	82.0	87.0	1.11***	0.64***	88.1	92.8	1.04***	0.57***	91.7	95.2	0.78***	0.31***	Yes	Yes
Kyrgyzstan	ECA	2005–6	2014	68.4	75.5	0.85***	0.31***	75.2	82.2	0.81***	0.28***	79.9	86.3	0.75***	0.22***	Yes	Yes
Macedonia	ECA	2005–6	2011	73.6	85.3	2.12***	1.53***	83.5	89.9	1.16***	0.56***	87.8	93.3	0.99***	0.40***	Yes	Yes
Moldova	ECA	2005	2012	82.1	84.9	0.40***	0.34***	88.3	89.7	0.20***	0.14***	91.8	92.5	0.10***	0.04***	Yes	Yes
Mongolia	ECA	2010	2013	58.6	62.8	1.40***	0.11	66.7	70.9	1.38***	0.08	71.9	76.1	1.41***	0.12***	Yes	No
Montenegro	ECA	2005–6	2013	82.9	85.1	0.29*	0.31**	88.7	89.8	0.15*	0.16***	92.1	91.9	-0.02	-0.01	No	No
Tajikistan	ECA	2012	2017	64.5	69.2	0.94***	0.29***	70.7	75.3	0.92***	0.27***	75.8	80.4	0.93***	0.28***	Yes	Yes
Turkmenistan	ECA	2006	2015–16	75.6	81.7	0.63***	0.22***	81.6	88.7	0.74***	0.33***	85.9	92.4	0.68***	0.27***	Yes	Yes
Belize	LAC	2011	2015–16	71.1	74.1	0.68***	0.45**	79.8	82.3	0.55***	0.32***	85.9	87.6	0.38***	0.15***	Yes	Yes
Bolivia	LAC	2003	2008	42.6	53.3	2.14***	0.36***	54.0	64.9	2.18***	0.40***	62.1	73.0	2.18***	0.40***	Yes	Yes
Colombia	LAC	2010	2015–16	73.3	75.6	0.42***	0.23***	82.7	85.3	0.47***	0.27***	88.4	90.2	0.32***	0.13***	Yes	Yes
Dominican Republic	LAC	2007	2014	69.5	78.5	1.30***	0.57***	78.3	86.4	1.15***	0.42***	83.7	90.9	1.04***	0.31***	Yes	Yes
Guyana	LAC	2009	2014	72.8	77.8	1.00***	0.57***	81.8	86.2	0.88***	0.45***	87.2	90.8	0.72***	0.29***	Yes	Yes
Haiti	LAC	2012	2016–17	38.7	41.7	0.68***	-0.09	47.8	51.9	0.92***	0.16***	55.3	59.5	0.94***	0.17***	Yes	No
Honduras	LAC	2005–6	2011–12	39.1	53.5	2.39***	0.89***	50.5	64.1	2.27***	0.78***	58.8	71.1	2.05***	0.55***	Yes	Yes
Jamaica	LAC	2010	2014	74.2	75.8	0.39	0.27	81.2	82.5	0.32**	0.21**	85.7	86.5	0.21**	0.09**	No	No
Mexico	LAC	2012	2016	73.3	75.2	0.47***	0.35***	83.3	84.4	0.28***	0.16***	88.8	89.6	0.20***	0.08***	Yes	Yes
Nicaragua	LAC	2001	2011–12	33.6	57.8	2.30***	0.98***	46.2	68.9	2.16***	0.83***	56.3	76.3	1.91***	0.58***	Yes	Yes
Peru	LAC	2012	2018	63.9	71.1	1.20***	0.66***	73.2	78.8	0.93***	0.38***	79.3	84.3	0.82***	0.27***	Yes	Yes
Suriname	LAC	2006	2010	62.8	70.5	1.93***	1.41***	77.8	82.7	1.23***	0.71***	85.0	88.5	0.86***	0.34***	Yes	Yes
Afghanistan	SAS	2010–11	2015–16	19.0	23.1	0.81***	-0.64***	29.0	35.0	1.20***	-0.24***	36.6	43.6	1.40***	-0.05	Yes	No
Bangladesh	SAS	2014	2019	45.1	56.2	2.22***	0.89***	54.6	64.6	2.00***	0.67***	61.7	70.9	1.84***	0.50***	Yes	Yes
India	SAS	2005–6	2015–16	32.0	51.9	1.99***	0.60***	42.8	61.4	1.87***	0.48***	50.6	68.1	1.75***	0.36***	Yes	Yes
Nepal	SAS	2011	2016	40.4	51.6	2.23***	1.00***	51.0	60.5	1.90***	0.67***	58.6	67.1	1.70***	0.47***	Yes	Yes
Pakistan	SAS	2012–13	2017–18	33.5	36.6	0.62***	-0.08	45.6	49.2	0.73***	0.03	54.9	59.2	0.86***	0.16***	Yes	No

Country	Region	Year1	Year2	Well-being (ω^1)				Well-being (ω^2)				Well-being (ω^3)				Robust	
				W_1	W_2	Δ	π	W_1	W_2	Δ	π	W_1	W_2	Δ	π	Δ	π
Benin	SSA	2014	2017–18	26.5	25.5	-0.29 **	0.05	36.2	35.0	-0.33 ***	0.01	44.1	42.9	-0.35 ***	0.00	Yes	No
Burkina Faso	SSA	2006	2010	6.9	9.5	0.65 ***	-0.16 **	14.6	17.2	0.64 ***	-0.17 ***	21.4	24.0	0.66 ***	-0.15 ***	Yes	Yes
Burundi	SSA	2010	2016–17	23.5	26.0	0.38 ***	-0.25 ***	30.8	34.3	0.54 ***	-0.10 ***	37.4	41.0	0.56 ***	-0.08 ***	Yes	Yes
Cameroon	SSA	2011	2014	29.6	31.4	0.60 **	0.09	41.9	43.7	0.60 ***	0.10	51.5	53.2	0.56 ***	0.06	Yes	No
Central African Republic	SSA	2000	2010	11.8	17.4	0.55 ***	-0.21 ***	19.8	26.4	0.66 ***	-0.10 ***	26.2	33.8	0.76 ***	0.00	Yes	No
Chad	SSA	2010	2014–15	9.5	11.6	0.47 ***	0.03	16.8	19.4	0.57 ***	0.13 ***	23.2	25.5	0.51 ***	0.07 **	Yes	No
Congo, DR	SSA	2007	2013–14	24.2	28.4	0.65 ***	0.03	30.9	37.5	1.02 ***	0.40 ***	37.7	43.4	0.87 ***	0.25 ***	Yes	No
Côte d'Ivoire	SSA	2011–12	2016	30.0	35.8	1.28 ***	-0.25 **	40.1	46.1	1.32 ***	-0.21 ***	47.8	54.7	1.54 ***	0.01	Yes	No
Eswatini	SSA	2010	2014	50.9	58.3	1.84 ***	0.58 ***	60.2	66.9	1.66 ***	0.40 ***	66.8	73.2	1.59 ***	0.33 ***	Yes	Yes
Ethiopia	SSA	2011	2016	16.0	20.7	0.94 ***	0.02	24.5	27.8	0.67 ***	-0.25 ***	29.8	34.3	0.91 ***	-0.01	Yes	No
Gabon	SSA	2000	2012	46.6	59.1	1.04 ***	0.41 ***	57.5	69.4	0.99 ***	0.36 ***	65.3	76.6	0.95 ***	0.31 ***	Yes	Yes
Gambia	SSA	2005–6	2013	21.3	33.4	1.61 ***	0.46 ***	31.6	43.0	1.53 ***	0.37 ***	40.0	50.7	1.43 ***	0.28 ***	Yes	Yes
Ghana	SSA	2011	2014	45.3	52.3	2.33 ***	1.43 ***	56.6	61.8	1.75 ***	0.85 ***	64.2	68.3	1.37 ***	0.47 ***	Yes	Yes
Guinea	SSA	2012	2018	19.7	24.0	0.71 ***	-0.12	28.2	33.7	0.91 ***	0.08 **	35.7	41.3	0.93 ***	0.10 ***	Yes	No
Kenya	SSA	2008–9	2014	40.4	45.8	0.99 ***	0.20	48.7	54.5	1.05 ***	0.26 ***	55.2	60.7	0.99 ***	0.20 ***	Yes	No
Lesotho	SSA	2009	2014	42.8	49.0	1.26 ***	0.06	50.8	57.6	1.35 ***	0.15 ***	57.0	63.6	1.32 ***	0.12 ***	Yes	No
Liberia	SSA	2007	2013	22.9	31.3	1.40 ***	-0.33 ***	30.1	41.1	1.83 ***	0.11 **	36.8	47.5	1.80 ***	0.07 **	Yes	No
Madagascar	SSA	2008–9	2018	24.4	26.3	0.20 ***	-0.29 ***	31.1	35.1	0.42 ***	-0.08 ***	38.0	42.2	0.44 ***	-0.05 ***	Yes	Yes
Malawi	SSA	2010	2015–16	33.0	41.3	1.50 ***	0.32 ***	42.3	49.4	1.29 ***	0.10 ***	48.0	55.3	1.33 ***	0.14 ***	Yes	Yes
Mali	SSA	2006	2015	19.4	23.2	0.42 ***	-0.32 ***	26.8	31.6	0.54 ***	-0.21 ***	32.7	38.3	0.62 ***	-0.12 ***	Yes	Yes
Mauritania	SSA	2011	2015	24.5	34.1	2.40 ***	0.36 ***	33.8	44.2	2.60 ***	0.55 ***	42.2	52.2	2.51 ***	0.47 ***	Yes	Yes
Mozambique	SSA	2003	2011	16.9	24.6	0.95 ***	-0.25 ***	25.2	32.8	0.95 ***	-0.26 ***	31.3	39.9	1.08 ***	-0.13 ***	Yes	Yes
Namibia	SSA	2006–7	2013	42.3	47.7	0.84 ***	0.20 **	51.2	57.0	0.88 ***	0.25 ***	58.4	63.7	0.80 ***	0.17 ***	Yes	Yes
Niger	SSA	2006	2012	7.5	12.9	0.90 ***	-0.25 ***	13.0	19.2	1.04 ***	-0.11 ***	18.5	24.9	1.07 ***	-0.08 ***	Yes	Yes
Nigeria	SSA	2013	2018	25.8	28.6	0.57 ***	0.04	38.3	41.7	0.69 ***	0.16 ***	48.2	51.6	0.69 ***	0.16 ***	Yes	No
Republic of Congo	SSA	2005	2014–15	38.7	51.1	1.30 ***	-0.06	47.0	61.7	1.55 ***	0.19 ***	54.1	68.7	1.55 ***	0.19 ***	Yes	No
Rwanda	SSA	2010	2014–15	32.4	40.2	1.75 ***	0.19 ***	40.6	48.2	1.68 ***	0.13 ***	46.5	54.3	1.74 ***	0.19 ***	Yes	Yes
São Tomé and Príncipe	SSA	2008–9	2014	45.6	57.4	2.14 ***	0.53 ***	54.4	65.8	2.08 ***	0.47 ***	61.1	72.3	2.02 ***	0.41 ***	Yes	Yes
Senegal	SSA	2005	2017	18.7	30.6	0.99 ***	0.35 ***	29.4	40.5	0.93 ***	0.29 ***	38.8	49.3	0.88 ***	0.25 ***	Yes	Yes
Sierra Leone	SSA	2013	2017	25.0	32.0	1.75 ***	-0.36 ***	33.4	41.9	2.13 ***	0.02	40.2	49.2	2.25 ***	0.13 ***	Yes	No
Tanzania	SSA	2010	2015–16	32.3	35.7	0.62 ***	-0.15 **	41.6	44.6	0.55 ***	-0.22 ***	47.2	51.2	0.73 ***	-0.05 **	Yes	Yes
Togo	SSA	2010	2013–14	26.4	27.0	0.18	-0.14	37.7	38.8	0.30 ***	-0.02	46.2	47.6	0.40 ***	0.08 **	No	No
Uganda	SSA	2011	2016	30.7	36.3	1.12 ***	0.03	40.3	45.3	1.00 ***	-0.09 **	46.2	51.8	1.14 ***	0.05	Yes	No
Zambia	SSA	2007	2013–14	29.5	36.6	1.10 ***	0.23 ***	38.3	45.6	1.13 ***	0.26 ***	45.1	52.5	1.15 ***	0.28 ***	Yes	Yes
Zimbabwe	SSA	2010–11	2015	48.4	51.0	0.58 ***	0.09	56.1	59.1	0.65 ***	0.16 ***	62.1	64.6	0.56 ***	0.07 ***	Yes	No

Source: Authors' computations based on the micro-datasets produced by Alkire et al. (2020a).

Notes: Statistical significance: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. Δ is the absolute change. Weights are ω^1 = (1, 0, 0, 0, 0), ω^2 = (1/2, 1/2, 0, 0, 0) and ω^3 = (1/3, 1/3, 1/3, 0, 0). W_1: Well-being in year 1. W_2: Well-being in period 2. Δ: Annual change in well-being between two periods. S: inclusivity premium. Grey rows indicate countries whose inclusivity premium is not robust across the three weighting structures. Regions: ARS: Arab States; EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAC: Latin America and Caribbean; SAS: South Asia; SSA: sub-Saharan Africa.