Inclusive absolute well-being changes: An application with multidimensional cross-country analysis*

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Abstract

The world has continued to witness prosperity in terms of poverty reduction and well-being improvement, but one cannot overstate the importance of examining whether the improvement is evenly shared or is being inclusive to all. In this paper, we propose a general quantile-based approach based on absolute changes that allow assessing and robustly examining inclusiveness of well-being for non-monetary indicators that are bounded in nature and can have both attainment and shortfall representations. Our empirical analysis of inclusiveness uses a multidimensional measure of well-being that is closely linked to the flagship global multidimensional poverty index and examine inclusiveness of well-being changes for 80 developing countries covering six different geographic regions. We observe robust improvements in well-being for most countries in our study, but only around three-fifth of all countries show robust inclusiveness. Further geographical analyses show that the same figure is less than one-third for the sub-Saharan African region. Our proposed framework could play an important role in jointly meeting the SDG targets of reducing inequality within countries and reducing poverty in multiple dimensions.

Keywords: Inclusive well-being, shared prosperity, consistency, bounded indicator, counting approach, robustness

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1. Introduction

Our world has witnessed significant reductions in monetary and multidimensional poverty as well as improvements in various indicators of well-being. However, to fulfil the United Nations' pledge of *not leaving anyone behind*, it is imperative to ensure that the global improvement in well-being is inclusively and evenly shared by all. Various targets have been set in the Sustainable Development Goals (SDG) agenda for this purpose. SDG target 10.1 on 'reduce inequality within and among countries', for example, requires progressively achieving and sustaining 'income growth of the bottom 40 per cent of the population at a rate higher than the national average.' This target is analogous to how the World Bank tracks shared prosperity by comparing the growth rates of the average incomes of the poorest 40% of the population within developing countries to the respective growth rates of the overall average income (World Bank, 2018). The overall prosperity assessed by the growth in average income is considered inclusive within a country whenever the income growth rate of the poorest 40% is no slower than the country's overall growth rate. The quantile-based approach to gauging shared prosperity is a pragmatic application of the Rawlsian maximin principle (Basu 2000, 2013; Ferreira et al. 2018).[1]

Poverty and well-being are however multifaceted and have many dimensions. SDG target 1.2, for instance, requires reducing 'poverty in all its dimensions according to national definitions' in addition to reducing extreme (monetary) poverty (i.e., target 1.1). Most non-monetary dimensions of poverty and well-being are characteristically different from their monetary counterparts. For instance, most social indicators – unidimensional and multidimensional alike – cannot register unbounded increase akin to their monetary counterparts.[2] Many social indicators for capturing well-being and deprivation are also either represented in terms of *attainments* (e.g., literacy and life expectancy) or in terms of *shortfalls* (i.e., the lack thereof).[3] In the multidimensional counting framework, namely, it is common to either count the deprivations (Atkinson, 2003; Alkire and Foster, 2011) or equivalently count the attainments (Seth and Alkire, 2017; Alkire and Foster, 2019). In such situations, traditional measurement approaches – commonplace for monetary indicators may become ineffective or even provide misleading conclusions.

In this paper, we make a theoretical as well as an empirical contribution to the literature. We contribute theoretically by presenting a quantile-based framework for capturing inclusiveness of well-being changes, built on absolute changes rather than on relative changes to ensure *consistency* – requiring that the comparison of well-being changes remain unaltered whether they are assessed in terms of attainments or in terms of shortfalls. Our motivation for focusing on absolute changes is analogous to the proposal for using absolute inequality partial ordering for consistent inequality comparisons (Lambert and Zheng, 2011). Given the consistency requirement, we present our theoretical framework in terms of attainments or from the perspective of changes in well-being, but our framework is equivalently applicable for studying and analysing well-being changes using

[1] For further discussions on the World Bank's twin goals on ending extreme (monetary) poverty and promoting sharing prosperity, see World Bank (2013) and Cruz et al. (2015).

[2] Such concerns have also been raised for specific indicators of health and human development by Wagstaff (2005) and Prados de la Escosura (2021), respectively.

[3] Concerns and proposals for consistent inequality assessment for attainment and shortfalls have been raised by Erreygers (2009), Lambert and Zheng (2011), Lasso de la Vega and Aristondo (2012), Bosmans (2016) and Permanyer et al. (2022).

shortfalls. Our proposed quantile-based framework facilitates studying anonymous changes in well-being using readily available repeated cross-sectional datasets.

We propose that the overall well-being be assessed as a quantile-weighted sum of average attainments across quantiles and consequently the overall well-being change be presented as a quantile-weighted sum of changes in quantile averages. We characterise the restrictions on quantile-weights by certain properties and show that lower quantiles should not receive lower quantile-weights during aggregation. To capture the extent of inclusiveness of well-being changes, we additively decompose the overall change in well-being into two components: (*i*) a change in the overall average and (*ii*) a component capturing the extent of inclusiveness referred to as the *inclusivity premium*. A positive value of the inclusivity premium ensures that the overall improvement in well-being has been strictly inclusive. We further note that most non-monetary indicators of well-being are bounded and once the overall well-being is closer the upper bound, the extent of further progress is naturally inhibited, which may obscure both cross-country and inter-temporal comparisons of progress. To nullify the effect of strict upper bounds, we also present a bound-adjusted measure of well-being change, which is the overall change in well-being of a country between two periods divided by the maximum feasible change in well-being for that country in the same period.[4]

We apply our proposed theoretical framework to analyse inclusiveness of well-being changes in 80 developing countries using a multidimensional measure of well-being within the counting framework. The well-being measure is closely linked to the global multidimensional poverty index (MPI) and uses the same set of dimensions, indicators and weights. The attainment for each person is the complement of the deprivation count of the person. To study inclusiveness, we divide the entire distribution of attainments within each country and for each period into five quintiles. We use a set of rank-dependent quantile-weights for the well-being measure, where we assign strictly larger weights to poorer quintiles so as to reward improvements among poorer quintiles more. Although, 77 of 80 countries register statistically significant increases in well-being, only 60 countries register statistically significantly positive inclusivity premiums; thus, lower quintiles in these countries register faster improvements than the average improvements. On the other hand, a quarter (20) of all countries in our study either register statistically significantly negative inclusivity premium – meaning lower quintiles in these countries register slower improvements than the average, or inclusivity premiums are not statistically significantly different from zero. Regional analyses show that most of these 20 countries reflecting uneven progress in well-being belong to the sub-Saharan African region. The two countries with largest inclusivity premiums are Ghana and Lao PDR. We furthermore explore the non-linear relationship between our inclusivity premium and the shared prosperity premium (World Bank, 2018) as well as the well-known multidimensional poverty index. Our findings demonstrate that our proposed framework can provide distinct novel insights over and above these existing measures.

As it is customary to other applications, we use a particular quantile-weight vector to study inclusiveness, but other alternatives are also admissible. We therefore introduce a methodology for checking robustness of well-being changes as well as inclusivity premiums, drawing from Seth and McGillivray (2018). The robustness analyses show that the changes in well-being are robust for 76

[4] Such a measure is in the same spirit as the normalised inequality indices proposed by Permanyer et al. (2022).

countries, but the inclusivity premiums for only 54 countries are robust with respect to admissible alternative quantile-weight vectors and the rest of the 26 countries do not pass the robustness test. Again, of these 26 countries, 17 are from the sub-Saharan African region.

The rest of the paper is organised as follows. Section 2 presents the theoretical framework for assessing absolute change in well-being, its decomposition into two components and the methodology for checking robustness. Section 3 presents the empirical well-being measure that we use for assessing inclusiveness, outline the data for our analysis and presents the overall average attainments and quantile wise averages across countries. Section 4 analyses inclusiveness of well-being changes across countries and examines the robustness of well-being changes and inclusivity premiums. Section 5 compares our inclusivity premiums to the shared prosperity premium reported by the World Bank and the global multidimensional poverty index reported by the Oxford Poverty and Human Development Initiative (OPHI) and the United National Development Programme (UNDP). Section 6 provides concluding remarks.

2. Theoretical framework

Suppose a social planner aims to assess well-being in a hypothetical society using an indicator, whose values – referred to as *attainments* – are bounded between a lower bound of zero and a strictly positive upper bound of U. The attainments of the society's population in two periods are summarised by the cumulative distribution functions (CDFs) F_1 and F_2. We summarise all possible distributions of attainments in period 1 by $\mathcal{F}_1$ and that in period 2 by $\mathcal{F}_2$. 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 $\mathcal{Q} = \{1, \dots, Q\}$. By construction, all quantiles for a given distribution are mutually exclusive and collectively exhaustive, and the population share within every quantile is equal to $1/Q$. Let us denote the average attainment within the q^{th} quantile by $\mu_q(F_i)$ for all $q \in \mathcal{Q}$ and for each time period $i = 1, 2$, and the overall average attainment within F_i by $\mu(F_i)$, such that $\mu(F_i) = \frac{1}{Q}\sum_{q=1}^{Q} \mu_q(F_i)$ for $i = 1, 2$.

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

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

where $\omega = (\omega_1, \dots, \omega_Q)$ is the Q-dimensional quantile-weight vector and $\omega_q \in \mathbb{R}$ is the quantile-weight assigned to the q^{th} quantile average.[5] 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

[5] The set of real numbers is denoted by $\mathbb{R}$.

$\bar{\omega} \in \Omega$ is 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 is equal to overall average attainment within F_i.[6]

We now introduce some notation on changes between two periods. We denote the change in the q^{th} quintile average between $F_1 \in \mathcal{F}_1$ and $F_2 \in \mathcal{F}_2$ 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 $\Delta : \mathcal{F}_1 \times \mathcal{F}_2 \times \Omega \mapsto \mathbb{R}$ – a mapping from the set of CDFs $\mathcal{F}_1$ and $\mathcal{F}_2$ and the set of quantile-weight vectors Ω to the real line $\mathbb{R}$, as:

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

Based on the fixed number of quantiles, thus, 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, i.e., $\Delta(F_1, F_2; \bar{\omega}) = \bar{\Delta}(F_1, F_2)$.

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 change in well-being is non-decreasing in all quantile-wise changes. This property ensures that Δ respects the directional changes in all quintile averages.

Weak Monotonicity For any $F_1 \in \mathcal{F}_1$, $F_2 \in \mathcal{F}_2$ and $\omega \in \Omega$, $\Delta(F_1, F_2; \omega) \geq 0$ whenever $\Delta_q(F_1, F_2) \geq 0$ for all $q \in \mathcal{Q}$.

We refer to the second property as *translation homogeneity*. The property conveniently 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 $F_1 \in \mathcal{F}_1$, $F_2 \in \mathcal{F}_2$ and $\omega \in \Omega$, $\Delta(F_1, F_2; \omega) = \gamma$ whenever $\Delta_q(F_1, F_2) = \gamma$ for all $q \in \mathcal{Q}$.

We refer to the third property as *weak priority*, which requires that, all else unchanged, an improvement in the average within a poorer quantile should not lead to a lower well-being improvement than an equal amount of improvement in a less poor quantile. This property is crucial for incorporating (weak) inclusiveness of well-being changes and is important from both an

[6] This type of additive measure to study absolute changes in social welfare has been used by Bossert and Dutta (2019) and that in the social mobility has been used by Palmasino and Van de Gaer (2016) and Seth and Yalonetzky (2021a).

egalitarian (Sen 1976) perspective and from a prioritarian perspective (Parfit 1997). The property suggests providing no less priority to the improvements among those in the poorer quantiles.[7]

Weak Priority For any $F_1 \in \mathcal{F}_1$, $F_2, F_2' \in \mathcal{F}_2$, $\omega \in \Omega$ and for some pair $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$, $\Delta(F_1, F_2; \omega) \geq \Delta(F_1, F_2'; \omega)$ 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 characterises the restrictions on quantile-weights that our change in well-being measure should respect.

Proposition 1 A change in well-being measure $\Delta: \mathcal{F}_1 \times \mathcal{F}_2 \times \Omega \mapsto \mathbb{R}$ 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 $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$.

Proof. See the Appendix.

Proposition 1 shows 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.[8]

Assessing inclusiveness of well-being changes

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

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

where $S(F_1, F_2; \omega) = \Delta(F_1, F_2; \omega) - \overline{\Delta}(F_1, F_2) = \sum_{q=1}^{Q} \omega_q \left[\Delta_q(F_1, F_2) - \overline{\Delta}(F_1, F_2)\right]$. The first term on the right-hand side of Equation (3) is the change in the overall average attainments between two periods and the second term, $S(F_1, F_2; \omega)$, is the quantile-weighted sum of the differences $S_q(F_1, F_2) = \Delta_q(F_1, F_2) - \overline{\Delta}(F_1, F_2)$ for all $q \in \mathcal{Q}$. Each difference $S_q(F_1, F_2)$ captures the change in the average within the q^{th} quantile compared to the change in the overall average attainment. We refer to $S(F_1, F_2; \omega)$ 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 practically more interested in situation where the inclusivity premium is positive (strictly).

We consider a well-being change to be *strictly* inclusive whenever every poorer quantile registers strictly higher improvement than every less poor quantile, i.e., $\Delta_q(F_1, F_2) > \Delta_{q+1}(F_1, F_2)$ for all

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

[8] 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 attainments, but many indicators in practice may have shortfall representations. Our approach is consistent and is immune to attainment and shortfall representations.

$q \in \mathcal{Q} \setminus \{Q\}$. Accordingly, in such a situation, the inclusivity premium should be *positive*, i.e., $S(F_1, F_2; \omega) > 0$. Proposition 2 presents the restrictions on quantile-weights that enable the inclusivity premium to be positive, while denoting the set of quantile-weight vectors characterised in Proposition 1 by $\Omega_0 \subset \Omega$, as follows.

Proposition 2 For any $F_1 \in \mathcal{F}_1$ and $F_2 \in \mathcal{F}_2$ 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 $\omega \in \Omega_0$, $S(F_1, F_2; \omega) > 0$ 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 the 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 element Q) and $\omega_q > \omega_{q+1}$ for at least one $q \in \mathcal{Q} \setminus \{Q\}$ – 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 characterised 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.[9]

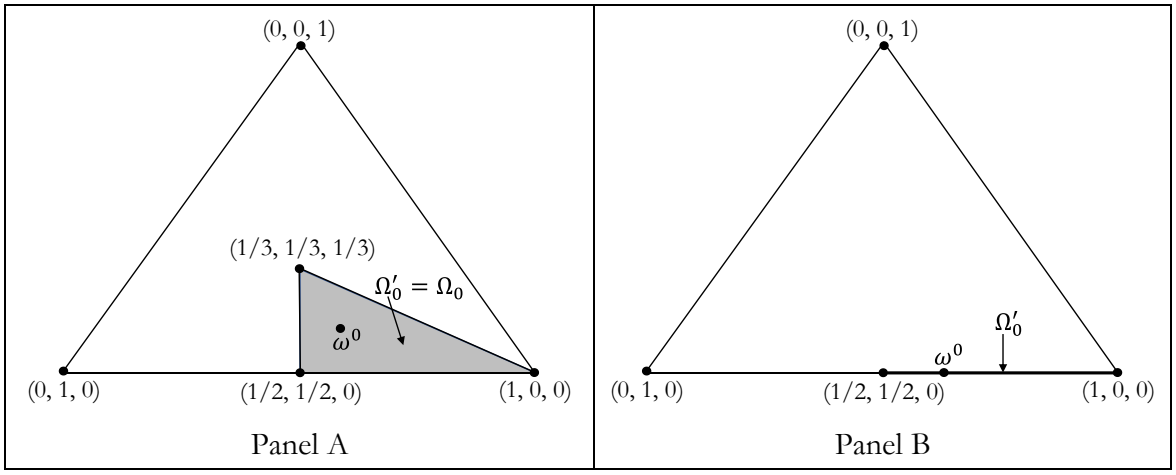
Robustness of inclusive well-being changes and inclusivity premiums

Typically, one would choose a particular quantile-weight vector $\omega^0 \in \Omega_0$ for assessing well-being changes and inclusivity premiums. Corresponding to ω^0, the change in well-being and the inclusivity premium between $F_1 \in \mathcal{F}_1$ and $F_2 \in \mathcal{F}_2$ are $\Delta(F_1, F_2; \omega^0) = \sum_{q=1}^{Q} \omega_q^0 \Delta_q$ and $S(F_1, F_2; \omega^0) = \sum_{q=1}^{Q} \omega_q^0 S_q$. In other words, both are presented as weighted sums of Δ_q's and S_q's. However, any other $\omega \in \Omega_0' \subseteq \Omega_0$ 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, i.e., $\sum_{q=1}^{Q} \omega_q^0 \Delta_q \geq 0$, and/or the inclusivity premium is positive $\sum_{q=1}^{Q} \omega_q^0 S_q > 0$. 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 $\sum_{q=1}^{Q} \omega_q S_q > 0$ for all $\omega \in \Omega_0'$. Now, 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. Let us illustrate the concept with the help of an example with $Q = 3$ or whenever the entire distribution is divided across terciles.

Figure 1: Set of alternative quantile-weight vectors for checking robustness

[9] Our definition of inclusivity premium 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).



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

In each panel of Figure 1, all quantile-weight vectors with non-negative quantile-weights that sum up to one in three dimensions are summarised 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 quantile-weight respectively to the change in the richest tercile, to the change in the middle tercile and to the change in the poorest tercile. Any quantile-weight vector within the simplex is a convex combination of these three vertices.

Now, Proposition 1 requires that $\omega_1 \geq \omega_2 \geq \omega_3$ for all weights in Ω^0. In Panel A of Figure 1, we present 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 summarised 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, i.e., at (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-weight in the shaded region. Since $\bar{\omega}$ is not a feasible alternative by Proposition 2, $\Omega_0' = \Omega_0$ cannot be the set of admissible alternatives for checking robustness for inclusivity premiums.

In Panel B of Figure 1, we present another case where ω^0 is such that the two poorest terciles are assigned strictly positive quantile-weight but no quantile-weight is assigned to the richest tercile (i.e., $\omega_1^0 \geq \omega_2^0 > \omega_3^0 = 0$). Then, in this case, 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 McGillivray and Seth (2018). However, let us provide a formal presentation of the case when $\Omega_0' = \Omega_0$. 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 $q = 1$, i.e., $\omega^1 = (1, 0, \cdots, 0)$, where $\Delta(F_1, F_2; \omega^1) = \Delta_1$ is the change in the poorest quantile. Next, let us consider the other extreme of $q = Q - 1$, i.e., $\omega^{Q-1} = (\frac{1}{Q-1}, \cdots, \frac{1}{Q-1}, 0)$, 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, i.e., $\Delta(F_1, F_2; \omega^q) = \frac{1}{q}\sum_{j=1}^{q} \Delta_j$. Finally, let us consider $\omega^Q = (\frac{1}{Q}\mathbf{1}_Q)$, which assigns equal quantile-weights to all Q quantiles so that $\omega^Q = \overline{\omega}$ and $\Delta(F_1, F_2; \omega^Q) = \overline{\Delta}(F_1, F_2)$. Thus, the robustness test corresponds to checking the average of changes for every bottom q quantiles, i.e., $\frac{1}{q}\sum_{q'=1}^{q} \Delta_{q'} \geq 0$ for all $q \in \mathcal{Q}$.[10]

Bound-adjusted well-being change

As we have discussed in the introduction, uninhibited improvement is not feasible for an indicator with strict upper bound. When the overall average gets closer to the upper bound U, the extent of possible progress becomes smaller. To deal with such a situation, we propose looking at the well-being change between two periods as a proportion of maximum feasible change in well-being.[11] The maximum feasible well-being is the upper bound U itself, which is achieved when everybody in the society enjoys the highest level of attainment U. Therefore, the maximum feasible change in well-being between two periods is the shortfall of the first period's well-being level from the maximum feasible well-being level, i.e., $U - W(F_1; \omega)$. Let us denote the boundary-adjusted change in well-being measure between distributions $F_1 \in \mathcal{F}_1$ and $F_2 \in \mathcal{F}_2$ for any quantile-weight vector $\omega \in \Omega_0$ as $\Delta_B(F_1, F_2; \omega)$, which can be expressed as:

$$\Delta_B(F_1, F_2; \omega) = \frac{\Delta(F_1, F_2; \omega)}{U - W(F_1; \omega)}. \tag{4}$$

Clearly, $U - W(F_1; \omega) \geq 0$ and whenever $U - W(F_1; \omega) > 0$, Δ_B and Δ share the same sign.

3. An empirical measure of well-being and the data

We capture well-being by adopting to a multidimensional counting approach (Atkinson, 2003; Alkire and Foster, 2011), which is closely connected to the global multidimensional poverty

[10] Comparing the well-being changes for every bottom quantile is analogous to Generalised Lorenz dominance (Shorrocks, 1983).

[11] The idea is analogous in spirit to the idea proposed by Permanyer, Seth and Yalonetzky (2022) for bounded variables, where normalised inequality indices are expressed as a proportion of maximum feasible inequality for a given mean.

measurement framework (Alkire Kanagaratnam and Suppa 2022) – consisting of three dimensions and ten indicators with weights of $1/6$ for four indicators and $1/18$ for the remainder.[12] A person living in a household is considered to be *deprived* in an indicator if the person fails to meet the deprivation cut-off for that indicator. Customarily, a deprivation score for each person is obtained by taking a weighted sum of the indicators in which they experience deprivations. A deprivation score indicates the person's breadth of multiple deprivations, and a higher deprivation score is associated with more intense poverty. In this paper, however, we consider the *complement* of a deprivation score as an attainment, where a higher attainment corresponds to higher well-being.[13] For the ease of interpreting small changes we normalise the weights assigned to the ten indicators such that they sum to 100. By construction, each attainment lies between a lower bound of zero and an upper bound of $U = 100$. An attainment equal to 'zero' point signifies the lowest possible well-being (i.e., simultaneous deprivations in all ten indicators) and an attainment equal to '100' points signifies the largest possible well-being (i.e., no deprivation in any of the ten indicators).

To study changes in well-being and inclusiveness, we divide the attainment distribution for each country and for each year into five quintiles (i.e., $Q = 5$), namely *poorest*, *second poorest*, *middle*, *second richest* and *richest*. We examine inclusiveness of well-being changes in 80 countries over two time periods by using 160 micro datasets (two datasets for each country), which include 92 Demographic Health Surveys (DHS), 61 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 ten indicators have been harmonised across two periods so that a consistent comparison can be performed. These datasets have been used to produce inter-temporal multidimensional poverty comparisons (Alkire et al. 2022). While conducting statistical inferences, we incorporate the sampling design of these household surveys.

Let us first look at the overall average attainment and the average attainment within each of the five quintiles for each country over two periods and then at the annual absolute changes in the overall average attainments and the annual absolute changes in the average attainments within each quintile (Table A1). The overall average attainments as well as the average attainments within quintiles vary globally as well as within six geographic regions. The overall average attainments in the first period range between 31.9 points in Niger and 97.9 points in Ukraine, whereas the overall average attainments in the second period range between 38.8 points and 99 points for the same pair of countries.[14] Average attainments vary the most within the sub-Saharan African region and the least within the Europe and Central Asia region. However, when we look at the poorest quintile, the average attainments vary the most within the Arab States region between 26.7 points in Sudan and 89.2 points in Jordan. Overall, the average attainments within the poorest quintile vary globally in the first period between 6.9 points in Burkina Faso and 89.5 points in Ukraine.

When we focus on the changes over time, we observe statistically significant improvements in the overall average ($\overline{\Delta}$) for 77 countries. For one country (Benin), we observe statistically significant

[12] The three dimensions, ten indicators and their deprivation cut-offs and weights assigned to all indicators are summarised in the appendix.
[13] See also Alkire and Foster (2016), Seth and Alkire (2017) and Alkire and Foster (2019) for attainment and deprivation representations.
[14] Note that the Ukraine study period corresponds to the pre-war period of 2007-2012.

deterioration in the overall average, and for the rest of the two countries, we do not observe any statistically significant change. Although countries with high levels of overall average in the initial period do not show large absolute improvements over time, changes across countries are certainly not monotonically related to the overall averages at the initial period and vary widely. Largest absolute annual improvements in the overall average attainments are observed for Mauritania and Sierra Leone – both registering around two points improvements in their average attainments. Chad, on the other hand, has one of the lowest levels of overall average in the initial period, but registers a low level of improvement in the overall average.

Let us now look at the changes in average attainments in different quintiles (i.e., Δ_q for $q = 1, \ldots, 5$). The average attainments for the poorest quintile show statistically significant improvements in 76 countries – all except Benin, Jamaica, Trinidad and Tobago and Togo. Only Benin has a statistically significant reduction in the average attainment for the poorest quintile; the other three countries show no change. When we look at the second poorest quintile, 75 countries have statistically significant improvements. Moving up the quintiles, the average attainments in the second richest quintile for 23 countries and that in the richest quintile for 29 countries are equal to 100 points, which means that no further improvements in well-being is possible in these countries' richer quintiles due to boundedness of attainment scores. We now examine whether the overall improvements across countries have been inclusive to the poorer quintiles in the next section.

4. Have changes in well-being been inclusive?

To assess 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 propose using a set of rank-dependent quantile-weights, $\omega^0 = (5/9, 3/9, 1/9, 0, 0)$, that satisfies the restrictions of both Propositions 1 and 2. In words, the quantile-weights in ω^0 assign a weight of 5/9 to the poorest quintile, a weight is 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 attainments within the two richest 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 attainments Δ_q's as well as to the quantile-wise components of inclusivity premiums S_q's.

Table 1: Change in well-being and inclusiveness

		Year		Inclusive well-being				Decomposition		Share (%)		Robust	
Country	Region	1st	2nd	W_1	W_2	Δ	Δ_B	$\bar{\Delta}$	S	$\bar{\Delta}$	S	Δ	S
Egypt	ARS	2008	2014	78.5	82.6	0.68***	3.2***	0.32***	0.36***	46.9	53.1	Yes	Yes
Iraq	ARS	2011	2018	73.9	79.0	0.74***	2.8***	0.44***	0.30***	59.4	40.6	Yes	Yes
Jordan	ARS	2012	2018	94.0	94.9	0.15***	2.6***	0.06***	0.10***	36.0	64.0	Yes	Yes
State of Palestine	ARS	2010	2014	87.1	89.1	0.50***	3.8***	0.26***	0.24***	51.6	48.4	Yes	Yes
Sudan	ARS	2010	2014	37.7	41.6	0.97***	1.6***	0.81***	0.16***	83.8	16.2	Yes	No
Yemen	ARS	2006	2013	51.4	58.5	1.02***	2.1***	0.79***	0.22***	77.9	22.1	Yes	Yes
Cambodia	EAP	2010	2014	49.6	55.6	1.52***	3.0***	1.26***	0.26***	83.0	17.0	Yes	Yes
China	EAP	2010	2014	71.3	77.3	1.48***	5.2***	0.96***	0.52***	64.7	35.3	Yes	Yes
Indonesia	EAP	2012	2017	79.8	86.3	1.30***	6.4***	0.70***	0.60***	54.1	45.9	Yes	Yes
Lao PDR	EAP	2012	2017	48.0	62.5	2.91***	5.6***	1.83***	1.08***	62.8	37.2	Yes	Yes
Philippines	EAP	2013	2017	76.6	80.0	0.86***	3.7***	0.57***	0.29***	66.3	33.7	Yes	Yes
Thailand	EAP	2012	2016	85.9	87.6	0.42***	3.0***	0.23***	0.18***	56.2	43.8	Yes	Yes
Timor-Leste	EAP	2010	2016	38.6	52.1	2.24***	3.6***	1.83***	0.41***	81.7	18.3	Yes	Yes

Country	Region	Year 1st	Year 2nd	Inclusive well-being W_1	W_2	Δ	Δ_B	Decomposition $\bar{\Delta}$	S	Share (%) $\bar{\Delta}$	S	Robust Δ	S
Viet Nam	EAP	2011	2014	78.8	80.3	0.51***	2.4***	0.34***	0.17**	66.4	33.6	Yes	No
Albania	ECA	2009	2018	85.3	89.1	0.42***	2.9***	0.19***	0.23***	45.2	54.8	Yes	Yes
Armenia	ECA	2010	2016	91.3	92.7	0.23***	2.7***	0.08***	0.15***	35.9	64.1	Yes	Yes
Bosnia and Herzegovina	ECA	2006	2012	84.8	89.1	0.70***	4.6***	0.15***	0.55***	21.6	78.4	Yes	Yes
Guyana	ECA	2009	2014	81.6	85.9	0.85***	4.6***	0.43***	0.42***	50.5	49.5	Yes	Yes
Kazakhstan	ECA	2011	2015	87.9	92.3	1.09***	9.0***	0.53***	0.56***	48.3	51.7	Yes	Yes
Kyrgyzstan	ECA	2006	2014	75.2	82.1	0.85***	3.4***	0.57***	0.29***	66.3	33.7	Yes	Yes
Macedonia	ECA	2006	2011	82.7	90.0	1.46***	8.4***	0.66***	0.80***	45.0	55.0	Yes	Yes
Moldova	ECA	2005	2012	88.1	89.6	0.21***	1.8***	0.06***	0.15***	28.2	71.8	Yes	Yes
Mongolia	ECA	2010	2013	66.7	70.8	1.39***	4.2***	1.29***	0.10*	92.9	7.1	Yes	No
Montenegro	ECA	2006	2013	88.5	89.5	0.13	1.2	-0.01	0.15**	-10.5	110.5	No	No
Serbia	ECA	2010	2014	91.3	91.9	0.16***	1.9***	0.06**	0.11***	35.4	64.6	Yes	Yes
Tajikistan	ECA	2012	2017	71.0	75.7	0.93***	3.2***	0.65***	0.28***	70.1	29.9	Yes	Yes
Turkmenistan	ECA	2006	2016	81.7	88.4	0.66***	3.6***	0.39***	0.27***	58.8	41.2	Yes	Yes
Ukraine	ECA	2007	2012	94.1	97.1	0.60***	10.3***	0.22***	0.38***	36.5	63.5	Yes	Yes
Belize	LAC	2011	2016	79.9	82.3	0.47***	2.4***	0.21***	0.26***	44.0	56.0	Yes	Yes
Bolivia	LAC	2003	2008	54.2	65.0	2.17***	4.7***	1.78***	0.39***	82.0	18.0	Yes	Yes
Colombia	LAC	2010	2016	82.5	84.8	0.37***	2.1***	0.17***	0.20***	46.9	53.1	Yes	Yes
Dominican Republic	LAC	2007	2014	78.1	86.1	1.14***	5.2***	0.72***	0.42***	63.4	36.6	Yes	Yes
Haiti	LAC	2012	2017	48.3	52.2	0.78***	1.5***	0.69***	0.10**	87.8	12.2	Yes	No
Honduras	LAC	2006	2012	50.7	64.1	2.22***	4.5***	1.49***	0.73***	67.2	32.8	Yes	Yes
Jamaica	LAC	2010	2014	81.1	82.4	0.31**	1.6**	0.12**	0.19**	39.1	60.9	No	No
Mexico	LAC	2012	2016	82.9	84.1	0.29***	1.7***	0.12***	0.17***	40.5	59.5	Yes	Yes
Nicaragua	LAC	2001	2012	46.8	68.9	2.01***	3.8***	1.27***	0.74***	63.1	36.9	Yes	Yes
Peru	LAC	2012	2018	73.2	78.9	0.95***	3.6***	0.55***	0.41***	57.4	42.6	Yes	Yes
Suriname	LAC	2006	2010	76.9	81.8	1.24***	5.4***	0.51***	0.74***	40.8	59.2	Yes	Yes
Trinidad and Tobago	LAC	2006	2011	90.0	89.6	-0.08	-0.8	-0.03	-0.06	30.2	69.8	No	No
Afghanistan	SAS	2011	2016	29.3	35.2	1.18***	1.7***	1.44***	-0.27***	122.5	-22.5	Yes	No
Bangladesh	SAS	2014	2019	54.9	64.9	2.00***	4.4***	1.33***	0.66***	66.8	33.2	Yes	Yes
India	SAS	2006	2016	43.0	61.5	1.86***	3.3***	1.39***	0.47***	74.7	25.3	Yes	Yes
Nepal	SAS	2011	2016	51.2	60.7	1.90***	3.9***	1.23***	0.68***	64.3	35.7	Yes	Yes
Pakistan	SAS	2013	2018	46.0	49.8	0.75***	1.4***	0.70***	0.05	93.2	6.8	Yes	No
Benin	SSA	2014	2018	36.7	35.5	-0.29***	-0.5***	-0.30***	0.01	104.9	-4.9	Yes	No
Burkina Faso	SSA	2006	2010	15.2	17.8	0.65***	0.8***	0.81***	-0.16***	125.0	-25.0	Yes	Yes
Burundi	SSA	2010	2017	31.4	34.7	0.47***	0.7***	0.59***	-0.12***	124.8	-24.8	Yes	Yes
Cameroon	SSA	2011	2014	42.4	44.1	0.59***	1.0***	0.51***	0.08	86.0	14.0	Yes	No
Central African Republic	SSA	2000	2010	20.2	26.8	0.67***	0.8***	0.76***	-0.09***	113.3	-13.3	Yes	No
Chad	SSA	2010	2015	17.3	19.7	0.47***	0.6***	0.39***	0.08**	83.2	16.8	Yes	No
Congo, DR	SSA	2007	2014	31.7	37.4	0.82***	1.2***	0.58***	0.25***	69.9	30.1	Yes	No
Cote D'Ivoire	SSA	2012	2016	40.4	46.7	1.56***	2.6***	1.72***	-0.16**	110.3	-10.3	Yes	No
Eswatini	SSA	2010	2014	60.4	67.1	1.68***	4.2***	1.26***	0.42***	75.1	24.9	Yes	Yes
Ethiopia	SSA	2011	2016	24.4	28.4	0.81***	1.1***	0.92***	-0.11***	113.8	-13.8	Yes	No
Gabon	SSA	2000	2012	57.6	69.5	0.99***	2.3***	0.64***	0.35***	64.4	35.6	Yes	Yes
Gambia	SSA	2006	2013	32.1	43.5	1.62***	2.4***	1.24***	0.39***	76.1	23.9	Yes	Yes
Ghana	SSA	2011	2014	56.6	61.9	1.75***	4.0***	0.90***	0.84***	51.7	48.3	Yes	Yes
Guinea	SSA	2012	2018	28.8	34.0	0.87***	1.2***	0.83***	0.04	95.6	4.4	Yes	No
Kenya	SSA	2009	2014	49.0	54.6	1.12***	2.2***	0.87***	0.25***	77.8	22.2	Yes	No
Lesotho	SSA	2009	2014	51.1	57.7	1.31***	2.7***	1.20***	0.12***	91.1	8.9	Yes	No
Liberia	SSA	2007	2013	30.7	41.0	1.72***	2.5***	1.73***	-0.01	100.4	-0.4	Yes	No
Madagascar	SSA	2009	2018	31.9	35.5	0.40***	0.6***	0.53***	-0.13***	131.2	-31.2	Yes	Yes
Malawi	SSA	2010	2016	42.1	49.5	1.23***	2.1***	1.09***	0.15***	88.0	12.0	Yes	Yes
Mali	SSA	2006	2015	27.1	32.0	0.54***	0.7***	0.74***	-0.20***	137.7	-37.7	Yes	Yes
Mauritania	SSA	2011	2015	34.5	44.6	2.53***	3.9***	2.04***	0.48***	80.9	19.1	Yes	Yes
Mozambique	SSA	2003	2011	25.4	33.3	0.99***	1.3***	1.21***	-0.21***	121.4	-21.4	Yes	Yes
Namibia	SSA	2007	2013	51.6	57.1	0.92***	1.9***	0.69***	0.23***	74.9	25.1	Yes	Yes
Niger	SSA	2006	2012	13.6	19.7	1.02***	1.2***	1.15***	-0.13***	113.0	-13.0	Yes	Yes
Nigeria	SSA	2013	2018	38.8	42.1	0.67***	1.1***	0.53***	0.14***	79.8	20.2	Yes	No
Republic of Congo	SSA	2005	2015	47.5	61.7	1.42***	2.7***	1.29***	0.13***	91.0	9.0	Yes	No
Rwanda	SSA	2010	2015	40.7	48.4	1.54***	2.6***	1.40***	0.15***	90.6	9.4	Yes	Yes
Sao Tome and Principe	SSA	2009	2014	54.7	66.1	2.28***	5.0***	1.77***	0.51***	77.7	22.3	Yes	Yes

		Year		Inclusive well-being				Decomposition		Share (%)		Robust	
Country	Region	1st	2nd	W_1	W_2	Δ	Δ_B	$\overline{\Delta}$	S	$\overline{\Delta}$	S	Δ	S
Senegal	SSA	2005	2017	30.1	41.3	0.93***	1.3***	0.63***	0.29***	68.4	31.6	Yes	Yes
Sierra Leone	SSA	2013	2017	33.8	42.2	2.09***	3.2***	2.12***	-0.03	101.5	-1.5	Yes	No
Tanzania	SSA	2010	2016	41.4	44.8	0.58***	1.0***	0.71***	-0.13***	123.3	-23.3	Yes	Yes
Togo	SSA	2010	2014	38.0	39.1	0.26**	0.4**	0.28***	-0.01	104.4	-4.4	No	No
Uganda	SSA	2011	2016	40.1	45.5	1.07***	1.8***	1.09***	-0.02	101.6	-1.6	Yes	No
Zambia	SSA	2007	2014	38.6	45.9	1.05***	1.7***	0.81***	0.24***	76.9	23.1	Yes	Yes
Zimbabwe	SSA	2011	2015	56.4	59.1	0.68***	1.6***	0.55***	0.13***	81.1	18.9	Yes	No

Source: Authors' own computations.

Statistical significance: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

Notes: $W_1 = W(F_1; \omega^0)$ is the well-being in period 1; $W_2 = W(F_2; \omega^0)$ is the well-being in period 2; Δ is the annual absolute change and Δ_B is the annual bound-adjusted change. The share of $\overline{\Delta}$ and S can be more than 100%.

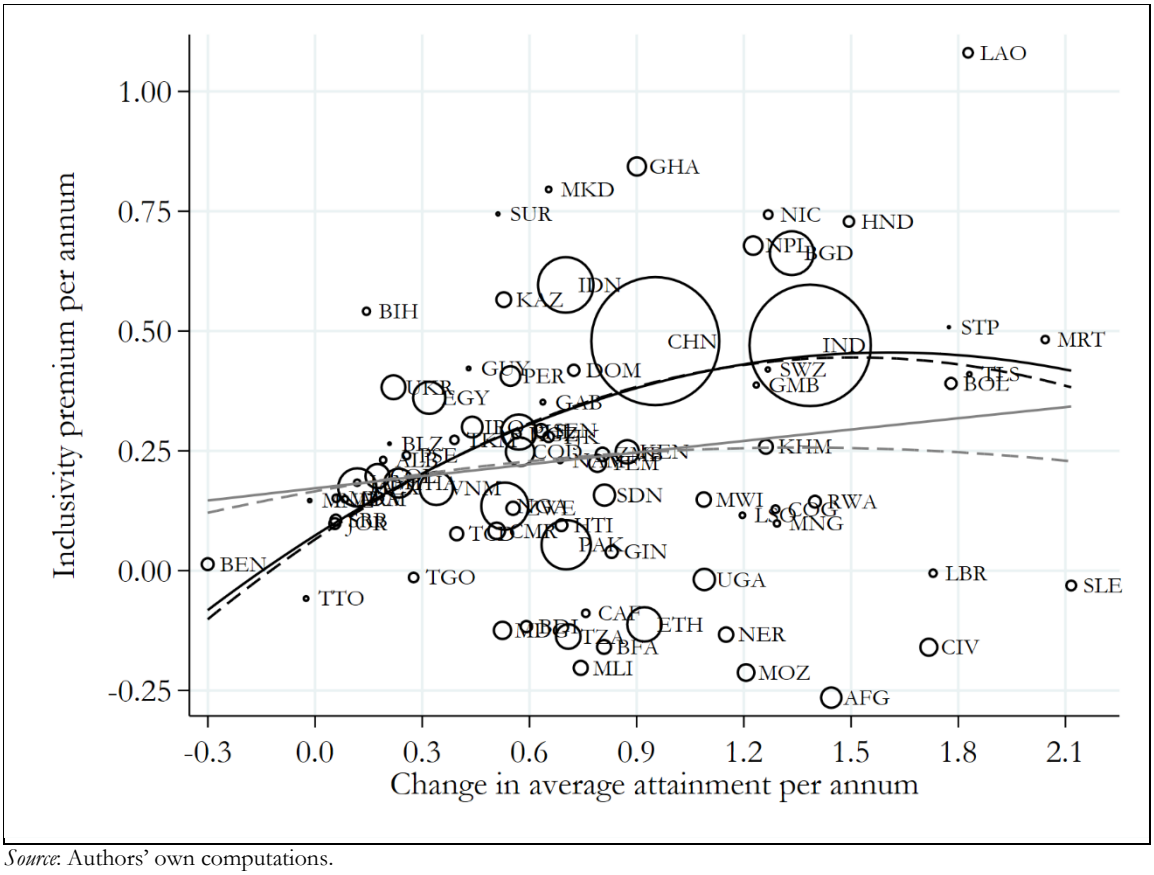
Robustness: Robustness of both Δ and S are assessed with respect to ω^1 = (1, 0, 0, 0, 0), ω^2 = (1/2, 1/2, 0, 0, 0) and ω^3 = (1/3, 1/3, 1/3, 0, 0). Additional information is available in Table A2.

Region abbreviations: ARS: Arab States; EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAP: Latin America and Caribbean; SAS: South Asia; SSA: Sub-Saharan Africa.

In Table 1, we present the inclusive well-being measures which are quantile-weighted sums of quintile averages that are available in Table A1. The change is the 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 in the case of the average attainment scores, 77 countries register statistically significant increases in inclusive well-being, one country reflects statistically significant reduction and two countries (Montenegro and Trinidad and Tobago) do not show any statistically significant changes. However, the extent of the increases in the well-being levels and the increases in the average attainments differ across countries based on whether the increases in average attainments are larger in the poorer quintiles, which can be analysed through assessing inclusiveness. We then decompose the overall change in well-being based on Equation (3) and we report the two components – the change in the average deprivation score ($\overline{\Delta}$) and the inclusivity premium (S). In the next two columns, we report the shares or contributions of $\overline{\Delta}$ and S to the overall change Δ. By construction $\Delta = \overline{\Delta} + S$ as in Equation (3) and so the shares of $\overline{\Delta}$ and S sum to 100%.

To visually understand the relationship between the change in the average attainment and the inclusivity premium across countries, we present the relationship in Figure 2 through a scatterplot. On the horizontal axis, we present the per annum change in average attainment between two periods, whereas on the vertical axis we present the inclusivity premium between two periods. Each point on the scatter plot 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 inclusivity premium per annum is 0.73 points. Therefore, the annual change in inclusive well-being for Honduras is 2.22 points (i.e., 1.49 + 0.73).

Figure 2: Change in average attainment and inclusivity premium



Source: Authors' own computations.
Notes: The solid black population weighed trend line corresponds to 80 countries. The black dashed population weighed trend line corresponds to 79 countries, excluding LAO PDR. The solid grey population unweighted trend line corresponds to 80 countries. The solid grey population unweighted trend line corresponds to 79 countries, excluding LAO PDR.
Country abbreviations: AFG: Afghanistan; ALB: Albania; ARM: Armenia; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Cote 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; JOR: Jordan; 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; SRB: Serbia; STP: Sao Tome and Principe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TTO: Trinidad and Tobago; TZA: Tanzania; UGA: Uganda; UKR: Ukraine; VNM: Viet Nam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

We observe that inclusivity premiums are statistically significantly negative for 11 countries of which one is from South Asia (Afghanistan) and ten countries are from sub-Saharan Africa (Burundi, Burkina Faso, Central African Republic, Cote D'Ivoire, Ethiopia, Madagascar, Mali, Mozambique, Niger and Tanzania). We further observe inclusivity premiums to be not statically significantly different from zero for nine countries, of which one country is from Latin America and Caribbean (Trinidad and Tobago), one country is from South Asia (Pakistan) and seven are from sub-Saharan Africa (Benin, Cameroon, Guinea, Liberia, Sierra Leone, Togo and Uganda). Thus, for a quarter of all countries in our sample (e.g., 20 out of 80), we do not observe positive inclusivity premium. Surprisingly, except for Benin and Trinidad and Tobago, all 18 of the 20 countries register statistically significant improvement in average attainments over the respective study periods. Moreover, the majority of these 20 countries are from sub-Saharan Africa. More precisely, nearly half of all sub-Saharan African countries (e.g., 17 out of 35) do not produce positive inclusivity premiums. Most countries though reflect positive inclusivity premiums with

wide variation. Out of the 60 countries that show positive premiums, 27 register premiums ranging 0-0.25 points per year; 20 register premiums ranging 0.25-0.5 points per year; 10 register premiums ranging 0.5-0.75 points per year; and only three countries (Ghana, Lao PDR and Macedonia) register premiums of over 0.75 points per year. It appears that 21 countries (around a fourth) have registered annual improvements in average attainments of 1.2 points or above, but only a third of these countries (7) have registered inclusivity premiums of 0.4 points or more.

In Table 1, we also report the contribution of each component to the total change in inclusive well-being. Interesting insights may be drawn by looking at these figures directly while comparing progress across countries. Let us consider the comparison between the two South Asian countries: India and Nepal. Both countries reflect a similar level of inclusive well-being in 2016 (i.e., 61.5 points for India and 60.7 points for Nepal) as well as a similar changes in average attainments over their respective study periods (i.e., 1.90 points per annum for Nepal and 1.86 points per annum for India). Decomposing their changes in well-being shows that India's change in the average attainment (1.39 points per annum) is statistically significantly higher than that of Nepal (1.23 points per annum), whereas Nepal's inclusivity premium (0.68 points per annum) is statistically significantly higher than that of India's (0.47 points per annum). The share of the inclusivity premium to the inclusive well-being change for Nepal is 35.7%, which is around ten percentage points higher than the contribution of the inclusivity premium to the well-being change for India (25.3%). Therefore, Nepal's progress can be claimed to have been accompanied by providing much larger priority to poorer quintiles.

Robustness of inclusive well-being changes and inclusivity premium

We have so far used the quantile-weight vector ω^0 to assess inclusiveness. However, ω^0 is just one of the several alternatives that satisfy the restrictions required by Propositions 1 and 2. Therefore, it is essential to check the robustness of well-being changes and inclusivity premiums with respect to feasible alternative quantile-weight vectors. As 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 $\Omega_0' = \{\omega \mid 1 \geq \omega_1 \geq \omega_2 \geq \omega_3 \geq \omega_4 = \omega_5 = 0 \;\&\; \sum_{q=1}^{Q} \omega_q = 1\} \subset \Omega_0 \setminus \{\overline{\omega}\}$. Following Seth and McGillivray (2018), we are required to compare well-being changes and inclusivity premiums at the following three quantile-weight vectors: $\omega^1 = (1, 0, 0, 0, 0)$, $\omega^2 = (1/2, 1/2, 0, 0, 0)$ and $\omega^3 = (1/3, 1/3, 1/3, 0, 0)$. 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 inclusivity premiums for the bottom two (poorest and second poorest) and the bottom three (poorest, second poorest and middle) quintiles, respectively.[15]

In the final two columns of Table 1, we report whether the changes in inclusive well-being and the inclusivity premiums are robust or not for all eighty countries (the well-being levels and inclusivity premiums for ω^1, ω^2 and ω^3 are available in Table A2). Our robustness tests are more conservative than our theoretical framework. We refer to an increase in well-being to be 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 for a country to be robust whenever we observe

[15] Note that 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 5.

statistically significant reductions in well-being levels for all three quantile-weight vectors. Out of the 80 countries, we observe the changes in well-being to be robust for 76 countries including Benin. Four countries for which the changes are not robust are Jamaica, Montenegro, Togo and Trinidad and Tobago. Out of these four non-robust changes, the changes for Montenegro and Trinidad and Tobago are not statistically significant even at ω^0. The changes for Jamaica and Togo, on the other hand, are statistically significant but their changes do not pass the robustness test.

We next analyse the robustness of the inclusivity premiums that are outlined in the final column of the table. 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 case of changes in well-being, only around two-third of all inclusivity premiums (for 54 countries) are robust with respect to all alternative quantile-weight vectors in Ω_0' and the rest of the 26 countries do not pass the robustness test. Out of the 60 countries that register positive inclusivity premiums, 47 are robust with respect to all alternative quantile-weight vectors in Ω_0' and the rest of 13 are not robust. Similarly, out of the 11 countries that register negative inclusivity premiums, seven are robust and four are not robust. We highlight the countries in grey that fail to satisfy the robustness test for inclusivity premium. Out of these 26 countries nine are from Arab States (1), East Asia and the Pacific (1), Europe and Central Asia (2), Latin America and Caribbean (3), and South Asia (2), whereas 17 are from the sub-Saharan African region. In other words, for nearly half of countries in sub-Saharan Africa, we do not observe robust inclusivity premium.

Some insights could be drawn by examining how some countries fail the robustness test. Let us consider the case of Sudan and Viet Nam – with 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 premium for ω^1. Although the poorest quintiles in both countries show improvements, yet their improvements are not faster than the overall improvements.[16]

Bound-adjusted change

So far, we have analysed absolute changes. However, as we have explained in the theoretical section, due to the boundedness nature of the attainments, further improvements may not be possible when the overall average moves closer to the upper bound of 100 points. The average attainments are equal to the upper bound of 100 points for 29 countries in their richest quintiles, for 23 countries in their second richest quintiles, for five countries in their middle quintiles and even for one country in its second poorest quintile (Table A1). Therefore, it may not be possible for these countries to register significant improvements over time, only because such feasibilities are naturally restricted. To assess the extent of improvements in such situations, we also compute the changes in well-being as percentages of maximum feasible improvements per annum (Δ_B), which are reported in Table 1.

Figure 3: Bound-adjusted changes versus absolute changes in well-being across countries

[16] 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.

Source: Authors' own computations.

Notes: %pt refers to percentage point. The solid black population weighed trend line corresponds to 80 countries. The black dashed population weighed trend line corresponds to 79 countries, excluding LAO PDR. The solid grey population unweighted trend line corresponds to 80 countries. The solid grey population unweighted trend line corresponds to 79 countries, excluding LAO PDR.

Country abbreviations: AFG: Afghanistan; ALB: Albania; ARM: Armenia; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Cote 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; JOR: Jordan; 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; SRB: Serbia; STP: Sao Tome and Principe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TTO: Trinidad and Tobago; TZA: Tanzania; UGA: Uganda; UKR: Ukraine; VNM: Viet Nam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

In Figure 3, we present the relationship between the bound-adjusted changes in well-being and the absolute changes in well-being across countries. We observe a wide variation. For example, let us consider the cases of Cambodia (KHM) and Egypt (EGY). Initial levels of well-being for Cambodia and Egypt are 49.5 and 78.5 points, respectively, and the per annum increases are 1.52 points and 0.68 points, respectively. However, when we look at the bound-adjusted changes or the changes as proportions of maximum feasible changes, they appear to be very similar (3 and 3.2 percentage points, respectively). Nine countries that produce bound-adjusted changes five percentage points per annum or more are China, Dominican Republic, Indonesia, Kazakhstan, Lao PDR, Macedonia, Sao Tome and Principe, Suriname and Ukraine. Eight of these nine countries belong to three geographic regions: Latin America and Caribbean, East Asia and the Pacific and Europe and Central Asia. Only one country (Sao Tome and Principe) is from the sub-

Saharan African region. Of the ten countries that produce a bound-adjusted change of one percentage point per annum or less, nine are from sub-Saharan Africa.

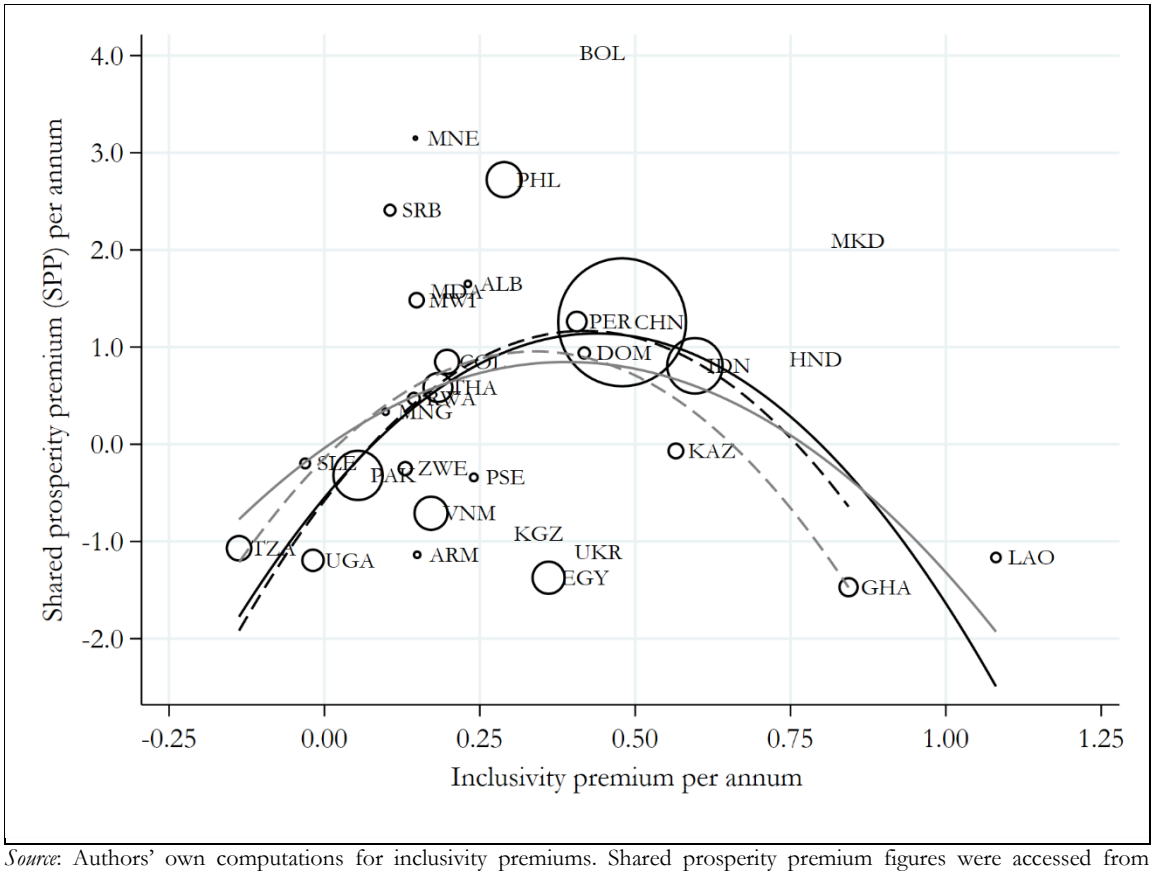
5. Comparison of inclusivity premium to other well-known measures

In this section, we elaborate how our proposed framework compares with two measures in particular: the Shared Prosperity Premium (SPP) produced by the World Bank and the Global Multidimensional Poverty Index (MPI) produced by the Oxford Poverty and Human Development Initiative and the United Nations Development Programme. Let us 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 inclusivity premium across countries. The SPP, like inclusivity premium, is positive whenever the average income growth among the poorest 40% is larger than the overall average income growth, whereas the SPP measure is negative whenever the average income growth among the poorest 40% is slower than the overall average income growth.

We are able to secure SPP data for only 31 of the 80 countries in our sample of developing countries from the World Bank's global database on shared prosperity.[17] Among these 31 countries, for only 25 countries the differences first periods and the last periods of the surveys for computing SPPs and those for the surveys for computing inclusivity premiums were three years or less. In Figure 4, we present the relationship between SPPs and inclusivity premiums across 25 countries using a simple scatter plot. Although there are instances where some countries perform relatively similarly by both measures, yet overall we observe an inverted-U relationship between these two measures for 25 countries and so higher shared prosperity premiums are 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 term of inclusivity premium but their SPPs are negative, whereas Malawi and Philippines register very high SPPs but their inclusivity premiums are less impressive.

Figure 4: Shared prosperity premiums and inclusivity premiums across 25 countries

[17] The overall income growth rates, the income growth rates of the poorest 40% of the population and shared prosperity premiums are reported in Table A3.

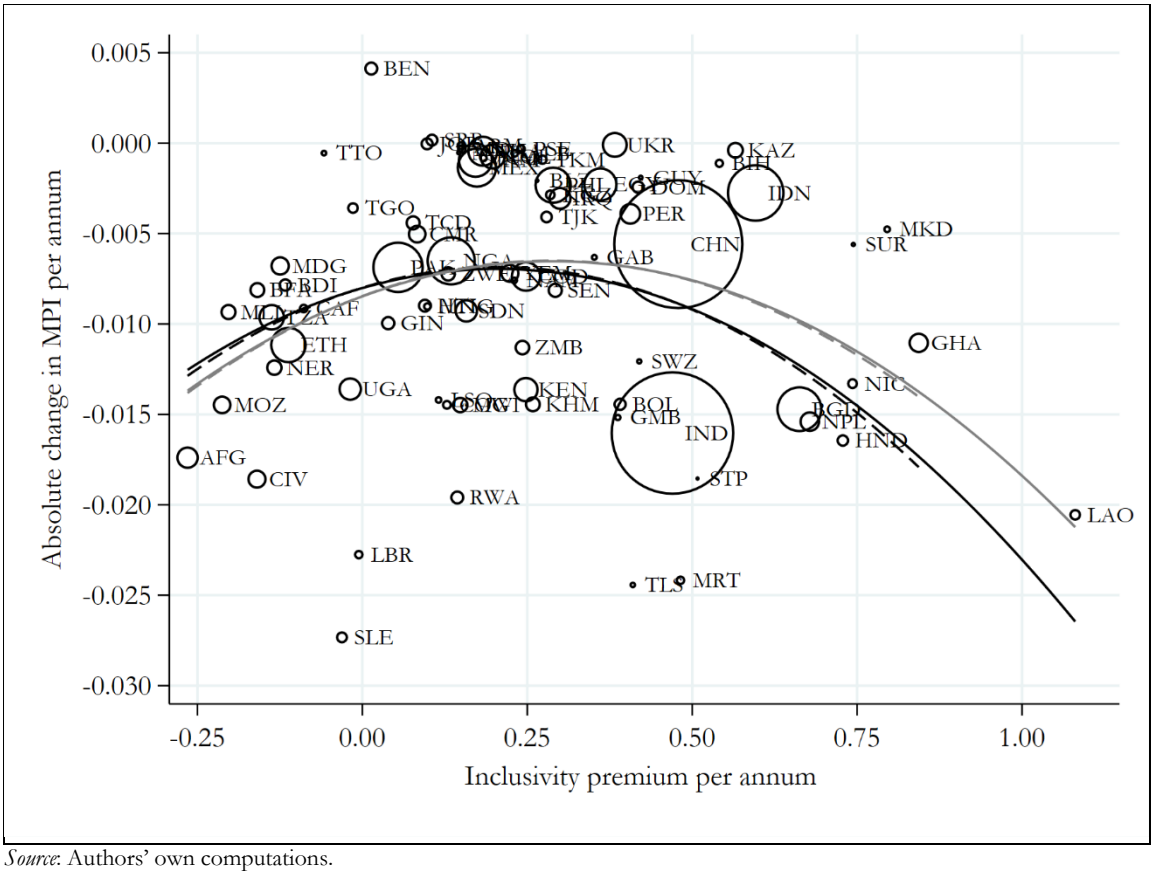


Source: Authors' own computations for inclusivity premiums. Shared prosperity premium figures were accessed from https://www.worldbank.org/en/topic/poverty/brief/global-database-of-shared-prosperity in Dec. 2021.
Countries for SPP: Albania (ALB, 2014-2017), Armenia (ARM, 2013-2018), China (CHN, 2013-2016), Colombia (COL, 2014-2019), Dominican Republic (DOM, 2011-2016), Egypt (EGY, 2012-2017), Ghana (GHA, 2012-2016), Indonesia (IDN, 2015-2019), Kazakhstan (KAZ, 2013-2018), Lao PDR (LAO, 2012-2018), Malawi (MWI, 2010-2016), Mongolia (MNG, 2011-2018), Montenegro (MNE, 2012-2016), Pakistan (PAK, 2013-2018), Peru (PER, 2014-2019), Philippines (PHL, 2015-2018), Rwanda (RWA, 2013-2016), Serbia (SRB, 2013-2017), Sierra Leone (SLE, 2011-2018), State of Palestine (PSE, 2011-2016), Tanzania (TZA, 2011-2018), Thailand (THA, 2015-2019), Uganda (UGA, 2012-2016), Viet Nam (VNM, 2014-2018), Zimbabwe (ZWE, 2011-2017).
Notes: The differences between the first periods and the second periods between the surveys for computing shared prosperity premiums and inclusivity premiums are three years or less. The solid black population weighted trend line corresponds to 25 countries. The dashed black population weighted trend line corresponds to 24 countries, excluding LAO PDR. The solid grey population unweighted trend line corresponds to 25 countries. The dashed grey population unweighted trend line corresponds to 24 countries, excluding LAO PDR.

We next compare the inclusivity premiums with the changes in the well-known global MPI values. Given that our inclusive well-being measure uses the same set of indicators and parameters as the global MPI, it is crucial to examine whether our inclusive well-being framework provides any additional insight over the changes in MPIs. In Figure 5, we present the relationship between inclusivity premiums and absolute changes in MPIs across 80 countries. As in the case of the SPP, the relationship in Figure 5 is also inverted-U shaped.[18] Countries such as Burkina Faso, Mali, Mozambique and Niger register statistically significant reductions in their MPIs, but they all register robust statistically significantly negative inclusivity premiums. In contrast, countries such as Bangladesh, Nepal and Honduras register statistically signficant reductions in their MPI as well as register robust statistically significantly positive shared prosperity premiums. There are also instances, such as Colombia and Thailand, where the absolute reductions in MPIs are small but their shared prosperity premiums are much larger.

[18] MPI values and MPI-headcount ratios for all 80 countries are reported in Table A3.

Figure 5: Inclusivity premiums and absolute changes in MPIs across countries



Source: Authors' own computations.

Notes: The figures for inclusivity premiums and absolute changes in MPIs are reported in Table A3. The solid black population weighed trend line corresponds to 80 countries. The black dashed population weighed trend line corresponds to 79 countries, excluding LAO PDR. The solid grey population unweighted trend line corresponds to 80 countries. The solid grey population unweighted trend line corresponds to 79 countries, excluding LAO PDR.

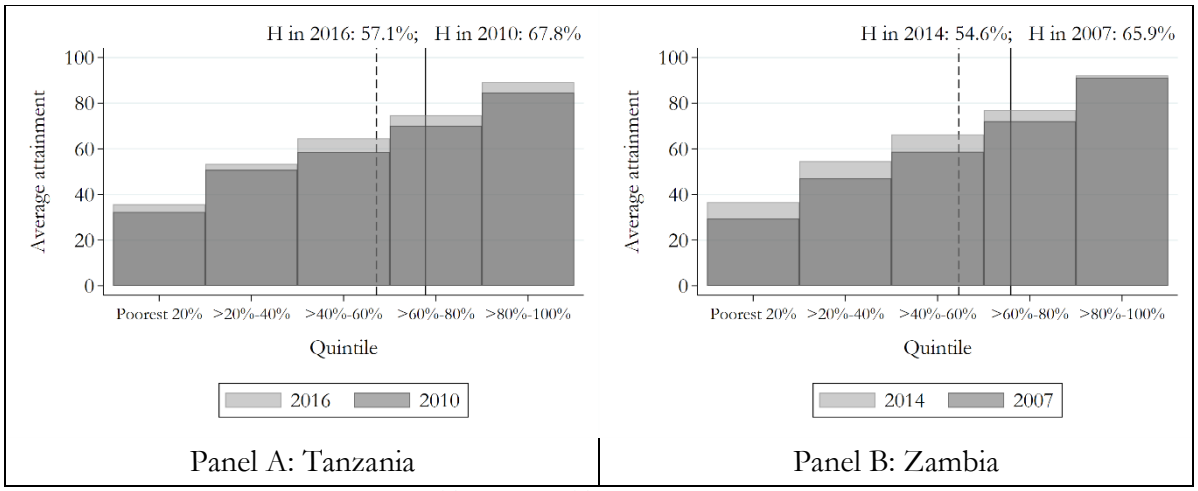
Country abbreviations: AFG: Afghanistan; ALB: Albania; ARM: Armenia; BDI: Burundi; BEN: Benin; BFA: Burkina Faso; BGD: Bangladesh; BIH: Bosnia and Herzegovina; BLZ: Belize; BOL: Bolivia; CAF: Central African Republic: CHN: China; CIV: Cote D'Ivoire; CMR: Cameroon; COD: Congo, DR; COG: Republic of Congo; 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; JOR: Jordan; 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; SRB: Serbia; STP: Sao Tome and Principe; SUR: Suriname; SWZ: Eswatini; TCD: Chad; TGO: Togo; THA: Thailand; TJK: Tajikistan; TKM: Turkmenistan; TLS: Timor-Leste; TTO: Trinidad and Tobago; TZA: Tanzania; UGA: Uganda; UKR: Ukraine; VNM: Viet Nam; YEM: Yemen; ZMB: Zambia; ZWE: Zimbabwe.

To form a deeper understanding of their relationship, we examine two countries – Tanzania and Zambia – closely. Both countries have similar levels of MPIs at their respective initial periods (0.342 for Tanzania and 0.349 for Zambia) as well as similar levels of annual absolute reductions (-0.010 for Tanzania and -0.011 for Zambia). Moreover, Tanzania's MPI headcount ratio is also similar to that of Zambia's in the initial period and they both show similar annual reductions. Within each panel of Figure 6, the solid-black vertical line denotes the MPI headcount ratio for the first period and the black-dashed vertical line denotes the MPI headcount ratios for the second period.

However, when we look at the inclusivity premiums, Tanzania reflects a robust and statistically significantly negative inclusivity premium, whereas Zambia reflects a robust and statistically

significantly positive inclusivity premium. We graphically present the quintile-wise changes in average attainments for both countries in two panels of Figure 6 using bar diagrams. The height of the bar with a darker shade denotes the average attainment within each quintile for the first period, whereas the height of the bar with a lighter shade denotes the average attainment within each quintile for the second period. The difference between the lighter-shaded bar and the darker-shaded bar denotes the improvement in average attainment within each quintile. Note that an attainment is the complement of a deprivation score by our definition, and therefore the magnitude of absolute improvement in the average attainment within a quintile is equivalent to the magnitude of the corresponding absolute reduction in the average deprivation score within that quintile.

Figure 6: Inclusivity premiums and absolute changes in MPIs in Tanzania and Zambia



Source: Authors' own computations based on Table A1 and Table A3.
Notes: The solid and dashed lines correspond to the MPI headcount ratios for the first year and the second year, respectively.

Hence, MPIs and the corresponding headcount ratios have improved by similar magnitudes for both Tanzania and Zambia, but we clearly observe a key difference between the two countries. For Tanzania, improvements in average attainments within poorer quintiles have been relatively slower than the improvements in richer quintiles, but for Zambia, improvements in average quintiles have been relatively faster 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 MPI.

6. Conclusions

In this paper, we first present a quantile-based framework for studying whether the overall progress in well-being is being inclusive to the poorer for indicators of well-being that are non-monetary in nature and are naturally bounded. To ensure consistent assessment of well-being changes as well as inclusiveness across attainments and shortfalls, we propose resorting to absolute changes in well-being, where our proposed well-being measure is a quantile-weighted sum of quantile averages. We characterise the restrictions on quantile-weights based on certain key axioms and through additive decomposition we show that the overall change in well-being can be broken down into two components: (i) change in the average attainment and (ii) inclusivity premium that captures the extent to which the overall change in well-being is shared with the poorer. We further

propose a methodology for checking the robustness of well-being changes and inclusivity premiums with respect to alternative sets of quantile-weights.

For empirical assessment of well-being, we resort to the well-known counting framework that has been widely adopted for multidimensional poverty measurement. The measure of well-being that we use is closely connected to the global multidimensional poverty index. We use the complement of the deprivation score, which captures the breadth of deprivations in the multidimensional poverty measurement framework, as attainment. Out of the 80 developing countries that we use for our analysis, we observe statistically significant increase in well-being for 77 countries. Out of all the statistically significant improvements, we observe robust well-being increases 75 countries. For one country, we observe robust well-being reduction. However, our analysis of inclusivity premium does not reflect such a rosy picture. Only three-quarters of all countries register positive inclusivity premium. In other words, for only 60 countries the progress in average attainment has been inclusive for the poorer. For the rest of the 20 countries, the inclusivity premiums are either negative or not statistically significantly different from zero. Moreover, out of the 60 countries with statistically significantly positive inclusivity premiums, only 47 are robust to alternative quantile-weight vectors and 13 are not robust. Similarly, statistically significantly negative inclusivity premiums are robust seven countries.

Geographical decomposition shows wide variation in inclusiveness across regions. Out of the 80 countries in our analysis, 35 countries are from the sub-Saharan African region and the rest of the 45 countries are distributed across Arab, East Asia and the Pacific, Europe and Central Asian, Latin America and Caribbean and South Asian regions. Out of the 60 countries that have resulted in statistically significantly positive inclusivity premiums, only 18 are from sub-Saharan African regions and 42 are from the other five regions. Out of the 47 such robust comparisons, only 11 are from the sub-Saharan African region. While 80 percent of all countries (i.e., 36 out of 45) from other five geographical regions show robust positive inclusiveness, only less than a third of all countries in the sub-Saharan African region are claimed to have shown robust positive inclusiveness. In fact, 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 link our approach to assessing inclusiveness of well-being to that of the World Bank's monetary shared prosperity analysis as well as the well-known Multidimensional Poverty Index. We observed a non-linear relationship with both these measures through cross-country analysis – meaning neither higher monetary shared prosperity nor faster reduction in multidimensional poverty is necessarily associated with inclusive improvement in well-being over time. We present an illustration of two countries showing how an improvement in well-being may remain non-inclusive to poorer section of the 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 analyses inclusiveness of well-being changes using five quintiles across countries, but our proposed framework may have wider applications. First, our general framework may be easily extended for any number of quantiles. Second, we analyse inclusiveness of well-being changes across different countries, but our framework may be easily used to study and analyse inclusiveness of well-being changes within different regions of a country,

which may be useful pro-poor progress within different regions of a country. Finally, we use 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 or well-being that may have attainment and shortfall representation.

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Appendix

Proof of proposition 1

For some $F_1 \in \mathcal{F}_1$, $F_2 \in \mathcal{F}_2$ 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 straightforwardly 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 $F_1 \in \mathcal{F}_1$ and $F_2, F_2' \in \mathcal{F}_2$ 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 $F_1 \in \mathcal{F}_1$ and $F_2, F_2' \in \mathcal{F}_2$ 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 $\{q', q'' | \, q' < q''\} \in \mathcal{Q}$, which This completes our proof for the necessity part. ■

Proof of proposition 2

From equation (3), we obtain the inclusivity premium as $S(F_1, F_2; \omega) = \Delta - \overline{\Delta} = \sum_{q=1}^{Q} \omega_q (\Delta_q - \overline{\Delta})$. 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:[19]

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

[19] It is also known as Abel's lemma (Guenther and Lee, 1988) or Abel's formula (Fishburn and Lavalle, 1995, p. 518).

Now, 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, $S(F_1, F_2; \omega) > 0$.

We next prove the necessity part by showing that $S < 0$ whenever $\omega_q < \omega_{q+1}$ for some q and $S = 0$ 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, $S = \omega_1\Delta_1 + \omega_2\Delta_2$. 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, $S < 0$. For the second part, by definition, $\overline{\Delta} = \left[\sum_{q=1}^{Q} \Delta_q\right]/Q$ and so $S(F_1, F_2; \overline{\omega}) = \sum_{q=1}^{Q} \overline{\omega}_q\left(\Delta_q - \overline{\Delta}\right) = \frac{1}{Q}\sum_{q=1}^{Q}\left(\Delta_q - \overline{\Delta}\right) = 0$, which completes our proof.

Table A1: Quintile-wise average attainment scores and overall average attainment scores across countries

		Survey		Year		Overall			Poorest Quintile			2nd Poorest Quintile			Middle Quintile			2nd Richest Quintile			Richest Quintile		
Country (ISO)	Region	1st	2nd	1st	2nd	$\mu(F_1)$	$\mu(F_2)$	$\bar{\Delta}$	$\mu_1(F_1)$	$\mu_1(F_2)$	Δ_1	$\mu_2(F_1)$	$\mu_2(F_2)$	Δ_2	$\mu_3(F_1)$	$\mu_3(F_2)$	Δ_3	$\mu_4(F_1)$	$\mu_4(F_2)$	Δ_4	$\mu_5(F_1)$	$\mu_5(F_2)$	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	0.97***	82.8	84.9	0.29***	92.0	98.5	0.94***	100.0	100.0	0.00	100.0	100.0	0.00
Jordan (JOR)	ARS	DHS	DHS	2012	2018	97.8	98.2	0.06***	89.2	90.9	0.28***	100.0	100.0	0.00	100.0	100.0	0.00	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	0.76***	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	0.92***	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	0.96***	63.8	70.8	1.74***	78.6	83.4	1.19***	87.0	91.3	1.08***	95.0	98.2	0.79***	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	2012	2017	71.0	80.1	1.83***	35.2	51.1	3.18***	60.1	73.8	2.74***	75.5	85.6	2.02***	89.0	94.3	1.07***	95.2	95.8	0.12***
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	2016	94.2	95.1	0.23***	79.0	80.6	0.40***	93.0	95.1	0.50***	98.9	100.0	0.27***	100.0	100.0	0.00	100.0	100.0	0.00
Timor-Leste (TLS)	EAP	DHS	DHS	2010	2016	58.2	69.1	1.83***	29.6	43.2	2.28***	47.1	60.7	2.26***	58.5	70.3	1.96***	69.9	79.6	1.61***	85.8	91.9	1.03***
Viet Nam (VNM)	EAP	MICS	MICS	2011	2014	90.7	91.7	0.34***	69.2	70.4	0.42*	89.5	91.3	0.62***	94.9	96.8	0.66***	100.0	100.0	0.00	100.0	100.0	0.00
Albania (ALB)	ECA	DHS	DHS	2009	2018	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
Armenia (ARM)	ECA	DHS	DHS	2010	2016	96.6	97.1	0.08***	86.5	89.0	0.42***	96.4	96.4	0.00	100.0	100.0	0.00	100.0	100.0	0.00	100.0	100.0	0.00
Bosnia and Herzegovina (BIH)	ECA	MICS	MICS	2006	2012	93.1	94.0	0.15***	77.7	84.7	1.18***	93.6	94.4	0.14***	94.4	94.4	0.00	99.9	96.5	-0.56***	100.0	100.0	0.00
Guyana (GUY)	ECA	DHS	MICS	2009	2014	92.3	94.5	0.43***	72.8	77.7	0.99***	90.9	94.7	0.76***	98.1	100.0	0.39***	100.0	100.0	0.00	100.0	100.0	0.00
Kazakhstan (KAZ)	ECA	MICS	MICS	2011	2015	95.0	97.1	0.53***	82.0	87.0	1.25***	94.2	98.6	1.09***	98.8	100.0	0.29***	100.0	100.0	0.00	100.0	100.0	0.00
Kyrgyzstan (KGZ)	ECA	MICS	MICS	2006	2014	86.9	91.4	0.57***	68.3	75.5	0.90***	82.1	88.8	0.83***	89.2	94.4	0.65***	94.9	98.4	0.44***	100.0	100.0	0.00
Macedonia (MKD)	ECA	MICS	MICS	2006	2011	92.7	96.0	0.66***	73.5	85.3	2.35***	93.5	94.5	0.22***	96.4	100.0	0.71***	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	0.28***
Montenegro (MNE)	ECA	MICS	MICS	2006	2013	95.3	95.2	-0.01	82.9	85.1	0.32*	94.4	94.4	0.00***	99.0	96.3	-0.39***	100.0	100.0	0.00	100.0	100.0	0.00
Serbia (SRB)	ECA	MICS	MICS	2010	2014	96.4	96.7	0.06**	87.5	88.7	0.30***	94.7	94.6	-0.01	100.0	100.0	0.00	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	0.95***	76.9	81.5	0.91***	85.9	90.6	0.94***	93.2	94.9	0.33***	99.3	100.0	0.14***
Turkmenistan (TKM)	ECA	MICS	MICS	2006	2016	91.6	95.5	0.39***	75.7	81.7	0.60***	87.6	95.7	0.81***	94.6	100.0	0.54***	100.0	100.0	0.00	100.0	100.0	0.00
Ukraine (UKR)	ECA	DHS	MICS	2007	2012	97.9	99.0	0.22***	89.5	94.8	1.07***	99.8	100.0	0.04***	100.0	100.0	0.00	100.0	100.0	0.00	100.0	100.0	0.00
Belize (BLZ)	LAC	MICS	MICS	2011	2016	91.5	92.6	0.21***	71.1	74.1	0.61***	88.6	90.5	0.38***	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***	78.2	89.2	2.19***	88.9	95.6	1.34***	95.0	100.0	1.01***
Colombia (COL)	LAC	DHS	DHS	2010	2016	93.1	94.1	0.17***	73.3	75.6	0.39***	92.2	95.0	0.47***	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	1.29***	87.2	94.2	1.00***	94.3	100.0	0.81***	96.4	100.0	0.52***	100.0	100.0	0.00
Haiti (HTI)	LAC	DHS	DHS	2012	2017	67.9	71.3	0.69***	38.7	41.7	0.61***	56.9	62.1	1.05***	70.3	74.6	0.87***	81.5	84.8	0.65***	92.1	93.4	0.27***
Honduras (HND)	LAC	DHS	DHS	2006	2012	72.6	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	0.40	88.2	89.3	0.26***	94.5	94.4	-0.01	100.0	99.8	-0.05***	100.0	100.0	0.00
Mexico (MEX)	LAC	ENS	ENS	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	2012	71.3	85.3	1.27***	33.6	57.8	2.20***	58.9	80.0	1.92***	76.4	91.1	1.34***	89.0	97.4	0.77***	98.7	100.0	0.11***
Peru (PER)	LAC	DHS	END	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	93.0	0.51***	62.8	70.4	1.91***	92.8	94.8	0.52***	99.5	100.0	0.11***	100.0	100.0	0.00	100.0	100.0	0.00
Trinidad and Tobago (TTO)	LAC	MICS	MICS	2006	2011	96.3	96.1	-0.03	83.3	82.3	-0.19	98.0	98.3	0.06**	100.0	100.0	0.00	100.0	100.0	0.00	100.0	100.0	0.00
Afghanistan (AFG)	SAS	MICS	DHS	2011	2016	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	90.3	1.22***
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	2006	2016	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***	96.1	97.6	0.31***

		Survey		Year		Overall			Poorest Quintile			2nd Poorest Quintile			Middle Quintile			2nd Richest Quintile			Richest Quintile		
Country (ISO)	Region	1st	2nd	1st	2nd	$\mu(F_1)$	$\mu(F_2)$	$\bar{\Delta}$	$\mu_1(F_1)$	$\mu_1(F_2)$	Δ_1	$\mu_2(F_1)$	$\mu_2(F_2)$	Δ_2	$\mu_3(F_1)$	$\mu_3(F_2)$	Δ_3	$\mu_4(F_1)$	$\mu_4(F_2)$	Δ_4	$\mu_5(F_1)$	$\mu_5(F_2)$	Δ_5
Pakistan (PAK)	SAS	DHS	DHS	2013	2018	70.1	73.6	0.70***	33.5	36.6	0.62***	57.6	61.9	0.84***	73.5	79.1	1.13***	87.2	90.5	0.66***	98.7	100.0	0.25***
Benin (BEN)	SSA	MICS	DHS	2014	2018	59.2	58.0	-0.30***	26.5	25.5	-0.25**	45.9	44.6	-0.33***	60.0	58.7	-0.33***	73.9	72.3	-0.40***	89.6	88.8	-0.19***
Burkina Faso (BFA)	SSA	MICS	DHS	2006	2010	37.1	40.3	0.81***	6.9	9.5	0.65***	22.3	24.8	0.62***	35.0	37.8	0.71***	48.8	52.1	0.83***	72.7	77.5	1.22***
Burundi (BDI)	SSA	DHS	DHS	2010	2017	49.9	54.1	0.59***	23.5	26.0	0.36***	38.1	42.6	0.64***	50.5	54.4	0.56***	59.8	65.8	0.85***	77.7	81.6	0.55***
Cameroon (CMR)	SSA	DHS	MICS	2011	2014	66.8	68.3	0.51***	29.6	31.3	0.60**	54.3	56.1	0.62***	70.7	72.2	0.49***	83.8	85.4	0.56***	95.8	96.6	0.28***
Central African Republic (CAF)	SSA	MICS	MICS	2000	2010	40.4	48.0	0.76***	11.8	17.3	0.55***	27.7	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	2015	38.0	40.0	0.39***	9.5	11.6	0.42***	24.1	27.1	0.61***	36.0	37.8	0.34***	49.5	51.6	0.40***	70.7	71.7	0.20
Congo, DR (COD)	SSA	DHS	DHS	2007	2014	51.8	55.8	0.58***	24.2	28.4	0.60***	37.5	46.6	1.29***	51.4	55.1	0.53***	63.8	67.4	0.51***	81.9	81.6	-0.05
Cote D'Ivoire (CIV)	SSA	DHS	MICS	2012	2016	62.4	69.3	1.72***	30.0	35.8	1.44***	50.3	56.4	1.54***	63.1	71.9	2.21***	76.2	84.8	2.16***	92.4	97.4	1.26***
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***	16.1	20.7	0.94***	32.9	35.0	0.41***	40.3	47.3	1.40***	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	1.05***	68.4	79.7	0.94***	80.7	91.1	0.86***	92.6	96.1	0.29***	99.4	100.0	0.05***
Gambia (GMB)	SSA	MICS	DHS	2006	2013	55.8	64.4	1.24***	21.3	33.4	1.73***	41.8	52.7	1.55***	56.8	66.0	1.33***	71.2	78.0	0.97***	87.6	91.9	0.61***
Ghana (GHA)	SSA	MICS	DHS	2011	2014	75.2	78.0	0.90***	45.4	52.3	2.32***	67.8	71.3	1.17***	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	0.70***	36.7	43.4	1.12***	50.7	56.5	0.96***	66.3	71.4	0.86***	85.3	88.4	0.51***
Kenya (KEN)	SSA	DHS	DHS	2009	2014	65.7	70.1	0.87***	40.4	45.8	1.09***	57.0	63.1	1.23***	68.3	73.1	0.95***	75.5	79.5	0.80***	87.5	89.0	0.30***
Lesotho (LSO)	SSA	DHS	DHS	2009	2014	68.7	74.7	1.20***	42.8	49.0	1.25***	58.9	66.1	1.44***	69.5	75.8	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***	23.0	31.3	1.39***	37.2	50.8	2.27***	50.2	60.5	1.73***	60.3	72.6	2.06***	78.1	85.2	1.19***
Madagascar (MDG)	SSA	DHS	MICS	2009	2018	52.1	56.9	0.53***	24.4	26.3	0.21***	37.9	43.9	0.67***	51.6	56.3	0.52***	63.8	71.4	0.85***	83.0	86.4	0.37***
Malawi (MWI)	SSA	DHS	DHS	2010	2016	59.2	65.8	1.09***	33.0	41.3	1.37***	51.6	57.5	0.98***	59.3	67.1	1.29***	70.0	75.5	0.93***	82.3	87.4	0.86***
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	2007	2013	71.6	75.7	0.69***	42.2	47.7	0.91***	60.2	66.2	1.00***	72.9	77.1	0.70***	84.3	88.3	0.67***	98.4	99.3	0.15***
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	1.48***	64.9	71.3	1.06***
Nigeria (NGA)	SSA	DHS	DHS	2013	2018	64.1	66.7	0.53***	25.8	28.6	0.58***	50.8	54.9	0.81***	67.9	71.4	0.71***	81.8	83.8	0.40***	94.1	94.9	0.17***
Republic of Congo (COG)	SSA	DHS	MICS	2005	2015	66.1	79.0	1.29***	38.7	51.1	1.24***	55.3	72.4	1.71***	68.1	82.8	1.46***	77.1	91.4	1.42***	91.1	97.3	0.62***
Rwanda (RWA)	SSA	DHS	DHS	2010	2015	58.4	65.4	1.40***	32.4	40.2	1.57***	48.8	56.1	1.45***	58.2	66.6	1.67***	69.0	76.0	1.41***	83.5	87.9	0.89***
Sao Tome and Principe (STP)	SSA	DHS	MICS	2009	2014	73.1	81.9	1.77***	45.6	57.4	2.36***	63.2	74.3	2.22***	74.7	85.2	2.10***	85.5	93.1	1.52***	96.3	99.7	0.67***
Senegal (SEN)	SSA	DHS	DHS	2005	2017	57.9	65.5	0.63***	18.7	30.5	0.99***	40.1	50.5	0.87***	57.4	66.9	0.79***	76.3	82.1	0.48***	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	2.51***	53.9	63.8	2.47***	66.4	76.0	2.40***	82.5	88.3	1.45***
Tanzania (TZA)	SSA	DHS	DHS	2010	2016	59.3	63.5	0.71***	32.3	35.7	0.57***	50.8	53.4	0.44***	58.6	64.6	0.99***	70.1	74.7	0.78***	84.6	89.2	0.76***
Togo (TGO)	SSA	MICS	DHS	2010	2014	61.1	62.2	0.28***	26.4	27.0	0.15	49.1	50.5	0.36***	63.2	65.2	0.52***	76.5	77.0	0.12*	90.3	91.2	0.23***
Uganda (UGA)	SSA	DHS	DHS	2011	2016	58.2	63.7	1.09***	30.7	36.3	1.13***	49.9	54.2	0.87***	57.9	65.0	1.42***	69.9	75.0	1.02***	82.9	88.0	1.01***
Zambia (ZMB)	SSA	DHS	DHS	2007	2014	59.7	65.4	0.81***	29.5	36.6	1.02***	47.1	54.6	1.08***	58.7	66.4	1.09***	72.1	77.0	0.70***	91.2	92.2	0.13*
Zimbabwe (ZWE)	SSA	DHS	DHS	2011	2015	73.0	75.2	0.55***	48.4	51.0	0.66***	63.8	67.1	0.82***	74.1	75.8	0.43***	82.5	85.2	0.67***	96.2	97.0	0.20***

Source: Authors' own computations.

Statistical significance: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

Notes: $\bar{\Delta}$ is the annual absolute change in overall average; Δ_q 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; LAP: 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; ENS: Mexico National Survey of Health and Nutrition; END: Peru Demographic and Family Health Survey.

Table A2: Robustness of changes in well-being and of inclusivity premium for 80 countries

				Well-being (ω^1)				Well-being (ω^2)				Well-being (ω^3)				Robust	
Country	Region	Year1	Year2	W_1	W_2	Δ	S	W_1	W_2	Δ	S	W_1	W_2	Δ	S	Δ	S
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	0.97***	0.53***	73.8	78.2	0.63***	0.19***	79.9	85.0	0.73***	0.29***	Yes	Yes
Jordan	ARS	2012	2018	89.2	90.9	0.28***	0.22***	94.6	95.5	0.14***	0.08***	96.4	97.0	0.09***	0.04***	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***	0.34***	49.4	55.5	1.52***	0.26***	56.6	62.4	1.46***	0.20***	Yes	Yes
China	EAP	2010	2014	63.8	70.8	1.74***	0.78***	71.2	77.1	1.47***	0.51***	76.5	81.8	1.34***	0.38***	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	2012	2017	35.2	51.1	3.18***	1.36***	47.7	62.5	2.96***	1.14***	56.9	70.2	2.65***	0.82***	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	0.70***	0.13***	Yes	Yes
Thailand	EAP	2012	2016	79.0	80.6	0.40***	0.16***	86.0	87.8	0.45***	0.21***	90.3	91.9	0.39***	0.16***	Yes	Yes
Timor-Leste	EAP	2010	2016	29.6	43.2	2.28***	0.45***	38.3	51.9	2.27***	0.44***	45.0	58.1	2.17***	0.34***	Yes	Yes
Viet Nam	EAP	2011	2014	69.2	70.4	0.42*	0.08	79.3	80.9	0.52***	0.18***	84.5	86.2	0.57***	0.23***	Yes	No
Albania	ECA	2009	2018	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
Armenia	ECA	2010	2016	86.5	89.0	0.42***	0.34***	91.4	92.7	0.21***	0.13***	94.3	95.1	0.14***	0.06***	Yes	Yes
Bosnia and Herzegovina	ECA	2006	2012	77.7	84.7	1.18***	1.03***	85.6	89.6	0.66***	0.51***	88.6	91.2	0.44***	0.29***	Yes	Yes
Guyana	ECA	2009	2014	72.8	77.7	0.99***	0.56***	81.8	86.2	0.88***	0.45***	87.2	90.8	0.72***	0.29***	Yes	Yes
Kazakhstan	ECA	2011	2015	82.0	87.0	1.25***	0.72***	88.1	92.8	1.17***	0.64***	91.7	95.2	0.88***	0.35***	Yes	Yes
Kyrgyzstan	ECA	2006	2014	68.3	75.5	0.90***	0.34***	75.2	82.2	0.87***	0.30***	79.9	86.3	0.80***	0.23***	Yes	Yes
Macedonia	ECA	2006	2011	73.5	85.3	2.35***	1.69***	83.5	89.9	1.28***	0.63***	87.8	93.3	1.09***	0.44***	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***	0.10	66.7	70.9	1.37***	0.08	71.9	76.1	1.41***	0.12***	Yes	No
Montenegro	ECA	2006	2013	82.9	85.1	0.32*	0.33**	88.7	89.8	0.16*	0.17***	92.1	91.9	-0.02	-0.01	No	No
Serbia	ECA	2010	2014	87.5	88.7	0.30***	0.24***	91.1	91.7	0.14**	0.09**	94.1	94.5	0.10**	0.04**	Yes	Yes
Tajikistan	ECA	2012	2017	64.5	69.2	0.95***	0.29***	70.7	75.3	0.93***	0.27***	75.8	80.4	0.93***	0.28***	Yes	Yes
Turkmenistan	ECA	2006	2016	75.7	81.7	0.60***	0.21***	81.6	88.7	0.70***	0.31***	85.9	92.4	0.65***	0.26***	Yes	Yes
Ukraine	ECA	2007	2012	89.5	94.8	1.07***	0.85***	94.7	97.4	0.55***	0.33***	96.4	98.3	0.37***	0.15***	Yes	Yes
Belize	LAC	2011	2016	71.1	74.1	0.61***	0.41**	79.8	82.3	0.50***	0.29***	85.9	87.6	0.35***	0.14***	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	2016	73.3	75.6	0.39***	0.21***	82.7	85.3	0.43***	0.25***	88.4	90.2	0.29***	0.12***	Yes	Yes
Dominican Republic	LAC	2007	2014	69.5	78.5	1.29***	0.57***	78.3	86.4	1.15***	0.42***	83.7	90.9	1.04***	0.31***	Yes	Yes
Haiti	LAC	2012	2017	38.7	41.7	0.61***	-0.08	47.8	51.9	0.83***	0.14***	55.3	59.5	0.84***	0.15***	Yes	No
Honduras	LAC	2006	2012	39.1	53.5	2.39***	0.89***	50.5	64.1	2.27***	0.78***	58.8	71.1	2.05***	0.56***	Yes	Yes
Jamaica	LAC	2010	2014	74.2	75.8	0.40	0.28	81.2	82.5	0.33**	0.21***	85.6	86.5	0.22**	0.10***	No	No
Mexico	LAC	2012	2016	73.3	75.2	0.47***	0.35***	83.3	84.4	0.27***	0.16***	88.8	89.6	0.20***	0.08***	Yes	Yes
Nicaragua	LAC	2001	2012	33.6	57.8	2.20***	0.93***	46.3	68.9	2.06***	0.79***	56.3	76.3	1.82***	0.55***	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	70.4	1.91***	1.40***	77.8	82.6	1.21***	0.70***	85.0	88.4	0.84***	0.34***	Yes	Yes
Trinidad and Tobago	LAC	2006	2011	83.3	82.3	-0.19	-0.16	90.6	90.3	-0.06	-0.04	93.8	93.5	-0.04	-0.02	No	No
Afghanistan	SAS	2011	2016	19.0	23.1	0.81***	-0.64***	29.0	35.0	1.20***	-0.24***	36.6	43.6	1.40***	-0.04	Yes	No

				Well-being (ω^1)				Well-being (ω^2)				Well-being (ω^3)				Robust	
Country	Region	Year1	Year2	W_1	W_2	Δ	S	W_1	W_2	Δ	S	W_1	W_2	Δ	S	Δ	S
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	2006	2016	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***	0.48***	Yes	Yes
Pakistan	SAS	2013	2018	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
Benin	SSA	2014	2018	26.5	25.5	-0.25**	0.05	36.2	35.0	-0.29***	0.01	44.1	42.9	-0.30***	0.00	Yes	No
Burkina Faso	SSA	2006	2010	6.9	9.5	0.65***	-0.16**	14.6	17.2	0.63***	-0.17***	21.4	24.0	0.66***	-0.15***	Yes	Yes
Burundi	SSA	2010	2017	23.5	26.0	0.36***	-0.23***	30.8	34.3	0.50***	-0.09***	37.4	41.0	0.52***	-0.07***	Yes	Yes
Cameroon	SSA	2011	2014	29.6	31.3	0.60**	0.09	41.9	43.7	0.61***	0.10	51.5	53.2	0.57***	0.06	Yes	No
Central African Republic	SSA	2000	2010	11.8	17.3	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	2015	9.5	11.6	0.42***	0.02	16.8	19.4	0.51***	0.12***	23.2	25.5	0.46***	0.06**	Yes	No
Congo, DR	SSA	2007	2014	24.2	28.4	0.60***	0.03	30.9	37.5	0.95***	0.37***	37.7	43.4	0.81***	0.23***	Yes	No
Cote D'Ivoire	SSA	2012	2016	30.0	35.8	1.44***	-0.28**	40.1	46.1	1.49***	-0.23***	47.8	54.7	1.73***	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	16.1	20.7	0.94***	0.01	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	1.05***	0.41***	57.5	69.4	0.99***	0.36***	65.2	76.6	0.95***	0.31***	Yes	Yes
Gambia	SSA	2006	2013	21.3	33.4	1.73***	0.49***	31.6	43.0	1.64***	0.40***	40.0	50.7	1.53***	0.30***	Yes	Yes
Ghana	SSA	2011	2014	45.4	52.3	2.32***	1.42***	56.6	61.8	1.75***	0.84***	64.2	68.3	1.37***	0.46***	Yes	Yes
Guinea	SSA	2012	2018	19.7	24.0	0.70***	-0.13*	28.2	33.7	0.91***	0.08*	35.7	41.3	0.93***	0.10***	Yes	No
Kenya	SSA	2009	2014	40.4	45.8	1.09***	0.22	48.7	54.5	1.16***	0.29***	55.2	60.7	1.09***	0.22***	Yes	No
Lesotho	SSA	2009	2014	42.8	49.0	1.25***	0.05	50.8	57.6	1.35***	0.15***	57.0	63.6	1.32***	0.12***	Yes	No
Liberia	SSA	2007	2013	23.0	31.3	1.39***	-0.34***	30.1	41.0	1.83***	0.10**	36.8	47.5	1.79***	0.07**	Yes	No
Madagascar	SSA	2009	2018	24.4	26.3	0.21***	-0.31***	31.1	35.1	0.44***	-0.08***	37.9	42.2	0.47***	-0.06***	Yes	Yes
Malawi	SSA	2010	2016	33.0	41.3	1.37***	0.29***	42.3	49.4	1.18***	0.09***	48.0	55.3	1.21***	0.13***	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	2007	2013	42.2	47.7	0.91***	0.22**	51.2	56.9	0.95***	0.27***	58.4	63.7	0.87***	0.18***	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	0.58***	0.04	38.3	41.8	0.69***	0.16***	48.2	51.6	0.70***	0.16***	Yes	No
Republic of Congo	SSA	2005	2015	38.7	51.1	1.24***	-0.05	47.0	61.7	1.47***	0.18***	54.1	68.7	1.47***	0.18***	Yes	No
Rwanda	SSA	2010	2015	32.4	40.2	1.57***	0.17***	40.6	48.2	1.51***	0.11***	46.5	54.3	1.57***	0.17***	Yes	Yes
Sao Tome and Principe	SSA	2009	2014	45.6	57.4	2.36***	0.58***	54.4	65.8	2.29***	0.51***	61.2	72.3	2.22***	0.45***	Yes	Yes
Senegal	SSA	2005	2017	18.7	30.5	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	2.24***	0.13***	Yes	No
Tanzania	SSA	2010	2016	32.3	35.7	0.57***	-0.14**	41.5	44.6	0.51***	-0.20***	47.2	51.2	0.67***	-0.04**	Yes	Yes
Togo	SSA	2010	2014	26.4	27.0	0.15	-0.12	37.7	38.8	0.26**	-0.02	46.2	47.6	0.35***	0.07*	No	No
Uganda	SSA	2011	2016	30.7	36.3	1.13***	0.04	40.3	45.3	1.00***	-0.09*	46.2	51.8	1.14***	0.05*	Yes	No
Zambia	SSA	2007	2014	29.5	36.6	1.02***	0.22***	38.3	45.6	1.05***	0.24***	45.1	52.5	1.06***	0.26***	Yes	Yes
Zimbabwe	SSA	2011	2015	48.4	51.0	0.66***	0.10	56.1	59.1	0.74***	0.18***	62.1	64.6	0.63***	0.08***	Yes	No

Source: Authors' own computations. *Statistical significance*: ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$. *Notes*: 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. *Regions*: ARS: Arab States; EAP: East Asia and the Pacific; ECA: Europe and Central Asia; LAP: Latin America and Caribbean; SAS: South Asia; SSA: Sub-Saharan Africa.

Table A3: Inclusivity premiums, shared prosperity premiums and changes in MPIs and MPI-headcount ratios

		Year		Well-being			MPI			H			Income Growth				
Country	Region	1st	2nd	W_1	W_2	S	MPI_1	MPI_2	ΔMPI	H_1	H_2	ΔH (%pt)	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 ***					
Jordan	ARS	2012	2018	94.0	94.9	0.10 ***	0.002	0.002	0.000	0.5	0.4	0.0					
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	49.6	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 ***	0.040	0.018	-0.006 ***	9.4	4.3	-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	2012	2017	48.0	62.5	1.08 ***	0.211	0.108	-0.021 ***	40.4	23.1	-3.5 ***	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	2016	85.9	87.5	0.18 ***	0.005	0.003	0.000 *	1.4	0.9	-0.1 **	2015	2019	0.1	0.7	0.6
Timor-Leste	EAP	2010	2016	38.6	52.1	0.41 ***	0.362	0.215	-0.024 ***	69.6	46.9	-3.8 ***					
Viet Nam	EAP	2011	2014	78.8	80.3	0.17 **	0.039	0.036	-0.001	9.3	8.8	-0.2	2014	2018	6.5	5.8	-0.7
Albania	ECA	2009	2018	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
Armenia	ECA	2010	2016	91.3	92.7	0.15 ***	0.001	0.001	0.000 *	0.4	0.2	0.0 *	2013	2018	2.4	1.3	-1.1
Bosnia and Herzegovina	ECA	2006	2012	84.9	89.1	0.54 ***	0.015	0.008	-0.001 ***	3.9	2.2	-0.3 ***					
Guyana	ECA	2009	2014	81.6	85.9	0.42 ***	0.023	0.014	-0.002 *	5.5	3.3	-0.4 **					
Kazakhstan	ECA	2011	2015	87.9	92.3	0.57 ***	0.003	0.002	0.000 **	0.9	0.5	-0.1 **	2013	2018	-0.2	-0.3	-0.1
Kyrgyzstan	ECA	2006	2014	75.3	82.1	0.28 ***	0.036	0.013	-0.003 ***	9.4	3.4	-0.7 ***	2014	2019	2.7	1.8	-0.9
Macedonia	ECA	2006	2011	82.8	90.0	0.80 ***	0.031	0.008	-0.005 ***	7.8	2.0	-1.1 ***	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	66.7	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	2006	2013	88.5	89.5	0.15 **	0.015	0.011	-0.001	3.5	3.0	-0.1	2012	2016	3.2	6.3	3.2
Serbia	ECA	2010	2014	91.3	92.0	0.11 **	0.001	0.001	0.000	0.2	0.4	0.0	2013	2017	1.5	3.9	2.4
Tajikistan	ECA	2012	2017	71.0	75.7	0.28 ***	0.049	0.029	-0.004 ***	12.2	7.4	-1.0 ***					
Turkmenistan	ECA	2006	2016	81.7	88.4	0.27 ***	0.013	0.004	-0.001 ***	3.4	1.0	-0.2 ***					
Ukraine	ECA	2007	2012	94.1	97.1	0.38 ***	0.001	0.001	0.000	0.4	0.2	0.0	2014	2019	2.8	1.7	-1.1
Belize	LAC	2011	2016	79.9	82.3	0.26 ***	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	2016	82.5	84.8	0.20 ***	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
Haiti	LAC	2012	2017	48.3	52.2	0.09 **	0.237	0.192	-0.009 ***	48.4	39.9	-1.7 ***					
Honduras	LAC	2006	2012	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	2012	46.8	68.9	0.74 ***	0.221	0.074	-0.013 ***	41.7	16.5	-2.3 ***					
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	0.74 ***	0.059	0.037	-0.006 ***	12.8	8.4	-1.1 ***					
Trinidad and Tobago	LAC	2006	2011	90.0	89.6	-0.06	0.021	0.018	-0.001	5.7	5.0	-0.1					
Afghanistan	SAS	2011	2016	29.3	35.2	-0.26 ***	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 ***					

		Year		Well-being			MPI			H			Income Growth				
Country	Region	1st	2nd	W_1	W_2	S	MPI_1	MPI_2	ΔMPI	H_1	H_2	ΔH (%pt)	Year1	Year2	G	G_{40}	SPP
India	SAS	2006	2016	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	2013	2018	46.0	49.8	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	2018	36.7	35.5	0.01	0.346	0.362	0.004	63.2	66.0	0.7 *					
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	2017	31.4	34.7	-0.12 ***	0.464	0.409	-0.008 ***	82.3	75.1	-1.0 ***					
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	2015	17.3	19.7	0.08 **	0.600	0.578	-0.004 **	90.0	89.4	-0.1					
Congo, DR	SSA	2007	2014	31.7	37.4	0.25 ***	0.439	0.388	-0.007 ***	77.6	73.7	-0.6 *					
Cote D'Ivoire	SSA	2012	2016	40.4	46.7	-0.16 **	0.310	0.236	-0.019 ***	58.9	46.1	-3.2 ***					
Eswatini	SSA	2010	2014	60.3	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	2006	2013	32.1	43.5	0.39 ***	0.387	0.281	-0.015 ***	68.0	54.7	-1.9 ***					
Ghana	SSA	2011	2014	56.6	61.9	0.84 ***	0.149	0.116	-0.011 ***	31.1	26.2	-1.7 ***	2012	2016	1.3	-0.2	-1.5
Guinea	SSA	2012	2018	28.8	34.0	0.04	0.433	0.373	-0.010 ***	72.8	66.3	-1.1 ***					
Kenya	SSA	2009	2014	49.0	54.6	0.25 ***	0.247	0.179	-0.014 ***	52.2	38.9	-2.7 ***					
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	41.1	-0.01	0.464	0.328	-0.023 ***	81.6	63.9	-3.0 ***					
Madagascar	SSA	2009	2018	31.9	35.5	-0.12 ***	0.433	0.372	-0.007 ***	75.7	67.4	-0.9 ***					
Malawi	SSA	2010	2016	42.1	49.5	0.15 ***	0.339	0.252	-0.014 ***	68.1	54.2	-2.3 ***	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	2007	2013	51.6	57.1	0.23 ***	0.205	0.159	-0.008 ***	43.0	35.4	-1.3 ***					
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	2015	47.5	61.7	0.13 ***	0.258	0.114	-0.014 ***	53.8	24.7	-2.9 ***					
Rwanda	SSA	2010	2015	40.7	48.4	0.14 ***	0.357	0.259	-0.020 ***	70.2	54.4	-3.2 ***	2013	2016	-0.1	0.3	0.5
Sao Tome and Principe	SSA	2009	2014	54.7	66.1	0.51 ***	0.185	0.092	-0.019 ***	40.7	22.1	-3.7 ***					
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	2016	41.4	44.8	-0.14 ***	0.342	0.285	-0.010 ***	67.8	57.1	-1.8 ***	2011	2018	0.9	-0.2	-1.1
Togo	SSA	2010	2014	38.0	39.1	-0.01	0.316	0.301	-0.004	57.5	55.3	-0.5					
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	2014	38.6	45.9	0.24 ***	0.349	0.270	-0.011 ***	65.9	54.6	-1.6 ***					
Zimbabwe	SSA	2011	2015	56.4	59.1	0.13 ***	0.176	0.147	-0.007 ***	40.1	34.0	-1.5 ***	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 https://ophi.org.uk/multidimensional-poverty-index/data-tables-do-files/ and the shared prosperity figures were obtained from https://www.worldbank.org/en/topic/poverty/brief/global-database-of-shared-prosperity.

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: Annualised absolute change in MPI; ΔH: Annualised absolute change in H in percentage points; G: Annualised growth in the average income; G_{40}: Annualised growth in the average income of the bottom 40%; SPP: Shared prosperity premium (G_{40} - G).