

The Role of Inclusive Growth in Ending Extreme Poverty

Christoph Lakner

Mario Negre

Espen Beer Prydz *

Abstract

The goal of eradicating extreme poverty by 2030 is becoming increasingly prominent in international development. This paper simulates a set of scenarios for poverty from 2011 to 2030, under different assumptions for growth and the degree to which this growth is inclusive. When holding within-country inequality unchanged and per capita growth similar to recent decades, our baseline simulations suggest that the number of extreme poor (living below \$1.25/day) will remain above 450 million in 2030, resulting in a global extreme poverty rate above 5.4%. However, if the incomes of the bottom 40% in each country grow 2pp faster than the mean, the global poverty rate could reach 3% in 2030. Conversely, it would increase beyond 11% in 2030 if the bottom 40% grows 2pp slower than the mean. Our main findings hold up when we use the 2011 PPPs, rather than the 2005 PPPs. We also test the robustness of our results to alternative growth scenarios, as well as different formulations of how this growth is distributed across the distribution.

JEL codes: D31, I32, O15

* All authors are with the World Bank. Negre is also affiliated with the German Development Institute. Contact information: clakner@worldbank.org, mnegre@worldbank.org, eprydz@worldbank.org. The authors wish to thank Shaohua Chen, La-Bhus Fah Jirasavetakul, Dean Joliffe, Aart Kraay, Peter Lanjouw, Christian Meyer, Prem Sangraula and Renos Vakis. The findings and interpretations in this paper do not necessarily reflect the views of the World Bank, its affiliated institutions, or its Executive Directors. Part of this work was funded by the UK Department for International Development through its Strategic Research Program (TF018888).

1 Introduction

Over the past two decades, global extreme poverty has decreased rapidly. Since 1990, the share of the world population living below the extreme poverty line of \$1.25 per day has more than halved, from 36.6% in 1990 to 14.5% in 2011 (World Bank, 2015a). Against this backdrop, international development actors such as the United Nations or the World Bank, as well as some bilateral development agencies, have recently united around a goal of ‘ending’ extreme poverty by 2030. This goal has been defined either as complete eradication (United Nations, 2014) or as 3% of the world’s population (World Bank, 2014b).² At the same time, the development policy debate is increasingly highlighting the importance of distributionally sensitive measures of growth and thus inequality.³ This paper simulates global extreme poverty until 2030 under different scenarios for shared growth and thus quantifies how inclusive growth can help to achieve the goal of eradicating extreme poverty.

Our simulations suggest that even under a relatively optimistic growth scenario the global poverty rate will remain above 5% in 2030 if growth is distribution-neutral. However, under a scenario in which the bottom 40% of each country’s population grows 2pp faster than the country mean, the global poverty rate falls to between 2.8% and 3.3% depending on the precise growth incidence. Not surprisingly, such pro-poor growth is associated with a dramatic decline in within-country inequality indicators. Although global measures of poverty will be substantially lower by 2030 under most of our scenarios, Sub-Saharan Africa’s poverty rate will remain above 15% in 2030 even under the most optimistic scenarios for growth and the inclusiveness of that growth.

We present a number of robustness checks. First, we test for robustness to using alternative growth scenarios. The global poverty rate remains at around 4% in 2030 when a less optimistic growth scenario is used, even under the most pro-poor growth incidence. Not surprisingly, the extent of pro-poor growth has an even bigger effect on the final poverty rate in a pure redistribution scenario with zero per capita growth. Second, we show that the results for the headcount ratio, as well as the poverty gap and severity, depend on the precise shape of the growth incidence curve (GIC), i.e. how a given growth rate is distributed within the bottom quantiles. Our main results use a linear GIC, which is an intermediate case. We also present results for step-function and convex GICs, as well as a GIC where the growth premium is allocated to the bottom 20%, instead of the bottom 40%. Third, while our main analysis is

² In 2013, the World Bank adopted a goal of ‘ending’ poverty by 2030, measured as “reducing to no more than 3 percent the fraction of the world’s population living on less than \$1.25 per day” (World Bank, 2014b). The United Nations is widely expected to adopt an even more ambitious goal to “eradicate extreme poverty for all people everywhere” as the first of its Sustainable Development Goals (SDGs) (United Nations, 2014). Several bilateral development agencies, such as DFID and USAID, have also made such goals central to their focus and mission.

³ The World Bank announced a goal of “boosting shared prosperity”, defined as “fostering [the] income growth of the bottom 40 percent of the population in every country” (World Bank, 2015a). Similarly, draft proposals for the Sustainable Development Goals include a target to “achieve income growth of the bottom 40% of the population at a rate higher than the national average” (United Nations, 2014). Also see, for example, Kanbur and Lustig (1999), Ravallion (2001), World Bank (2006), Berg et al. (2012), and International Monetary Fund (2014).

based on consumption and income estimates denominated in 2005 purchasing power parity (PPP) adjusted dollars, we show that our results are robust to using the 2011 PPP exchange rates.⁴

The paper is structured as follows. Section 2 briefly reviews the literature. In Section 3, we describe the conceptual framework for the simulations, while Section 4 describes the data and our method for implementing the simulations. Section 5 presents the results on global and regional poverty, as well as within-country inequality, for different growth scenarios, GICs, growth premiums, and PPP exchange rates. The final section concludes.

2 Inclusive Growth and Global Extreme Poverty

We model the impact of distributional changes on future trajectories of global poverty by letting the growth rate of the bottom 40% (or the bottom 20%) differ from the growth rate of the mean (as explained in more detail in the next section). Our approach is motivated by the World Bank's goal of "boosting shared prosperity", which is measured by the growth of the bottom 40% in every country.⁵ In addition to being directly relevant to the shared prosperity goal, the focus on the bottom 40% in relation to poverty reduction has some precedence in the literature. Chenery (1974) argues that focusing on overall growth is too narrow, and Ahluwalia (1974) specifically looks at the bottom 40%. More recently, Basu (2001) adds that the growth of the bottom 20% is more closely correlated with non-income welfare indicators than growth in the mean.⁶ Palma (2011) has argued that variation in inequality across countries largely depends on the relative income shares of the bottom 40% and top 10%, with the 'middle 50%' having a constant share. With respect to analyzing extreme poverty, it is important to recognize that the bottom 40% within a country does not necessarily coincide with the extreme poor (as defined by the international poverty line).⁷

We choose to model distributional changes by varying the growth of the bottom quintiles (bottom 20% and 40%) of each country's population because of its direct policy relevance and conceptual simplicity. Several alternative approaches to model distributional changes have been adopted in the literature. Some authors have simply imposed distribution-neutral growth (Birdsall et al., 2014; Karver et al., 2012;

⁴ We choose the 2005 PPPs as the baseline scenario because they are used by the World Bank in their official global poverty estimates at the time of writing. Furthermore, at the time of writing, there exists no general agreement about how to measure global poverty with the 2011 PPPs (e.g. rural-urban price adjustments, or the choice of poverty line), as discussed in more detail in Section 4.

⁵ Also see footnote 3. The official shared prosperity goal is not explicit in how progress in this indicator should be monitored. However, a natural and intuitive method is to compare the growth rate of the bottom 40% to that of the mean in each country (e.g. Basu, 2013). In fact, this is the approach adopted by the World Bank Group Corporate Scorecard (World Bank, 2014) which helps to assess the performance toward achieving the two goals.

⁶ Because it is difficult to measure the incomes of the bottom 20% accurately (e.g. irregular, multiple or informal incomes), it might be better to focus on the bottom 40%, although any cutoff will always remain somewhat arbitrary (Basu, 2013).

⁷ The degree of overlap between the populations classified as bottom 40% and the extreme poor varies across countries. In 2011, 90.3% of the extreme poor are within the bottom 40% of their respective countries while 9.7% are not. In this same year, the bottom 40% in each country amounted to 2.78 billion people. Of this group, 37% are classified as extreme poor and 63% are not. This illustrates how the extreme poor are mostly situated within the bottom 40% of their countries' population. However, it also shows that a large share of the national bottom 40% in the world is not classified as extreme poor. See Beegle et al. (2014) for a detailed discussion on the overlap of these two groups in different dimensions.

Hellebrandt and Mauro, 2015), thus ignoring any future changes in within-country inequality. Others have fixed the distribution at the most equal historical episode and then projected distribution-neutral growth using these distributions. For example, Ravallion (2013) simulates the distribution of the developing world beginning from the year with lowest inequality. Edward and Sumner (2014) use the lowest historical ratio of income of the top to the bottom quintile (Q5/Q1 ratio) for every country as one of their scenarios.

A third group of studies, which is most closely related to the approach taken by this paper, simulates additional distributional changes. Edward and Sumner (2014), Hillebrand (2008) and Higgins and Williamson (2002) extrapolate the country-specific trend in the Q5/Q1 ratio. Chandy et al. (2013) project changes in the Palma ratio based on historical variation, subject to upper and lower bounds. In their study of African poverty, Ncube et al. (2014) change the income share of the bottom 40% based on cross-country patterns. Higgins and Williamson (2002) use in one of their scenarios a distributionally-sensitive growth model based on demographic changes. Rather than changing the distribution, Yoshida et al. (2014) impose a penalty on the historic growth rates used in their (distribution-neutral) projection if inequality increased prior to their baseline (and vice versa for an inequality reduction).

While the main focus in this paper is on the impact of the distributional nature of future growth, we also develop our own baseline (distribution-neutral) growth scenarios. We base our projections on country-specific historic national accounts growth rates, adjusted for observed differences between household survey growth and national accounts growth. Two main approaches are used in the literature, which can produce quite different results for global poverty (Dhongde and Minoiu, 2013). First, scenarios based on historical survey growth rates, as in Ravallion (2013) and Yoshida et al. (2014). Second, scenarios derived from national accounts either through growth models or projecting historical growth rates into the future. Edward and Sumner (2014) make use of both in a sensitivity analysis. Birdsall et al. (2014) and Hillebrand (2008) use growth rates from macroeconomic models. Karver et al (2012) consider a range of growth scenarios based on the World Economic Outlook (WEO) for the 2009-14 period. Similar to our approach (explained in more detail in Section 4), Chandy et al. (2013) use Economist Intelligence Unit (EIU) and WEO growth rates adjusted to survey growth using factors from a cross-country regression.

While our findings are in line with previous work on the role of growth and inequality in poverty reduction, this paper adds to the literature in five main ways. First, we model a set of policy relevant and intuitive distributional scenarios where the bottom quintiles grow faster and slower than the mean, in a way directly relevant to key indicators used for international development policy and monitoring. Second, we use a number of functional forms for the GIC, which capture how a given growth premium is distributed within the bottom 40% (and bottom 20%) in a transparent manner. Third, we construct our own growth scenarios, based on national accounts growth rates. These are adjusted to fit household survey growth by using factors estimated separately for income and consumption surveys, as well as for key countries. Fourth, we base our simulations on the most recent set of household surveys for 2011, closely replicating PovcalNet, the World Bank's official database for global poverty monitoring. Fifth, we test for the robustness of our results to the 2011 PPP exchange rates which substantially changed the geographic distribution of global extreme poverty.

3 Conceptual Framework

In this paper, we compare the growth in the bottom 40% to the growth in the mean. We define the shared prosperity premium m as the difference between the growth in the mean (γ) and growth in the bottom 40% (γ_{40}). This premium can be negative or positive, and can be expressed as

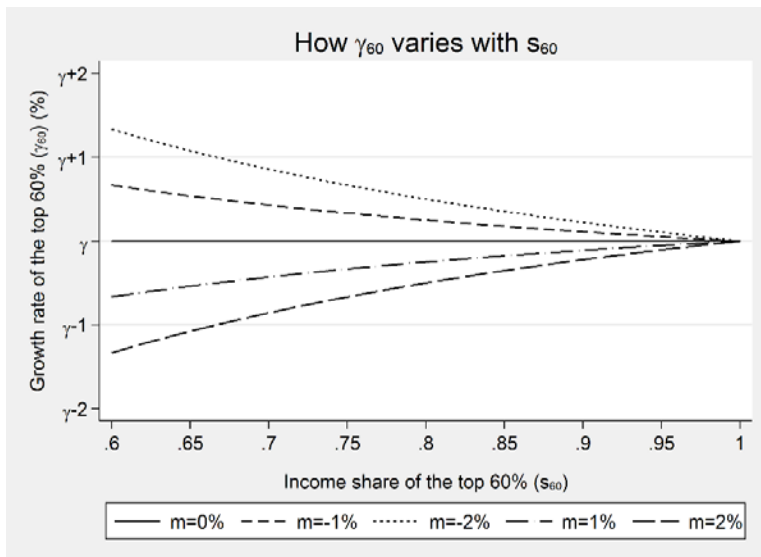
$$m = \gamma_{40} - \gamma \quad (1)$$

Growth in the mean (γ) can be written as a weighted sum of growth amongst the bottom 40% (γ_{40}) and growth of the top 60% (γ_{60}), where the weights are the respective income shares in the initial period (s_{40}, s_{60}):

$$\gamma = s_{40} * \gamma_{40} + s_{60} * \gamma_{60} \quad (2)$$

Using the fact that $s_{40} = 1 - s_{60}$ and the definition for m (1), we can rewrite (2) to obtain an expression for γ_{60} : $\gamma_{60} = \gamma + m \left(1 - \frac{1}{s_{60}}\right)$ (also see Equation 4). Figure 1 shows how the growth rate of the top 60% varies with their income share for a given value of m . It is clear that as a result of fixing the growth rate of the bottom 40% above the growth rate of the mean (i.e. $m > 0$), we impose a lower growth rate on the top 60%. As can be seen in Figure 1, this growth shortfall by the top 60% declines with their income share. In other words, the more unequal the distribution, the closer γ_{60} will be to γ . In our sample, the top 60% receives on average 83.3% of total income (Table 2). Hence, even with $m = 2\%$, γ_{60} would be within 0.5pp of γ . The shared prosperity premium simulated in this paper does not impose a heavy burden on the rest of the distribution in terms of growth because a small relative reduction in income gains of the top 60% suffices to bring about larger relative gains in the bottom 40%. In Rwanda, for example, boosting the growth of the bottom 40% from 3.4% to 5.4% in the first year requires that the top 60% grows at 3.1%, giving up only 0.3pp compared to distribution-neutral growth, as illustrated by the GICs in Figure 2.

Figure 1: Top 60%'s growth shortfall from that of the mean declines with this group's income share

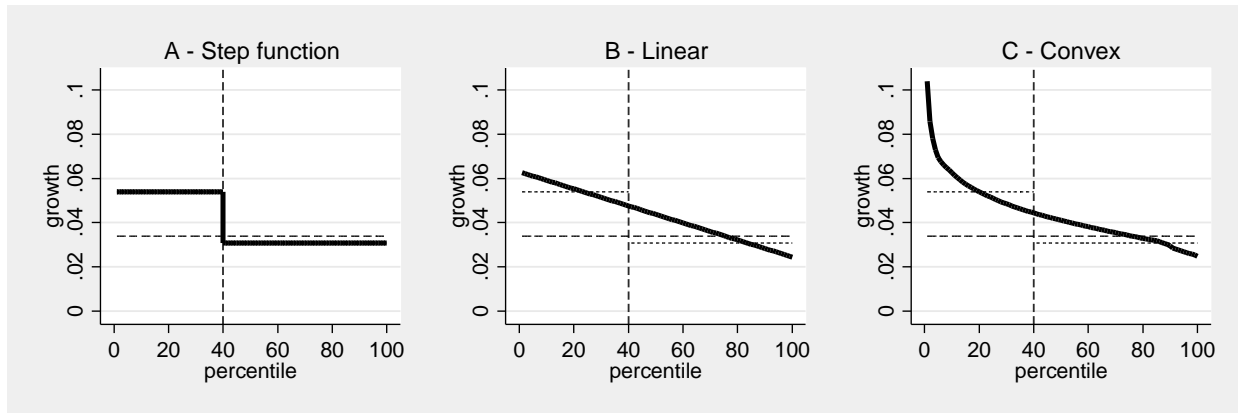


For a given shared prosperity premium m , there are infinite ways in which growth can be distributed within the bottom 40% and the top 60%. To conceptualize this, we define a variant of the GIC.⁸ Let y_i be the mean income of fractile group i (e.g. the bottom 10%) in the initial period. Final mean income y_i^* can be expressed as

$$y_i^* = y_i(1 + g_i) \quad (3)$$

where g_i is the growth rate associated with this fractile group. We define the GIC as the plot of g_i against the percentile group (p_i) in the initial period. In Figure 2, we present three stylized GICs that could all represent the same shared prosperity premium (in this case $m = 2\%$).⁹ Panel A shows a situation where everyone in the first four decile groups grows at the same rate, while the rest grow at a different rate. Panel C is the result of a flat tax together with a per capita transfer. The intermediate case (panel B) is simply a linear GIC, where the slope and the intercept depend on the income share of the bottom 40%.

Figure 2: Different growth incidence curves compatible with same shared prosperity premium



Note: These GICs are drawn using data from Rwanda from 2011 available in PovcalNet, $m = 2\%$, evaluated at percentile groups after one year. Mean grows at 3.4%, bottom 40% at 5.4 % and top 60% at 3.1%.

The step function GIC (Panel A) is arguably the simplest way to define the shared prosperity premium and can be expressed as

⁸ In Ravallion and Chen (2003), the GIC shows the growth rate of the income at a given percentile (e.g. the 10th percentile) between the initial and final period. In contrast, we compute the growth rate in the mean of a particular percentile group.

⁹ To draw this figure we fitted a parametric Lorenz curve with 10,000 points on the distribution for Rwanda in 2010, as described in the methodological framework. Note that the GICs displayed in panels B and C rely on the income space as opposed to percentile groups. For this reason we needed to choose an income distribution (e.g. Rwanda) to plot these two GICs.

$$g_i = \begin{cases} \gamma_{40}; & p_i \leq 0.4N \\ \gamma_{60}; & p_i > 0.4N \end{cases} \quad \text{which is equal to:} \quad g_i = \begin{cases} \gamma + m; & p_i \leq 0.4N \\ \gamma + m \left(1 - \frac{1}{s_{60}}\right); & p_i > 0.4N \end{cases} \quad (4)$$

This can be thought of as a tax rate of $-m \left(1 - \frac{1}{s_{60}}\right)$ on the top 60% combined with an equiproportional transfer to the bottom 40% of m . Note that within the bottom 40%, those quantiles just below the 40th percentile would benefit most in absolute terms from this GIC.

Compared with the step function, the (declining) linear GIC (panel B of Figure 2) represents a more pro-poor way of simulating shared prosperity, as growth is highest for the poorest percentiles.¹⁰ Such a GIC takes the following form

$$g_i = \delta - \theta p_i \quad (5)$$

Substituting (5) into (3), we can obtain the following expression for the income of fractile group i in the final period

$$y_i^* = (1 + \delta)y_i - \theta y_i p_i \quad (6)$$

Although not very intuitive, this linear GIC can be obtained by taxing everyone in proportion to both their income and rank – the poorest person is taxed at a rate of θ and the tax increases proportionally with the rank – combined with a transfer where every person receives a share δ of their income. In the first part of Appendix 1, we derive the values of the parameters δ and θ for a given income vector.

A more intuitive tax and transfer scheme is the one introduced by Kakwani (1993) and further discussed by Ferreira and Leite (2003). This transformation involves an increase of everyone's income at a rate γ (i.e. by the overall rate of income growth) together with a tax and transfer scheme which taxes everyone at a rate α and gives everyone an equal absolute transfer.¹¹ The vector of final incomes can be written as

$$y_i^* = (1 + \gamma)[(1 - \alpha)y_i + \alpha\mu], \quad (7)$$

where μ is the mean income in the initial period. Using (7) and (3), it can be easily shown that the corresponding GIC takes the following form¹²

$$g_i = (1 - \alpha)(1 + \gamma) - 1 + [\alpha(1 + \gamma)\mu] \frac{1}{y_i}, \quad \text{with } 0 < \alpha < 1, \gamma > 0 \quad (8)$$

¹⁰ Pro-poor is used here in the relative sense whereby poorer percentiles grow faster as proposed by Kakwani and Pernia (2000), Son (2004), Klasen (2004), Essama-Nssah and Lambert (2009), inter alia. Ravallion and Chen (2003) and Kraay (2006) suggest an 'absolute approach' whereby growth is pro-poor whenever poverty is reduced.

¹¹ As pointed out by Ferreira and Leite (2003), this is a type of Lorenz-convex transformation. They show that the transformed Lorenz curve is given by $L(p)^* = L(p) + \alpha(p - L(p))$. This transformation can be obtained by moving every point on the Lorenz curve upwards by an amount proportional to its vertical distance to the equidistribution (45-degree) line. Furthermore, the transformed Gini coefficient can be readily obtained as $Gini(y)^* = (1 - \alpha)Gini(y)$.

¹² Note that Equation 8 is defined over the income and not the percentile space. The linear GIC (Equation 5) is defined over the percentiles space but incomes enter through the parameters as shown in the Appendix.

In the Appendix, we show that α is a function of m , γ and s_{40} . This GIC is a convex, decreasing function along the percentile groups (panel C of Figure 2). It attributes high growth rates at lower percentiles, while it becomes flatter at higher percentiles. However, like the linear GIC, it is decreasing throughout, i.e. the growth rate will be lowest for the richest percentile groups.

4 Data and Methodology

In our baseline simulations we use the linear GIC (Figure 2, panel B, Equation 6). In a robustness check we use the alternative GICs defined in the previous section, as well as a linear GIC which uses the bottom 20% instead of the bottom 40%. There are three reasons for choosing the linear GIC: First, it is an intermediate case. It is more pro-poor than the step-function and, depending on the shape of the distribution of income, generally less so than the convex GIC. Second, it produces a smoother final distribution of income than the step-function. As we explain in more detail below, we allow for re-ranking of incomes at every annual step of the simulation. The discontinuity in the step-function GIC leads to extensive re-ranking because the 40th percentile group in the initial year is growing faster than the 41st percentile group, and thus may end up richer. In practice, percentile groups around the 40th get re-ranked frequently and thus end up with very similar incomes. Hence there is a lot of bunching in the simulated final distribution around the 40th percentile (as explained in detail in Lakner et al., 2014). Third, the linear GIC allows for simulating both positive and negative shared prosperity premiums, i.e. pro-rich as well as pro-poor patterns of growth. While negative shared prosperity premiums can be modeled through the step-function, this is not possible with the convex GIC.¹³

Our three scenarios for the growth rate of mean income or consumption are based on the following: (1) each country's annualized growth rate from national accounts for the last 10 years for which we have poverty data (2001-2011); (2) each country's annualized growth rate for the latest 20 years (1991-2011); and (3) a scenario which assumes zero growth of per capita income or consumption to isolate the pure redistributive effects of our shared prosperity premiums. The simulations relying on the 10 year historic growth rates (2001-2011) may be optimistic as the rapid growth experienced in the early 2000s is showing signs of slowing down.¹⁴

The preferred source of growth data is annualized growth in real final household private consumption expenditure (PCE) per capita from national accounts, as reported in the World Development Indicators (WDI). When that series is not available for the whole period, we use annualized growth in real Gross Domestic Product (GDP) per capita, with the preferential series being GDP per capita from WDI, and, if that series is not available either, GDP per capita from Penn World Tables, version 8. To adjust for differences in growth rates between national accounts and household surveys we estimate adjustment factors based on the historical relationship between growth rates from the two sources, following the

¹³ As shown by Equation 7, the tax and transfer scheme underlying the convex GIC is determined by α , which is a positive number according to Ferreira and Leite (2003). In practice, using a negative shared prosperity premium in the convex GIC gives rise to negative consumption values, which is clearly problematic.

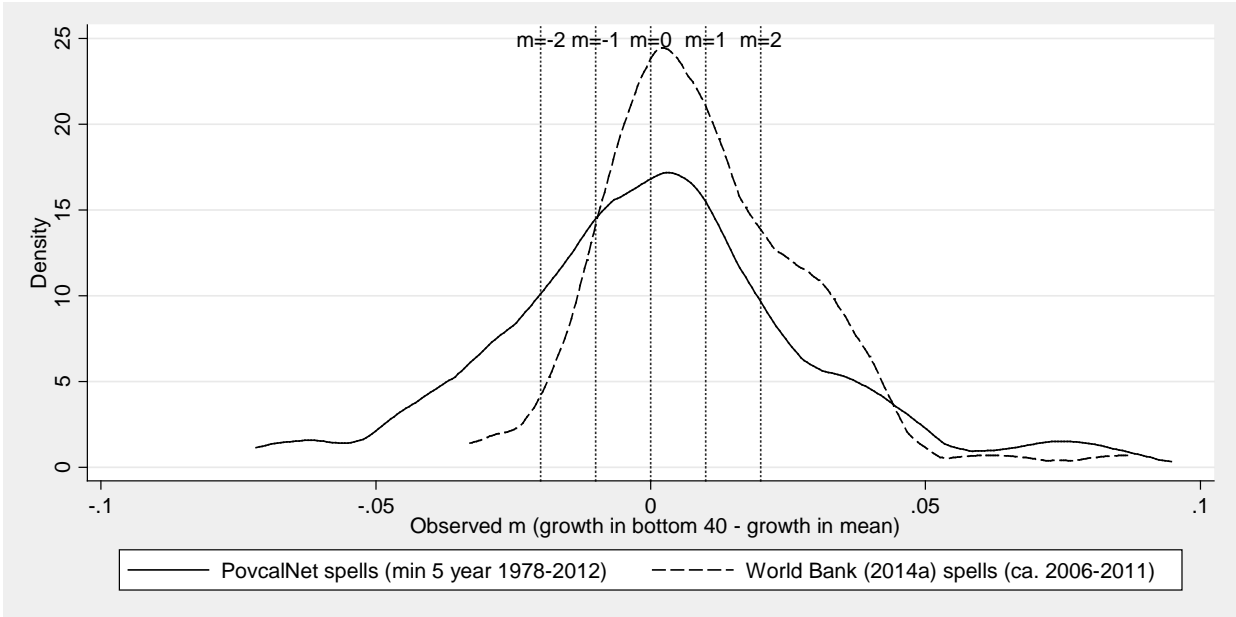
¹⁴ For example, Rodrik (2014) suggests that the rapid growth experienced by emerging economies in recent decades is unlikely to persist indefinitely and that convergence will slow down in coming decades.

methodology applied by Ravallion (2003). We estimate these factors separately for income-based surveys, consumption-based surveys, and for China and India due to different historical patterns for these countries.¹⁵ Applying such factors is common practice in adjusting between household survey growth and national accounts growth rates (see for example Birdsall et al., 2014; Chen and Ravallion, 2010; and Chandy et al., 2013).

We consider five shared prosperity scenarios for m – the growth rate differential of the bottom 40% relative to the mean (see Equation 1). Our baseline scenario is a distribution-neutral growth where each percentile group grows at the same annualized rate over the entire period ($m = 0\%$). We have two scenarios with pro-poor growth: $m = 1\%$ ($m = 2\%$) implies that the mean of the bottom 40% grows 1pp (2pp) faster than the mean. Similarly, we have two scenarios with pro-rich growth, where the bottom 40% grows slower than the mean ($m = -1\%$ and $m = -2\%$).

Figure 3 compares these values of m against the observed differences in household survey growth rates for the bottom 40% and the mean. Over 271 comparable growth spells observed in PovcalNet, for all years, the median value of m observed is practically zero. For the sample of 72 countries for which the World Bank has published official growth spells of the bottom 40% from approximately 2006-2011, the median value of m is 0.7pp (World Bank, 2014). More than a quarter of the most recent spells show $m > 2\%$. While we clearly impose an optimistic shared prosperity scenario, our maximum premium of $m = 2\%$ is not unprecedented in past spells.

Figure 3: Observed shared prosperity premiums compared with shared prosperity premiums used in simulations



¹⁵ Our resulting adjustment factors are as follows: For countries with income-based surveys, 0.92 for PCE and 0.85 for GDP. For countries with consumption-based surveys, 0.77 for PCE and 0.69 for GDP. China and India are assigned country-specific factors (using consumption-based surveys and PCE); China: 0.98; India: 0.67.

We begin our simulations in 2011, which is the most recent year for which PovcalNet estimates mean income or consumption and its distribution within developing countries. From PovcalNet, we obtain estimates of the income or consumption shares of the ten decile groups and the overall mean in 2011 for 126 countries. These estimates cover more than 96% of the population living in countries classified as low and middle income by the World Bank. Based on these decile shares and means, we use a lognormal Lorenz curve to generate a distribution of 10,000 points for each country. The use of a parametric Lorenz curve is very similar to what is done in PovcalNet to calculate poverty when micro data are not directly available.¹⁶ The data available in PovcalNet is standardized as far as possible, but does not correct for different methods of collecting data across countries and differences between income and consumption surveys. But by relying on the PovcalNet database, we ensure consistency with the official numbers used by the World Bank and United Nations for monitoring poverty, inequality and related goals. We follow the aggregation method used by Chen and Ravallion (2010) and deployed by PovcalNet, assuming regional poverty rates for developing countries without a poverty estimate for 2011. For high income countries not included in PovcalNet's aggregation, we assume zero extreme poverty when estimating the global poverty rate, following World Bank (2015a).¹⁷ As explained in Appendix 2, our distributions and estimates for poverty in 2011 are very similar to those available in PovcalNet. When calculating aggregate poverty estimates, we use annual population projections for each country from the World Development Indicators (WDI).

We simulate these base year distributions until 2030 under three different growth scenarios and five shared prosperity premiums m . Changes to the income distribution are simulated forward in the following way. At every annual step (e.g. from 2011 to 2012), we apply a growth rate to each of the 10,000 fractile groups according to the equations given in the previous section (e.g. Equations 5 and 6 for the linear GIC). Imposing higher growth rates for lower percentiles means that some of them may end up with a final income above that of percentiles that were originally richer. Hence it is necessary to re-rank fractile groups before simulating another year of growth.¹⁸ The growth premium at every annual interval is chosen such that the annualized growth rate of the bottom 40% over the entire period is m pp above the growth rate of the mean.¹⁹ As a result, the top 60% grow at a lower rate than the mean (Figure 1).

¹⁶ From two parametric Lorenz curves – the General Quadratic and the Beta Lorenz – PovcalNet chooses the one with the best fit. Instead, Shorrocks and Wan (2008) suggest that a lognormal functional form fits better. Minoiu and Reddy (2014) show that for global poverty estimates a parametric Lorenz curve should be preferred to estimating kernel densities. We use the ungroup command included in the DASP Stata Package (Abdelkrim and Duclos, 2007) to fit a separate lognormal Lorenz curve for every country. This command implements the Shorrocks and Wan (2008) approach which ensures that the fitted Lorenz curve matches the observed shares. PovcalNet provides separate rural and urban estimates of means and decile shares for China, India and Indonesia. For these countries, we combine the 10,000 point rural and urban distributions (weighted by population shares) to produce national estimates of means and decile shares which we use as the basis for our simulations.

¹⁷ See World Bank (2015a, box 6.4) for details on aggregation and imputation methods used by the World Bank.

¹⁸ Given the discontinuity in this GIC, the re-ranking is most pervasive for the step-function GIC. In our simulations the convex GIC requires no re-ranking. The linear GIC only requires re-ranking in five countries (for $m=2\%$ and very last years of the simulation), depending on the flatness of the distribution relative to the slope of the GIC.

¹⁹ Because of the re-ranking, some of the growth premium 'leaks' to the top 60% along with the fractile groups that are re-ranked upward. Hence the growth premium applied at every annual interval could be different from the shared prosperity premium aimed for over the entire period.

For our main simulations we use a \$1.25 poverty line and PPPs from the 2005 International Comparison Program (ICP) to convert local currency values into PPP USD, following the methods used by PovcalNet and documented by Chen and Ravallion (2010). In 2014, the ICP released new PPPs with the 2011 base year (World Bank, 2015b), which we use in a robustness check. Following Jolliffe and Prydz (2015), we use an extreme poverty line of \$1.82 per day (2011 PPPs), which corresponds to the \$1.25 per day line (2005 PPPs). It is unclear whether and how to adjust for (1) rural-urban price differences and (2) any urban bias in the price collection with the 2011 PPPs. With the 2005 PPPs, Chen and Ravallion (2010) adjusted for rural-urban price differences and urban bias for China, India and Indonesia. When applying the 2011 PPPs we use two methods to address the rural-urban price adjustment: First, we apply the PPPs at ‘face value’ without any adjustment, following Jolliffe and Prydz (2015). Second, we update the Chen and Ravallion method, as explained in detail in Appendix 2.

5 Results

This section presents the results from the simulations described above. First, we show the poverty trajectory towards 2030, both at the global and regional level, focusing on the poverty rate measured at \$1.25/day in 2005 PPPs. More detailed results at the regional level are presented in the Online Appendix. We also present key results for the 2011 PPPs. Second, we explore some of the dynamic aspects of our simulations and the mechanics of the effect on poverty reduction. Third, we present the distributional impacts of our simulations.

5.1 Impacts on Poverty: Global and Regional Trajectories to 2030

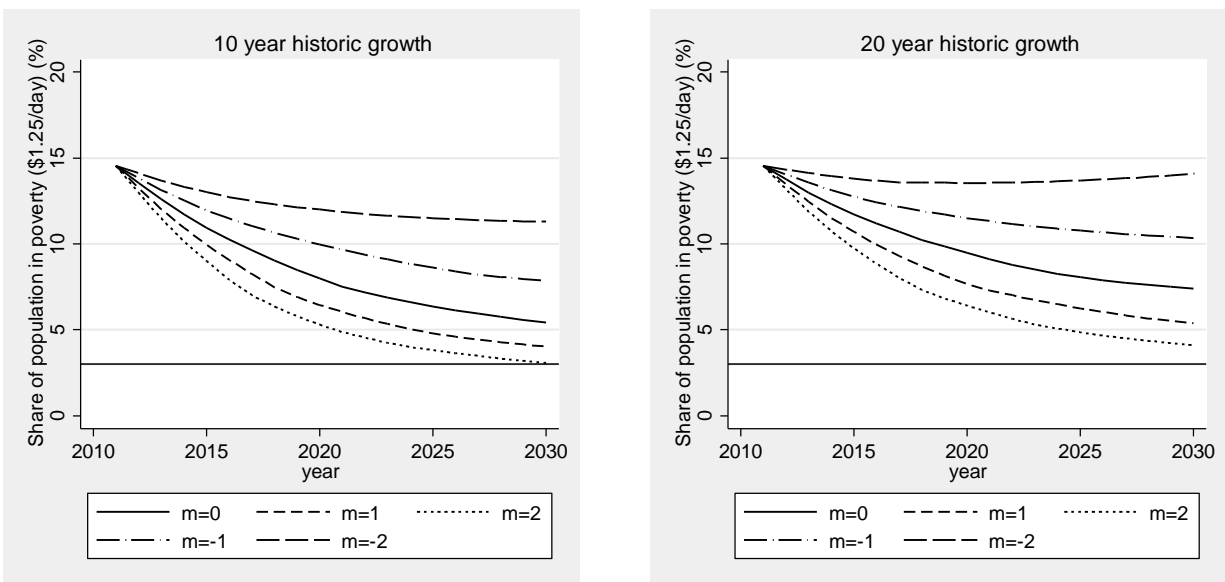
Figure 4 presents our simulated trajectories for the global headcount ratio up to 2030 for the 10 and 20 year historic growth scenarios, using the linear GIC. Table 1 shows the full results for various poverty lines, different growth and GIC scenarios.²⁰ In Figure 4, the simulations with distribution-neutral growth ($m = 0\%$) fall short of reaching the World Bank’s goal of reducing extreme poverty to 3% by 2030. The global poverty rate reaches between 5.4% and 7.3% in 2030, depending on the growth scenario (10 year historic growth, 20 year historic growth), which confirms the findings of World Bank (2015a). ‘Ending poverty’ becomes more viable in simulations where the bottom 40% grows faster than the mean of the distribution (i.e. $m = 1\%$ or $m = 2\%$). With $m = 2\%$ and the 10 year historic growth scenario, poverty reaches between 2.8% and 3.3%, depending on the GIC applied. With $m = 2\%$, the global poverty rate reaches approximately 4.1% under the 20 year historic growth scenario, irrespective of the GIC. In contrast, in scenarios with a negative shared prosperity premium ($m = -1\%$, $m = -2\%$), where the bottom 40% grows slower than the population mean, the global poverty rate in 2030 remains high. Using the linear GIC, it reaches 11.3% under the 10 year historic growth scenario and $m = -2\%$; and 7.9% with $m = -1\%$.²¹ Overall, this shows how sensitive the global headcount ratio is to changes in the

²⁰ Chen and Ravallion (2010) use \$1.25, \$1.45, \$2.0 and \$2.5. Global headcount ratio figures are reported only for these poverty lines because the assumption of zero poverty in rich countries may not apply for higher poverty lines.

²¹ Results hereafter refer to the linear GIC unless otherwise specified.

growth rate of the bottom 40%. Under the same average growth scenario, the global poverty rate could either be around 3% or over 11%, depending on the distributional nature of that growth.

Figure 4: Simulations of poverty under different scenarios for shared prosperity



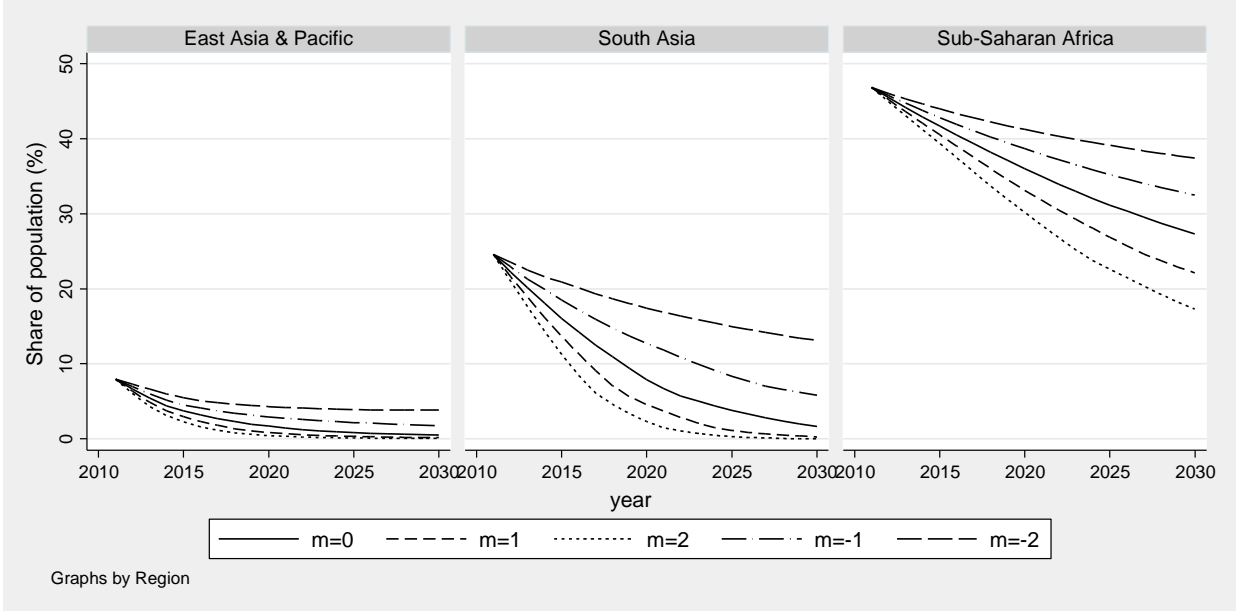
Note: Graphs show results from simulations using linear GIC.

The global poverty rate at \$2 a day appears to be much more sensitive to distribution effects than the extreme poverty line, falling from 30.9% to between 6.7% ($m = 2$) and 21.2% ($m = -2$) over the 2011-2030 period in our simulations. In absolute terms, this means that from the initial 2.15 billion poor by the \$2-a-day line, the number of poor would be reduced almost four times with positive shared prosperity to some 560 million or only slightly so if distributional changes are regressive to 1.77 billion people.

The full results on regional headcount ratios for multiple poverty lines are presented in the Online Appendix. In the discussion we focus on those regions which drive the results for the global headcount ratio and where shared prosperity has the greatest effects. The Middle East and North Africa (MENA) and Europe and Central Asia (ECA) regions both start with a low headcount ratio below 3% and have small populations compared to the other regions.

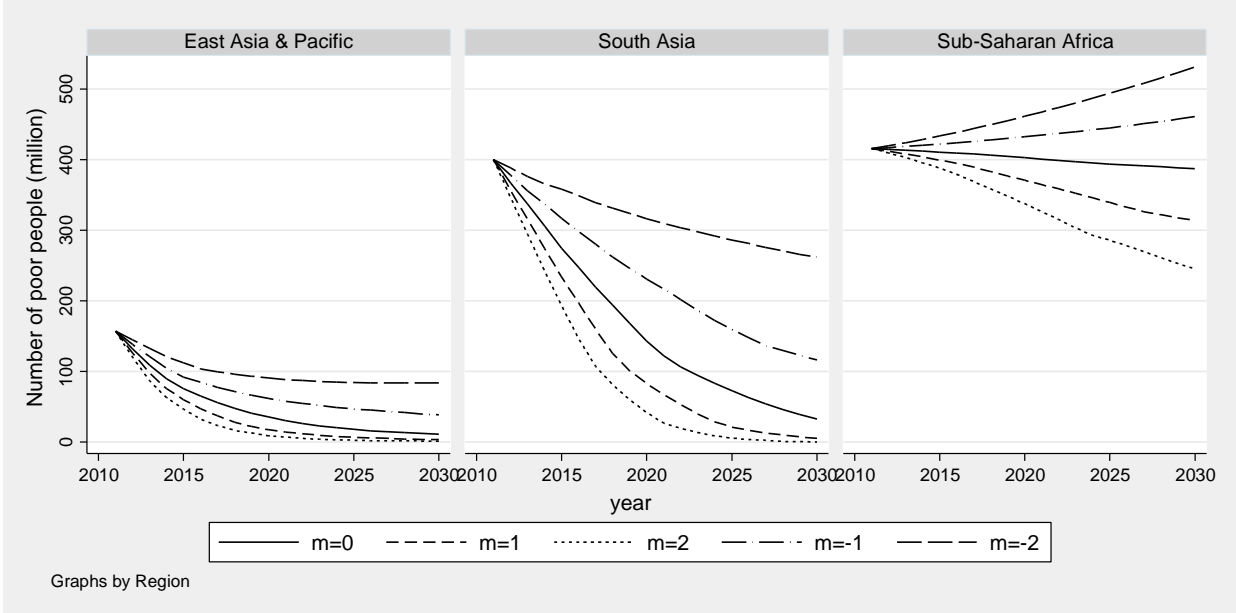
For East Asia & Pacific (EAP), South Asia (SAS) and Sub-Saharan Africa (SSA), we show the simulated trajectories for the headcount ratio (Figure 5) and absolute number of poor (Figure 6). We use the 10 year historic growth scenario and allow for different values of the shared prosperity premium m . In East Asia, we see relatively small differences across the different shared prosperity premiums, because poverty is already low and growth is projected to be high. In South Asia, the end point of the simulations for 2030 is similar between $m = 0\%$, $m = 1\%$ and $m = 2\%$ (ranging from 0.0% under $m = 2\%$ to 1.6% under $m = 0\%$). For Sub-Saharan Africa, instead, the differences between the shared prosperity premiums are large, with the 2030 poverty rate ranging from 17.3% to 37.4%.

Figure 5: Share of poor people for selected regions (at \$1.25, 2005 PPPs, 10 year historic growth rates)



Note: Results are from simulations using 10 year historic growth rates, with linear GIC.

Figure 6: Number of poor people for selected regions (at \$1.25, 2005 PPPs, 10 year historic growth rates)



Note: Results are from simulations using 10 year historic growth rates, linear GIC.

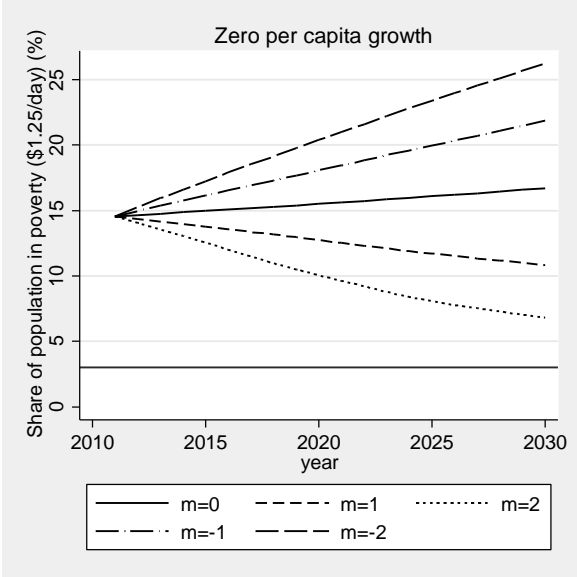
Across all scenarios, the vast majority of the extreme poor will live in Sub-Saharan Africa by 2030. In 2011, the poor lived in almost equal shares in Sub-Saharan Africa (41% of the global poor) and South

Asia (40%). By 2030 (assuming $m = 0\%$ and 10 year historic growth rate), 85% of the world's 250 million poor will live in Sub-Saharan Africa, compared with 7% for South Asia.

While the number of people living below the \$1.25 line decreases in all regions until 2030, at higher poverty lines we see an increase in the number of poor in some regions at $m = 0\%$. The number of people below \$4 increases in Sub-Saharan Africa by more than a quarter of a billion. Although Sub-Saharan Africa's poverty rate falls, demographic growth outpaces poverty reduction at this high poverty line, leading to an increase in the number of poor people. The number of people below the \$10 threshold, increases in both South Asia and Sub-Saharan Africa.

Figure 7 presents the results from a pure redistribution scenario in which we allow for different shared prosperity premiums while holding mean per capita income fixed. It shows that even without any growth in the mean, substantial progress in poverty reduction would be possible, under $m = 1\%$ and $m = 2\%$. Under the higher positive shared prosperity premium, global poverty is estimated at less than 7% in 2030. However, with negative growth among the bottom 40%, we see a substantial increase in global poverty, with a headcount ratio close to 26% in 2030 (for $m = -2\%$). Of course, zero growth in the mean is an unlikely scenario. However, the results from this scenario illustrate the effects of differential growth incidence for the bottom 40%, abstracting from growth in the mean. It highlights the importance of the growth incidence for the welfare of the poor, independent from growth.

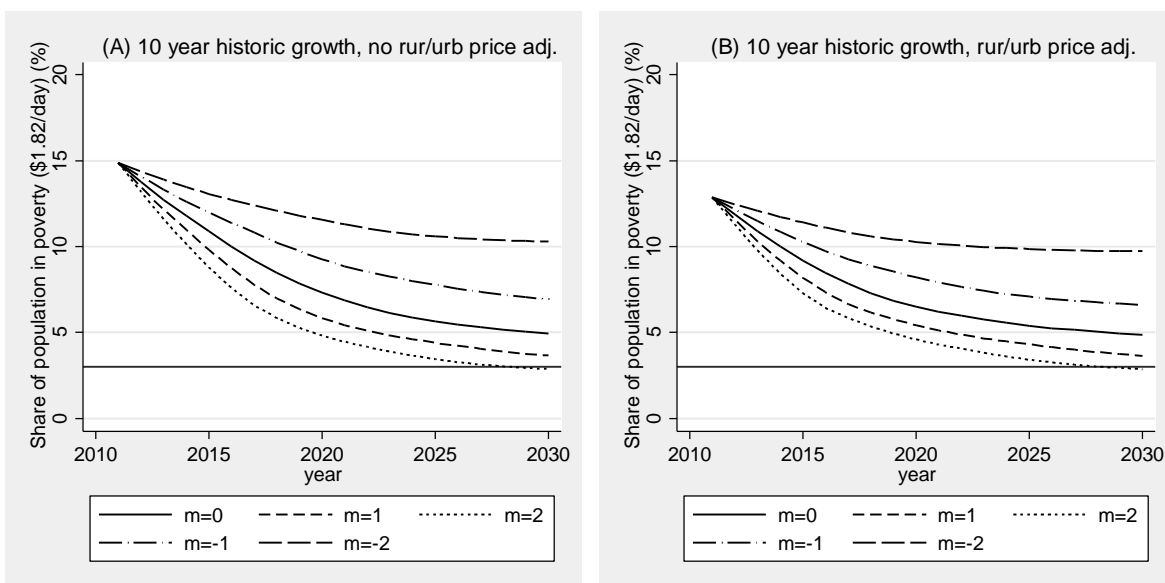
Figure 7: Effect of shared prosperity premium on the world's headcount ratio under a zero growth scenario



We test for the robustness of our main results to using the 2011 PPPs, as explained in the preceding section. Panel A of Figure 8 shows the headcount ratio at \$1.82 per day (2011 PPPs) using the application of the 2011 PPPs as Jolliffe and Prydz (2015). In 2011, the global headcount ratio is 14.9%, 0.4pp higher than estimated using the 2005 PPPs. Panel B of Figure 8 uses the alternative method for adjusting for rural-urban price differences. Under both these applications of 2011 PPPs, the goal of

reducing global poverty to less than 3% in 2030 is not reached under distribution-neutral growth, even under the optimistic 10 year historic growth scenario. Only under the scenario with $m = 2\%$ does the global headcount ratio reach just below 3% target. The trajectories under 2011 PPPs show a slightly faster reduction than under the 2005 PPPs, because the 2011 PPP suggest a somewhat lower concentration of poverty in Sub-Saharan Africa and South Asia. However, broadly speaking the results obtained under the 2005 PPPs are robust to using the 2011 PPPs.

Figure 8: Poverty trajectories using 2011 PPPs



Note: Estimates use 2011 PPPs and a poverty line of 1.82, following Jolliffe and Prydz (2011). Panel A makes no adjustments to rural-urban price differences in China, India and Indonesia, which gives a global headcount ratio of 14.9% in 2011. Panel B shows adjustments for these three countries, applying similar adjustment to those applied by Chen and Ravallion (2010) for China, India and Indonesia, with a global headcount ratio of 12.9%.

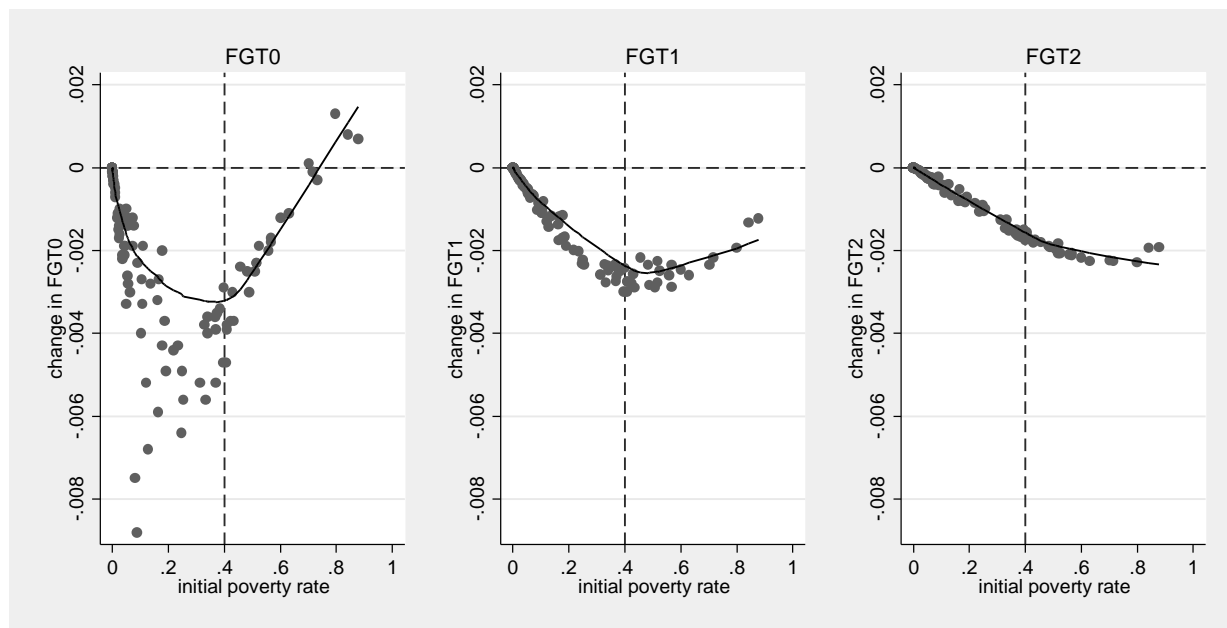
5.2 The Dynamics of Inclusive Growth and Poverty Reduction

It should be noted that although some of the simulated estimates for poverty in 2030 are similar across shared prosperity scenarios, their trajectories differ. In other words, although the 2030 endpoints may look similar, the number of poor is reduced sooner under scenarios with more inclusive growth. This is well illustrated by comparing the trajectories of $m = 1\%$ and $m = 2\%$ for South Asia in Figure 5 and Figure 6. Both simulations result in a low regional headcount ratio in 2030, however they follow different trajectories up to this point. For example, in 2020, the $m = 2\%$ scenario is already at 39 million people, while the $m = 1\%$ scenario has more than twice the number of poor people at 84 million. A steeper poverty trajectory of course implies that fewer people live fewer years in poverty up to 2030.

The impact on the headcount ratio from inducing a shared prosperity premium varies with the level of the initial headcount ratio, as well as the shape of the GIC, the income distribution, and the growth rate. The one-year changes in the poverty rate (FGT0), gap (FGT1) and severity (FGT2) against the initial

poverty rate level are shown in Figure 9 for the linear GIC.²² This figure is drawn for the change in the first year and the zero-growth scenario to abstract from differences in growth rates across countries.²³ It is clear that the initial level of poverty matters for the impact of boosting shared prosperity on the poverty rate. This relationship takes a U-shape where the reduction in the poverty rate at first increases with the initial poverty rate and then decreases (Panel A of Figure 9).

Figure 9: Impact on FGT measures varies with initial headcount ratio



Note: Figures show the ‘one-year’ change in FGT measures under $m = 2\%$, zero per capita growth and a linear GIC, across the countries in our sample.

In countries where the initial poverty headcount ratio is above 40%, imposing a positive shared prosperity premium could slow down the reduction in the headcount ratio or even increase it in comparison to a distribution-neutral scenario. In Panel A of Figure 9 this occurs for countries with an initial headcount ratio of around 80%. For a step-function GIC, this effect is more pronounced, at an initial headcount ratio of 40% (Lakner et al. 2014). Hence, there may be a certain tradeoff between decreasing the poverty rate and boosting growth of the bottom 40%. Panels B and C of Figure 9 show, however, that such a pattern of pro-poor growth unambiguously decreases both the poverty gap and severity even for high initial headcount ratios. This indicates that the tradeoff is rather about maximizing the reduction in the headcount ratio or the poverty gap – the latter corresponding to a stronger focus on the poorest of the poor.

²² These three indicators correspond to the FGT functions for $\alpha = 0,1,2$, as defined in Foster et al. (1984).

²³ Another reason for focusing on one-year changes is that over time, the higher the poverty headcount ratio, the higher the potential total reduction in poverty simply because poverty cannot be reduced below zero.

5.3 Impacts on Distribution and Inequality

Aside from impacts on poverty rates, imposing a higher or lower growth rate on the bottom 40% of the distribution obviously also has substantial impacts on inequality within countries. Table 2 summarizes a set of distributional measures, for various scenarios for growth and shared prosperity premiums up to 2030. Under the scenarios with a positive shared prosperity premium, inequality falls rapidly. With $m = 2\%$, the mean Gini in our sample of 126 countries falls from 0.40 to 0.28 (around the level of Pakistan and Bulgaria in the most recent data). With $m = 1\%$ our mean simulated Gini for 2030 is 0.35. When compared to historical data, such large reductions in inequality over a 20 year period stand out, but are not unprecedented. For example, Brazil's Gini fell from a peak of 0.63 in 1989 to 0.54 in 2009. Nevertheless, it is clear that in our simulations with $m = 2\%$, inequality in countries that are relatively equal today falls to extremely low levels.

An alternative measure of inequality which is particularly relevant to how we have modelled inclusive growth is the share of income received by the bottom quintiles. It is also directly relevant to the World Bank's shared prosperity goal, and the Millennium Development Goals which track an indicator of the income share of the bottom 20% (World Bank 2014c; United Nations, 2008). We therefore report the change in the income share of the bottom 20% and 40%, respectively, with different shared prosperity premiums for the linear GIC. Of course, a positive shared prosperity premium implies that these income shares increase. In 2011, the mean income share of the bottom 40% in the 126 countries for which we have data was 16.5%, with a standard deviation of 4.2pp. Under the 10-year historic growth scenario, the mean income share of the bottom 40% increases to 23.8% with $m = 2\%$, and declines to 11.4% with $m = -2\%$.

It should be noted that the changes in inequality implied by our simulations are rather exceptional when compared to the past. In particular, countries with already low levels of inequality become even less unequal at a very rapid rate. For countries which start with high inequality, the level of inequality simulated for 2030 is not unprecedented, however. In our simulations, the bottom 40% at any point is helped to catch up with the rest of the population, so this would lead to a perfectly equal society if repeated infinitely. In other words, our method does not take into account a country's initial level of inequality. Therefore, it is not surprising that we obtain such low levels of inequality.

6 Conclusion

This paper has established that under assumptions of distribution-neutral growth, the World Bank's goal of less than 3% extreme poverty, as well as the United Nations' goal of complete eradication, will be difficult to reach by 2030. It has also shown that these goals become more viable by making growth more pro-poor, while maintaining the growth rate of the mean. Therefore, inclusive growth can contribute substantially to reaching the goal of ending global poverty by 2030. Conversely, pro-rich distributional changes can severely limit the way in which growth contributes to poverty reduction. While many of the findings are intuitive, one of the contributions of the paper is to quantify these effects. We also highlight that even under an optimistic growth scenario and a pro-poor growth incidence, more than 15% of the population in Sub-Saharan Africa will be poor in 2030.

It is important to highlight that making growth more pro-poor as simulated in this paper does not impose a large 'cost' on the rest of the distribution. Because of the large income share of the top 60%, the reduction in the growth rate of the top 60% necessary to ensure that the bottom 40% grows m pp above the mean is relatively small. For example, in the case of Rwanda, a growth incidence such that the bottom 40% grows 2pp above the mean (5.4% vs 3.4%), implies that the top 60% grows at an annualized rate of 3.1%, just 0.3pp below the growth in the mean, or what would have been the case with distribution-neutral growth.

Motivated by the World Bank's measure of shared prosperity, we have modeled inclusive growth in terms of the growth premium of the bottom 40% within every country. The impact on poverty of more inclusive growth defined in this way is different across countries and depends on the initial level of poverty, as well as the shape of the distribution, the precise GIC used and the growth rate. At high levels of initial poverty, boosting the growth of the bottom 40% could lead to a decrease in the pace of poverty reduction in the short term compared with a distribution-neutral growth scenario. In other words, for a country with a headcount ratio above 40%, some of the top 60%, who are growing slower than in a distribution-neutral scenario, are also poor. This highlights a certain tradeoff, also inherent in the World Bank's twin goals, between focusing on the poor within every country and the poor according to an international poverty line. Nevertheless, in such cases the poorest of the poor still receive a growth premium and thus the poverty gap and severity are reduced.

Inequality falls rapidly across all countries when we assume a pro-poor growth premium. While the model used in this paper uses an artificially imposed GIC, the growth premium of the bottom 40% over the growth in the mean is not unprecedented. Obviously, inducing such a growth incidence in reality and sustaining it over almost 20 years and in all countries, as is done in our simulations, is optimistic. The interest of this exercise, nonetheless, does not lie in producing a 'plausible' transformation but rather simulating an intuitive version of inclusive growth.

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8 Tables

Table 1: Global poverty rates in 2030

Scenario			Estimated poverty rate in 2030			
			at various poverty lines, USD per capita per day, 2005 PPPs			
GIC	Growth	m	1.25 (2011: 14.5%)	1.45 (2011: 19.4%)	2.00 (2011: 30.9%)	2.50 (2011: 39.0%)
Linear	zero	0	16.7%	21.9%	34.0%	42.4%
		1	10.8%	15.9%	30.8%	40.4%
		2	6.8%	9.8%	27.0%	39.0%
		-1	21.9%	26.5%	37.2%	44.6%
		-2	26.3%	30.5%	40.1%	46.8%
Linear	10 year	0	5.4%	7.2%	13.3%	19.4%
		1	4.0%	5.1%	9.2%	14.8%
		2	3.1%	3.9%	6.7%	10.5%
		-1	7.9%	10.3%	17.4%	23.3%
		-2	11.3%	14.1%	21.2%	26.7%
Linear	20 year	0	7.4%	9.5%	17.1%	23.9%
		1	5.4%	7.0%	12.5%	19.6%
		2	4.1%	5.2%	9.6%	14.6%
		-1	10.3%	13.3%	21.0%	27.2%
		-2	14.1%	17.1%	24.5%	30.3%
Step function	zero	0	16.7%	21.9%	34.0%	42.4%
		1	11.5%	17.2%	32.7%	41.0%
		2	7.7%	10.9%	30.7%	40.4%
		-1	21.6%	25.0%	35.3%	44.1%
		-2	24.4%	27.1%	37.1%	45.0%
Step function	10 year	0	5.4%	7.2%	13.3%	19.4%
		1	4.2%	5.4%	9.6%	15.6%
		2	3.3%	4.1%	7.1%	12.4%
		-1	7.3%	9.6%	16.8%	22.9%
		-2	10.1%	13.2%	20.5%	24.6%
Step function	20 year	0	7.4%	9.5%	17.1%	23.9%
		1	5.6%	7.7%	13.7%	19.9%
		2	4.1%	5.6%	10.3%	15.5%
		-1	9.4%	12.5%	20.8%	25.8%
		-2	12.7%	16.1%	23.5%	26.8%
Convex	zero	0	16.7%	21.9%	34.0%	42.4%
		1	10.4%	15.6%	30.4%	40.0%
		2	6.3%	9.3%	25.4%	37.3%
Convex	10 year	0	5.4%	7.2%	13.3%	19.4%
		1	3.8%	4.8%	8.9%	14.6%

Scenario		Estimated poverty rate in 2030 at various poverty lines, USD per capita per day, 2005 PPPs				
		1.25 (2011: 14.5%)	1.45 (2011: 19.4%)	2.00 (2011: 30.9%)	2.50 (2011: 39.0%)	
GIC	Growth	m				
		2	2.8%	3.7%	6.4%	10.1%
Convex	20 year	0	7.4%	9.5%	17.1%	23.9%
		1	5.2%	6.7%	12.1%	19.8%
		2	4.1%	5.3%	9.3%	13.8%

The results below impose m only on the bottom 20% (instead of the bottom 40%):

Linear	zero	0	16.7%	21.9%	34.0%	42.4%
		1	12.0%	17.3%	31.5%	40.7%
		2	8.2%	12.1%	28.8%	39.6%
		-1	20.9%	25.6%	36.5%	44.2%
		-2	24.5%	28.9%	39.0%	45.9%
Linear	10 year	0	5.4%	7.2%	13.3%	19.4%
		1	4.3%	5.4%	9.9%	15.8%
		2	3.4%	4.3%	7.6%	12.0%
		-1	7.3%	9.6%	16.6%	22.6%
		-2	9.8%	12.6%	19.7%	25.3%
Linear	20 year	0	7.4%	9.5%	17.1%	23.9%
		1	5.7%	7.5%	13.4%	20.6%
		2	4.6%	5.9%	10.6%	16.5%
		-1	9.6%	12.5%	20.3%	26.6%
		-2	12.6%	15.6%	23.2%	29.0%

Table 2: Gini, bottom 20% share and bottom 40% share in 2030

Scenario			Distributional Measure (mean) – Estimate for 2030		
GIC	Growth	M	Gini (2011: 40.5%)	Bottom 20% Share (2011: 6.2%)	Bottom 40% Share (2011: 16.7%)
L	zero	0	40.5%	6.2%	16.7%
		1	34.4%	7.9%	20.1%
		2	27.5%	10.0%	24.3%
		-1	45.8%	4.9%	13.8%
		-2	50.5%	3.8%	11.3%
L	10 year	0	40.5%	6.2%	16.7%
		1	34.6%	7.9%	20.0%
		2	27.9%	9.9%	24.0%
		-1	45.7%	4.9%	13.8%
		-2	50.3%	3.9%	11.5%
L	20 year	0	40.5%	6.2%	16.7%
		1	34.5%	7.9%	20.1%
		2	27.8%	10.0%	24.1%
		-1	45.7%	4.9%	13.8%
		-2	50.3%	3.9%	11.4%

9 Appendix 1: Derivation of Formulas for Growth Incidence Curves

9.1 Derivation of the Linear GIC (panel B, Figure 2)

The growth in the overall mean can be written as²⁴

$$\gamma = \frac{\sum_i^N y_i^*}{\sum_i^N y_i} - 1 \quad (9)$$

We can rewrite this using the GIC definition (Equation 3) and its linear functional form (Equation 5)

$$\gamma = \frac{\sum_i^N y_i(1+g_i)}{\sum_i^N y_i} - 1 = \frac{\sum_i^N y_i(1+\delta-\theta p_i)}{\sum_i^N y_i} - 1 = \delta - \theta \frac{\sum_i^N p_i y_i}{\sum_i^N y_i} \quad (10)$$

Similarly, the growth in the mean income of the bottom 40% can be written as

$$\gamma_{40} = \frac{\sum_i^{0.4N} y_i^*}{\sum_i^{0.4N} y_i} - 1 = \delta - \theta \frac{\sum_i^{0.4N} p_i y_i}{\sum_i^{0.4N} y_i} \quad (11)$$

Substituting (10) and (11) into the shared prosperity premium (Equation 1) yields

$$m = \gamma_{40} - \gamma = \theta \left(\frac{\sum_i^N p_i y_i}{\sum_i^N y_i} - \frac{\sum_i^{0.4N} p_i y_i}{\sum_i^{0.4N} y_i} \right) \quad (12)$$

Rearranging gives the expression for θ below. δ is derived by substituting for θ in (10). In sum, the parameters of the linear GIC are defined as

$$\theta = \frac{m}{\Theta - \Gamma} \quad \text{and} \quad \delta = \gamma + \Theta \left(\frac{m}{\Theta - \Gamma} \right) \quad (13)$$

where,

$$\Theta \equiv \frac{\sum_i^N p_i y_i}{\sum_i^N y_i} \quad \text{and} \quad \Gamma \equiv \frac{\sum_i^{0.4N} p_i y_i}{\sum_i^{0.4N} y_i} \quad (14)$$

²⁴ Note that in our definition of the GIC, i denotes a fractile group. y_i is the average income of that fractile group. In Equations 9 and 10, we used the fact that the mean over the fractile group means equals the overall mean.

9.2 Derivation of the Convex GIC (panel C, Figure 2)

We can denote the total transformed income of the bottom 40% as

$$\sum_i^{0.4N} y_i^* = \sum_i^{0.4N} (1 + \gamma)[(1 - \alpha)y_i + \alpha\mu] = (1 + \gamma)(1 - \alpha) \sum_i^{0.4N} y_i + (1 + \gamma)\alpha 0.4N\mu \quad (15)$$

Using the definition of the growth rate in mean income of the bottom 40% (Equation 11), this can be written as

$$1 + \gamma_{40} = \frac{(1 + \gamma)(1 - \alpha) \sum_i^{0.4N} y_i + (1 + \gamma)\alpha 0.4N\mu}{\sum_i^{0.4N} y_i} \quad (16)$$

This in turn can be expressed in terms of the income share of the bottom 40% by making use of the fact that $N\mu = \sum_i^N y_i$

$$\frac{1 + \gamma_{40}}{1 + \gamma} = 1 - \alpha + \frac{0.4\alpha}{s_{40}} \quad (17)$$

Using $\gamma_{40} = \gamma + m$ (Equation 1), we can solve the expression for α

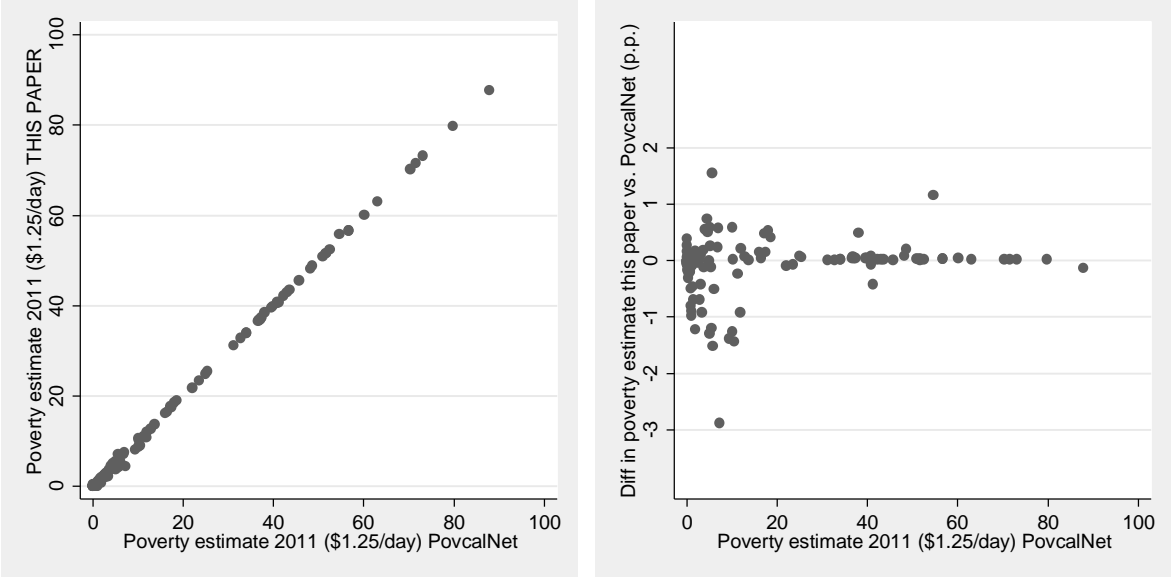
$$\alpha = \frac{m}{(1 + \gamma)\left(\frac{0.4}{s_{40}} - 1\right)} \quad (18)$$

10 Appendix 2: Data Used in Simulations

10.1 Comparison with PovcalNet

Figure 10 compares our poverty estimates at the \$1.25 poverty line against those from PovcalNet (using 2005 PPPs). The difference has a median of 0.02pp and standard deviation of 0.53pp. For more than half of the observations, the modeled estimates fall within +/- 0.1pp of the PovcalNet estimates. Our estimate of global poverty in 2011 is 14.5%, the same as the estimate generated with PovcalNet (to 1 decimal point). The differences are largest for countries where PovcalNet relies on microdata for estimating poverty (mostly the Latin America and Caribbean region). Furthermore, our simulated headcount ratios for 2030 under distribution-neutral growth are very similar to World Bank (2015a) when using the same growth rates as were used in those estimates. However, the main results in our paper use different growth rates which results in different poverty estimates for 2030.

Figure 10: Differences in poverty estimates calculated in this paper vs. PovcalNet (2005 PPPs)



10.2 Methods for Applying 2011 PPPs

Following Jolliffe and Prydz (2015) and Lakner and Milanovic (forthcoming), we convert income or consumption in 2005 PPP-adjusted USD ($PPP05inc_t$) into 2011 PPP-adjusted USD ($PPP11inc_t$) as follows

$$PPP11inc_t = PPP05inc_t \times \frac{CPI_{11}}{CPI_{05}} \times \frac{PPP05}{PPP11} \quad (19)$$

where CPI_t is the CPI in year t and $PPP05$ ($PPP11$) is the 2005 (2011) PPP exchange rate for private consumption.²⁵ In their calculations of global poverty, Chen and Ravallion (2010) adjust the 2005 PPPs for rural-urban China, India and Indonesia. As explained in the main text, it is unclear whether and how to implement such an adjustment with the 2011 PPPs, so we consider two options. First, we use the 2011 PPPs without any spatial price adjustment. As explained in detail in Jolliffe and Prydz (2015), we need to use the spatially adjusted 2005 PPP exchange rates in Equation 19 (instead of the official $PPP05$) for China, India and Indonesia, to undo the adjustment used with the 2005 PPPs.

Second, we apply a spatial price adjustment to the 2011 PPPs which updates the Chen and Ravallion method. We do this only for China, India and Indonesia, because these are the countries for which PovcalNet has readily available separate rural and urban distributions. Ravallion (2008) explains that this method requires two parameters: (a) the relative urban-rural price level ω , and (b) the urban weight in the ICP price collection λ . The relative urban-rural price level ω is defined as

$$\omega = \frac{PPP_U}{PPP_R} \quad (20)$$

where PPP_U (PPP_R) is the urban (rural) PPP exchange rate. The national (official) PPP exchange rate can be expressed as a weighted sum of the urban and rural PPPs

$$PPP = \lambda PPP_U + (1 - \lambda) PPP_R \quad (21)$$

Equations 20 and 21 are solved simultaneously to derive the expressions for PPP_R and PPP_U .

The relative urban-rural price levels (ω) for India and Indonesia are based on the ratio of the official urban and rural poverty lines in 2011. For India, we use the official Tendulkar poverty lines from 2011-12 (Planning Commission, 2014). For Indonesia, we use the official urban and rural poverty lines for September 2011 (Statistics Indonesia, 2015). Because of the absence of an official urban poverty line in China, we have assumed a relative urban-rural price level of 1.37, as used by Chen and Ravallion (2010) for the 2005 PPPs.

World Bank (2015b) argues that the 2011 PPPs achieved a better coverage of rural areas in China compared with the 2005 PPPs, and covered both urban and rural areas in India and Indonesia. Hence we assume that there is no urban bias in the 2011 ICP price collection. This might be an extreme assumption, but provides a useful starting point, especially considering the limited sampling documentation by the ICP. This is similar to the approach followed by Chen and Ravallion for the 2005

²⁵ See derivation in Annex 1.B of Jolliffe and Prydz (2015).

PPPs in Indonesia (explained in detail in Chen and Ravallion, 2008). If there is no urban bias, i.e. the ICP sample is self-weighting, urban and rural outlets should be selected according to their volume of sales (Vogel, 2015). This is equivalent to setting the urban weight in the ICP price collection (λ) equal to the urban *real* expenditure share (i.e. controlling for urban-rural price differences):

$$\lambda = \frac{\overline{Y}_U N_U}{\overline{Y}_U N_U + \omega \overline{Y}_R N_R} \quad (22)$$

where \overline{Y}_U (\overline{Y}_R) is the urban (rural) mean and N_U (N_R) is the urban (rural) population. Table A.1 summarizes our 2011 PPP conversion factors for China, India and Indonesia. In Figure 8, Panel A uses the official PPPs (Column 2), while Panel B uses the urban and rural PPPs (Columns 5 and 6) which adjust for spatial price differences.

Table A.1: 2011 PPP conversion factors

Country	Official PPP	Urban to rural price level (ω)	Urban weight (λ)	Urban PPP	Rural PPP
China	3.70	1.37	0.71	4.01	2.93
India	14.98	1.23	0.42	16.76	13.68
Indonesia	4091.94	1.18	0.60	4360.91	3692.31

11 Online Appendix: Additional tables

Table OA.1: Regional poverty rates in 2030

Region	Scenario			Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)					
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
East Asia & Pacific	L	zero	0	8.2%	12.3%	23.1%	32.4%	55.3%	88.7%
			1	2.3%	5.6%	16.0%	25.6%	51.8%	90.4%
			2	0.6%	1.3%	8.3%	18.1%	46.2%	92.6%
			-1	14.3%	18.6%	29.5%	38.6%	58.0%	87.4%
			-2	20.2%	24.6%	35.3%	43.6%	60.2%	86.5%
East Asia & Pacific	L	10 year	0	0.5%	1.1%	4.3%	7.0%	15.3%	43.8%
			1	0.2%	0.3%	1.7%	4.6%	12.8%	39.1%
			2	0.1%	0.1%	0.4%	1.5%	11.1%	34.4%
			-1	1.8%	3.2%	6.4%	9.4%	19.7%	48.3%
			-2	3.8%	5.1%	8.8%	12.5%	23.9%	51.9%
East Asia & Pacific	L	20 year	0	0.4%	1.1%	3.9%	6.7%	15.8%	45.7%
			1	0.1%	0.3%	1.5%	4.2%	12.8%	40.9%
			2	0.0%	0.1%	0.3%	1.5%	10.3%	36.0%
			-1	1.6%	2.8%	6.3%	9.5%	20.4%	50.1%
			-2	3.6%	5.0%	8.9%	13.1%	24.7%	53.5%
East Asia & Pacific	S	zero	0	8.2%	12.3%	23.1%	32.4%	55.3%	88.7%
			1	3.3%	6.8%	16.0%	27.2%	56.6%	89.6%
			2	1.0%	2.1%	9.1%	22.6%	58.8%	91.0%
			-1	13.4%	18.3%	28.1%	38.7%	54.3%	87.9%
			-2	19.8%	24.1%	34.6%	41.8%	53.3%	87.3%
East Asia & Pacific	S	10 year	0	0.5%	1.1%	4.3%	7.0%	15.3%	43.8%
			1	0.2%	0.4%	2.1%	4.6%	14.3%	39.3%
			2	0.1%	0.2%	0.6%	1.9%	14.1%	35.3%
			-1	1.3%	2.7%	6.5%	9.3%	17.8%	49.4%
			-2	3.2%	4.8%	9.0%	10.4%	21.1%	52.6%
East Asia & Pacific	S	20 year	0	0.4%	1.1%	3.9%	6.7%	15.8%	45.7%
			1	0.2%	0.4%	1.8%	4.2%	14.4%	40.9%
			2	0.0%	0.1%	0.6%	1.7%	13.9%	36.5%
			-1	1.3%	2.4%	6.2%	9.3%	18.4%	51.5%
			-2	2.8%	4.6%	8.8%	11.0%	21.6%	53.0%
East Asia & Pacific	C	zero	0	8.2%	12.3%	23.1%	32.4%	55.3%	88.7%
			1	1.0%	3.6%	15.4%	26.3%	53.2%	90.0%
			2	0.0%	0.2%	5.2%	16.4%	49.6%	92.0%
East Asia & Pacific	C	10 year	0	0.5%	1.1%	4.3%	7.0%	15.3%	43.8%
			1	0.1%	0.1%	1.4%	4.7%	12.3%	39.5%

Region	Scenario			Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)					
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
			2	0.1%	0.1%	0.1%	1.1%	11.2%	32.9%
East Asia & Pacific	C	20 year	0	0.4%	1.1%	3.9%	6.7%	15.8%	45.7%
			1	0.0%	0.1%	1.3%	4.1%	12.2%	41.5%
			2	0.0%	0.0%	0.1%	1.2%	10.5%	35.1%
Europe & Central Asia	L	zero	0	1.0%	1.6%	4.3%	7.3%	18.3%	63.1%
			1	0.4%	0.7%	2.1%	4.4%	13.8%	60.0%
			2	0.2%	0.3%	0.8%	1.9%	11.2%	55.1%
			-1	2.3%	3.4%	7.2%	11.1%	24.2%	65.0%
			-2	4.3%	6.0%	10.9%	15.7%	30.2%	66.5%
Europe & Central Asia	L	10 year	0	0.1%	0.2%	0.5%	1.1%	4.2%	23.2%
			1	0.0%	0.1%	0.2%	0.4%	2.3%	18.5%
			2	0.0%	0.0%	0.1%	0.2%	0.9%	14.6%
			-1	0.3%	0.4%	1.2%	2.2%	6.8%	28.2%
			-2	0.6%	1.0%	2.4%	4.1%	9.9%	32.7%
Europe & Central Asia	L	20 year	0	2.0%	2.7%	4.7%	6.5%	11.7%	39.1%
			1	1.2%	1.9%	4.0%	5.6%	9.8%	32.7%
			2	0.4%	0.8%	3.9%	5.0%	8.8%	27.2%
			-1	2.8%	3.6%	5.9%	8.0%	14.8%	44.8%
			-2	3.8%	4.7%	7.6%	10.3%	19.0%	49.2%
Europe & Central Asia	S	zero	0	1.0%	1.6%	4.3%	7.3%	18.3%	63.1%
			1	0.5%	0.8%	2.3%	4.6%	14.7%	61.2%
			2	0.2%	0.3%	1.0%	2.0%	12.2%	60.2%
			-1	1.9%	3.0%	6.8%	9.8%	23.7%	62.4%
			-2	3.4%	5.0%	9.4%	12.9%	29.9%	61.5%
Europe & Central Asia	S	10 year	0	0.1%	0.2%	0.5%	1.1%	4.2%	23.2%
			1	0.0%	0.1%	0.3%	0.6%	2.5%	19.4%
			2	0.0%	0.0%	0.1%	0.2%	1.1%	15.2%
			-1	0.2%	0.3%	0.9%	1.9%	6.1%	28.2%
			-2	0.4%	0.6%	1.7%	3.3%	8.4%	32.4%
Europe & Central Asia	S	20 year	0	2.0%	2.7%	4.7%	6.5%	11.7%	39.1%
			1	1.2%	1.7%	4.2%	5.8%	10.1%	32.8%
			2	0.5%	0.8%	4.1%	4.9%	9.0%	27.8%
			-1	2.6%	3.0%	5.5%	7.4%	13.9%	42.8%
			-2	3.2%	3.8%	6.4%	8.7%	17.0%	45.7%
Europe & Central Asia	C	zero	0	1.0%	1.6%	4.3%	7.3%	18.3%	63.1%
			1	0.2%	0.3%	1.6%	3.7%	12.5%	61.1%
			2	0.0%	0.1%	0.3%	1.5%	9.0%	55.7%
Europe & Central Asia	C	10 year	0	0.1%	0.2%	0.5%	1.1%	4.2%	23.2%

Region	Scenario			Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)					
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
			1	0.0%	0.0%	0.0%	0.2%	1.8%	18.4%
			2	0.0%	0.0%	0.0%	0.0%	0.6%	13.2%
Europe & Central Asia	C	20 year	0	2.0%	2.7%	4.7%	6.5%	11.7%	39.1%
			1	1.2%	1.9%	3.9%	5.4%	8.8%	33.5%
			2	0.1%	0.9%	3.6%	4.9%	8.4%	26.6%
Latin America & Caribbean	L	zero	0	5.2%	6.6%	10.5%	14.2%	27.8%	67.1%
			1	3.4%	4.4%	7.5%	10.4%	21.3%	65.3%
			2	2.1%	2.8%	5.1%	7.4%	15.2%	63.1%
			-1	7.6%	9.3%	14.2%	19.4%	33.8%	68.5%
			-2	10.5%	12.5%	19.1%	24.7%	39.0%	69.7%
Latin America & Caribbean	L	10 year	0	2.7%	3.5%	6.0%	8.3%	15.7%	47.4%
			1	1.9%	2.4%	4.1%	5.9%	12.0%	42.7%
			2	1.3%	1.7%	2.8%	4.0%	8.5%	37.0%
			-1	4.1%	5.2%	8.4%	11.5%	20.5%	51.1%
			-2	6.1%	7.4%	11.6%	14.9%	25.7%	54.3%
Latin America & Caribbean	L	20 year	0	3.4%	4.3%	6.9%	9.2%	17.7%	51.8%
			1	2.4%	3.0%	4.9%	6.8%	13.0%	47.5%
			2	1.7%	2.1%	3.4%	4.8%	9.5%	41.8%
			-1	4.9%	6.1%	9.3%	12.5%	23.1%	55.2%
			-2	7.0%	8.4%	12.5%	16.7%	28.3%	57.9%
Latin America & Caribbean	S	zero	0	5.2%	6.6%	10.5%	14.2%	27.8%	67.1%
			1	3.9%	5.0%	8.0%	10.9%	21.9%	68.2%
			2	2.8%	3.6%	5.9%	8.1%	16.3%	68.6%
			-1	6.9%	8.6%	13.4%	18.4%	34.2%	66.1%
			-2	8.9%	11.0%	17.5%	23.8%	39.8%	65.2%
Latin America & Caribbean	S	10 year	0	2.7%	3.5%	6.0%	8.3%	15.7%	47.4%
			1	2.1%	2.7%	4.5%	6.3%	12.7%	44.6%
			2	1.7%	2.1%	3.3%	4.6%	9.8%	40.9%
			-1	3.6%	4.7%	7.7%	10.8%	19.8%	48.3%
			-2	4.9%	6.2%	10.2%	13.4%	25.0%	48.4%
Latin America & Caribbean	S	20 year	0	3.4%	4.3%	6.9%	9.2%	17.7%	51.8%
			1	2.7%	3.3%	5.3%	7.2%	13.8%	51.7%
			2	2.1%	2.5%	3.9%	5.4%	10.7%	45.9%
			-1	4.4%	5.6%	8.7%	12.0%	22.5%	51.5%
			-2	5.8%	7.2%	11.3%	15.1%	28.2%	51.4%
Latin America & Caribbean	C	zero	0	5.2%	6.6%	10.5%	14.2%	27.8%	67.1%
			1	1.5%	2.2%	5.5%	8.8%	21.8%	66.5%
			2	1.0%	1.3%	2.1%	3.6%	13.7%	65.5%

Region	Scenario		Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)						
			GIC	Growth	m	1.25	1.45	2	2.5
	Latin America & Caribbean	C	10 year	0	2.7%	3.5%	6.0%	8.3%	15.7%
			1	1.2%	1.5%	2.3%	3.6%	10.5%	44.3%
			2	1.0%	1.1%	1.7%	2.2%	4.8%	39.7%
Latin America & Caribbean	C	20 year	0	3.4%	4.3%	6.9%	9.2%	17.7%	51.8%
			1	1.4%	1.7%	2.9%	4.7%	12.1%	49.2%
			2	1.1%	1.3%	1.8%	2.3%	6.3%	45.3%
Middle East & North Africa	L	zero	0	1.7%	3.4%	11.7%	22.8%	51.4%	89.2%
			1	0.4%	0.9%	4.4%	11.9%	48.1%	91.0%
			2	0.1%	0.2%	1.1%	3.7%	45.6%	93.4%
			-1	5.3%	8.8%	20.7%	31.1%	54.5%	87.9%
			-2	11.4%	16.2%	28.2%	37.2%	57.2%	86.8%
Middle East & North Africa	L	10 year	0	0.9%	1.8%	5.6%	11.0%	32.4%	78.2%
			1	0.2%	0.5%	2.4%	5.9%	24.6%	78.3%
			2	0.1%	0.1%	0.7%	2.4%	17.4%	77.7%
			-1	2.6%	4.3%	10.7%	17.8%	38.9%	78.3%
			-2	5.7%	8.4%	16.9%	24.7%	43.7%	78.1%
Middle East & North Africa	L	20 year	0	0.7%	1.4%	4.9%	9.9%	31.3%	79.9%
			1	0.2%	0.4%	1.8%	4.8%	22.4%	81.1%
			2	0.0%	0.1%	0.5%	1.6%	13.3%	82.4%
			-1	2.3%	3.8%	9.8%	16.9%	38.1%	79.2%
			-2	5.2%	7.9%	16.4%	24.3%	43.4%	78.9%
Middle East & North Africa	S	zero	0	1.7%	3.4%	11.7%	22.8%	51.4%	89.2%
			1	0.6%	1.3%	5.4%	12.2%	50.1%	90.4%
			2	0.1%	0.3%	1.5%	4.0%	44.6%	92.2%
			-1	4.0%	7.4%	21.0%	29.5%	52.6%	88.4%
			-2	8.6%	14.4%	28.7%	34.3%	51.9%	87.6%
Middle East & North Africa	S	10 year	0	0.9%	1.8%	5.6%	11.0%	32.4%	78.2%
			1	0.3%	0.7%	2.7%	7.5%	25.2%	80.0%
			2	0.1%	0.2%	0.8%	2.2%	19.6%	82.8%
			-1	2.1%	3.6%	9.5%	16.7%	36.7%	76.9%
			-2	4.2%	6.8%	15.0%	23.2%	39.3%	75.9%
Middle East & North Africa	S	20 year	0	0.7%	1.4%	4.9%	9.9%	31.3%	79.9%
			1	0.3%	0.6%	2.3%	5.2%	23.3%	81.9%
			2	0.1%	0.1%	0.7%	1.9%	12.8%	84.9%
			-1	1.7%	3.1%	8.9%	15.6%	35.3%	78.4%
			-2	3.6%	6.0%	14.4%	23.7%	39.0%	77.1%
Middle East & North Africa	C	zero	0	1.7%	3.4%	11.7%	22.8%	51.4%	89.2%
			1	0.0%	0.1%	3.0%	11.9%	48.1%	90.9%

Region	Scenario		Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)						
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
			2	0.0%	0.0%	0.0%	1.6%	42.6%	93.0%
Middle East & North Africa	C	10 year	0	0.9%	1.8%	5.6%	11.0%	32.4%	78.2%
			1	0.1%	0.2%	1.9%	5.1%	24.8%	78.8%
			2	0.0%	0.0%	0.2%	2.2%	15.4%	79.2%
Middle East & North Africa	C	20 year	0	0.7%	1.4%	4.9%	9.9%	31.3%	79.9%
			1	0.0%	0.1%	1.2%	4.0%	22.6%	81.3%
			2	0.0%	0.0%	0.0%	0.7%	12.0%	83.3%
South Asia	L	zero	0	24.5%	35.3%	60.1%	74.6%	90.2%	99.1%
			1	11.4%	22.1%	57.5%	77.4%	92.2%	99.5%
			2	2.1%	6.5%	51.7%	82.8%	94.3%	99.8%
			-1	34.7%	43.4%	62.0%	73.4%	88.5%	98.7%
			-2	41.6%	48.7%	63.7%	73.0%	87.2%	98.2%
South Asia	L	10 year	0	1.6%	3.9%	14.9%	28.4%	63.0%	94.1%
			1	0.3%	0.7%	5.8%	16.6%	61.4%	95.4%
			2	0.0%	0.1%	1.1%	6.4%	56.2%	97.0%
			-1	5.8%	10.1%	24.8%	37.3%	64.3%	92.8%
			-2	13.2%	18.7%	32.9%	43.5%	65.5%	91.7%
South Asia	L	20 year	0	3.6%	6.6%	22.5%	38.5%	72.0%	95.6%
			1	0.7%	2.1%	10.5%	26.7%	73.8%	97.0%
			2	0.1%	0.3%	3.8%	12.3%	78.1%	98.1%
			-1	9.7%	15.8%	32.4%	45.6%	71.5%	94.4%
			-2	18.4%	24.6%	39.5%	50.3%	71.5%	93.6%
South Asia	S	zero	0	24.5%	35.3%	60.1%	74.6%	90.2%	99.1%
			1	12.2%	22.5%	64.4%	77.8%	91.3%	99.3%
			2	2.7%	7.1%	64.6%	82.7%	93.1%	99.6%
			-1	37.2%	40.3%	57.0%	72.1%	89.4%	99.0%
			-2	39.7%	40.2%	54.4%	69.9%	88.6%	98.9%
South Asia	S	10 year	0	1.6%	3.9%	14.9%	28.4%	63.0%	94.1%
			1	0.4%	1.1%	6.4%	18.0%	66.9%	94.7%
			2	0.0%	0.2%	1.4%	10.2%	72.9%	95.8%
			-1	4.6%	8.4%	24.4%	37.7%	60.2%	93.6%
			-2	10.0%	17.4%	34.2%	40.5%	57.9%	93.1%
South Asia	S	20 year	0	3.6%	6.6%	22.5%	38.5%	72.0%	95.6%
			1	1.0%	2.8%	13.2%	25.9%	75.2%	96.3%
			2	0.2%	0.4%	4.2%	13.5%	80.2%	97.3%
			-1	7.8%	14.5%	33.7%	42.1%	69.5%	95.2%
			-2	16.4%	24.4%	40.0%	41.9%	67.5%	94.8%
South Asia	C	zero	0	24.5%	35.3%	60.1%	74.6%	90.2%	99.1%

Region	Scenario		Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)						
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
			1	11.0%	23.4%	57.4%	76.0%	92.2%	99.6%
			2	0.3%	4.6%	50.1%	79.0%	95.0%	99.9%
South Asia	C	10 year	0	1.6%	3.9%	14.9%	28.4%	63.0%	94.1%
			1	0.0%	0.2%	4.8%	16.3%	61.3%	95.5%
			2	0.0%	0.0%	0.3%	5.1%	56.5%	97.6%
South Asia	C	20 year	0	3.6%	6.6%	22.5%	38.5%	72.0%	95.6%
			1	0.2%	1.2%	9.2%	28.1%	72.7%	97.2%
			2	0.0%	0.0%	2.9%	9.5%	74.1%	98.6%
Sub-Saharan Africa	L	zero	0	48.0%	55.6%	70.7%	79.2%	89.9%	98.0%
			1	42.4%	51.4%	70.4%	79.8%	90.9%	98.3%
			2	35.3%	45.4%	70.7%	80.3%	92.1%	98.5%
			-1	52.3%	58.6%	71.2%	78.7%	89.0%	97.7%
			-2	55.5%	60.9%	71.9%	78.5%	88.4%	97.4%
Sub-Saharan Africa	L	10 year	0	27.3%	32.7%	45.9%	55.8%	75.2%	94.5%
			1	22.1%	27.1%	40.9%	52.0%	74.6%	95.2%
			2	17.3%	21.7%	35.5%	47.5%	73.6%	95.9%
			-1	32.5%	37.8%	50.1%	58.8%	75.6%	93.8%
			-2	37.4%	42.5%	53.5%	61.2%	76.0%	93.3%
Sub-Saharan Africa	L	20 year	0	35.5%	41.9%	56.9%	67.2%	84.1%	96.5%
			1	29.2%	35.9%	52.9%	65.4%	85.1%	97.0%
			2	23.1%	29.2%	48.0%	62.6%	86.4%	97.4%
			-1	41.1%	46.9%	59.9%	68.6%	83.4%	96.0%
			-2	45.8%	50.9%	62.2%	69.7%	82.9%	95.5%
Sub-Saharan Africa	S	zero	0	48.0%	55.6%	70.7%	79.2%	89.9%	98.0%
			1	43.3%	56.0%	71.3%	80.2%	90.5%	98.1%
			2	38.6%	49.2%	72.6%	81.5%	91.5%	98.3%
			-1	49.1%	55.2%	69.8%	78.3%	89.4%	97.9%
			-2	49.5%	54.8%	69.0%	77.4%	88.9%	97.8%
Sub-Saharan Africa	S	10 year	0	27.3%	32.7%	45.9%	55.8%	75.2%	94.5%
			1	22.8%	28.1%	41.5%	54.1%	76.4%	94.8%
			2	18.5%	22.5%	37.0%	53.0%	73.4%	95.3%
			-1	32.0%	37.0%	47.6%	56.7%	74.1%	94.2%
			-2	36.5%	40.5%	48.9%	57.7%	73.1%	93.9%
Sub-Saharan Africa	S	20 year	0	35.5%	41.9%	56.9%	67.2%	84.1%	96.5%
			1	29.8%	38.8%	55.5%	68.0%	84.9%	96.8%
			2	22.9%	30.6%	51.2%	65.7%	85.9%	97.1%
			-1	39.2%	45.0%	57.6%	66.4%	83.3%	96.3%
			-2	42.6%	47.2%	57.3%	65.6%	82.5%	96.2%

Region	Scenario			Poverty rate in 2030 at poverty lines (USD per capita per day, 2005 PPPs)					
	GIC	Growth	m	1.25	1.45	2	2.5	4	10
Sub-Saharan Africa	C	zero	0	48.0%	55.6%	70.7%	79.2%	89.9%	98.0%
			1	43.6%	52.5%	70.5%	79.8%	90.8%	98.3%
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			2	16.0%	21.1%	36.2%	48.6%	74.3%	96.0%
Sub-Saharan Africa	C	20 year	0	35.5%	41.9%	56.9%	67.2%	84.1%	96.5%
			1	29.4%	36.5%	53.8%	66.1%	85.0%	97.0%
			2	23.4%	30.1%	48.7%	63.6%	86.1%	97.5%

Note: Linear, step function and convex GIC are respectively represented as L, S and C. The table uses the World Bank's regional classification which excludes high income countries. Hence, the regional headcount ratios in the table represent the share of the population in low and middle income countries in a particular region that lives below a given poverty line.