Leaving no one behind: the impact of pro-poor growth

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Cover photo: Pak Sugandi rearranges a pile of bananas, Indonesia - Danumurthi Mahendra (Creative Commons Licensed via Flickr)

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Key messages

- To address the widening gap between the rich and the poor and in order to leave no one behind, a focus on change in *absolute* inequality is more appropriate than the usual focus on *relative* inequality.

- Over the last 30 years, absolute inequality has always increased when countries have experienced prolonged periods of income growth across the distribution.

- On average, the top 10% have accumulated around one third of the absolute gains in income from growth over the past two decades, while the bottom 40% have accumulated only around half as much.

- The vast majority of countries would still have experienced increases in absolute inequality even if the most extreme cases of relative pro-poor growth in history had prevailed.

- To reduce absolute inequality in the future, unprecedented rates of relative pro-poor growth will be required – on average, the rate of growth among the bottom 40% would need to be more than twice as fast as the mean to begin to close the gap.

Acknowledgments

Introduction

Tackling worsening income inequality has been labelled a key challenge of our time (World Economic Forum, 2015). Analyses by academics such as Thomas Piketty (Piketty, 2014), and advocacy organisations including Oxfam,[1] have shown that the gap between the richest and the poorest is widening both within countries and on a global scale. Attempts to address this include a Sustainable Development Goal (SDG) targeting inequality and the World Bank's aim to promote 'shared prosperity'. Specifically, SDG Target 10.1 aims for the bottom 40% of the distribution to grow faster than the average, and the World Bank has a similar – albeit weaker – aim to promote income growth of the bottom 40% within every country. The idea is for everyone's incomes to grow, but for incomes among the bottom 40% of the distribution to grow at a faster rate. The hope is that everyone's standard of living can be raised while the gap between the most well off and least well off in society shrinks at the same time, so that ultimately, no one is left behind.

This paper unpacks the prevailing discourse and demonstrates that the gap between the rich and the poor is likely to continue to widen, and people therefore will be left behind, even if the SDG target and the World Bank's aim are met. In the past, growth levels that were in favour of the bottom 40% of the distribution have not been sufficient to close the gap between the rich and the poor. This has been the case even in countries that have experienced falling inequality as measured by indicators such as the Gini index or the Palma ratio.

The bulk of the discussion about changes in inequality focuses on 'relative' inequality, but this does not measure the income gap between the rich and the poor. Relative inequality refers to the ratio of the incomes of the richest over those of the poorest (as measured, for example, by the Gini index and the Palma ratio). When countries have been growing but there has been no change in relative inequality, commentators often mistakenly suggest that 'growth raised the incomes (of the poor) by about as much as it raised the incomes of everybody else' (*The Economist*, 2000: 94). However, this is not the case. No change in relative inequality means that the entire distribution experienced the same percentage increase in income (i.e. equal growth across the distribution). The situation referred to in the

quotation marks implies that everyone's incomes grew by the identical absolute amount (i.e. the same number of dollars). In other words, the income gap between the richest and poorest did not change. This a more equitable distribution of growth than the situation whereby everyone's income increased by the same percentage.

Consider the following example that further illustrates the distinction between changes in relative and absolute inequality. Figure 1 shows how income changed for each percentile across the distribution between 1985 and 2009 in the Philippines. Growth is roughly evenly distributed for most of the distribution, which means that relative inequality did not change. However, the absolute gain in income was marginal for the poorest but was much greater towards the top of the distribution. As such, absolute inequality (i.e. the gap between the rich and poor) increased dramatically.

To address the widening gap between the rich and poor in such a way that no one is left behind, a focus on changes in 'absolute' inequality is more appropriate. Absolute inequality refers to the gap in incomes between the richest and the poorest (Kolm, 1976). Klasen (2008) defines a reduction in relative inequality as 'relative pro-poor growth' and a reduction in absolute inequality as 'strictly absolute pro-poor growth'. The latter has a solid foundation in the literature but has received surprisingly little empirical attention (Bosmans et al., 2011), especially considering that it seems plausible that people in general may perceive inequality in an absolute sense as opposed to in relative terms (Amiel and Cowell, 1999; Ravallion, 2007). In other words, a widening gap between the rich and the poor in society potentially concerns people more than how the ratio of incomes changes over time.

This paper undertakes three main pieces of analysis: it examines how absolute inequality has changed over time within countries; it models what would have happened to absolute inequality if growth had been more relatively pro-poor; and, given today's level of relative inequality, it determines how relatively 'pro-poor' growth would need to be to reduce absolute inequality in the future. This empirical analysis is sourced from the World Bank's online portal PovcalNET, one of the largest standardised datasets available.

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1   http://www.oxfam.org.uk/get-involved/campaign-with-us/our-campaigns/inequality-and-poverty

Figure 1: Difference between income growth and additional income in the Philippines
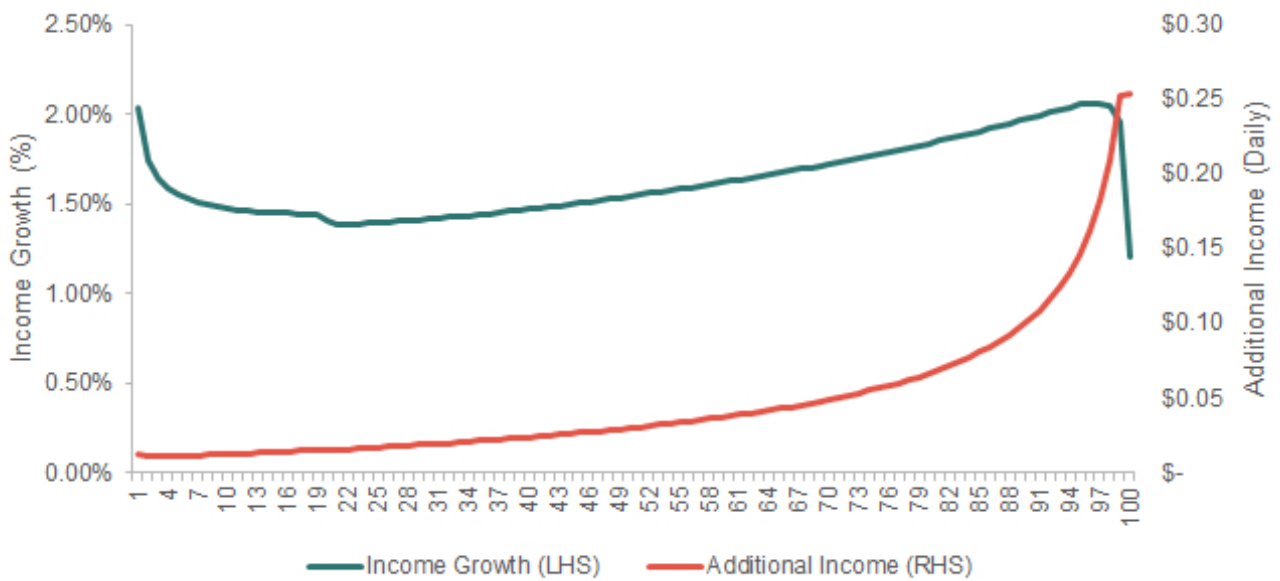
Source: World Bank, PovcalNET

There are at least three important findings. First, over the last 30 years, absolute inequality has always increased when countries have experienced prolonged periods of income growth across the distribution. Second, the vast majority of countries would still have experienced increases in absolute inequality even if the most extreme cases of relative pro-poor growth in history had prevailed. Finally, to reduce absolute inequality in the future, unprecedented rates of 'relative pro-poor growth' will be required.

The structure of this paper is as follows. First, it gives a brief overview of some of the literature regarding absolute inequality. It then details the methodology used in this paper and analyses what has actually happened in terms of changes in both relative and absolute inequality. Next, it considers a number of scenarios to illustrate what could have happened to absolute inequality in the past if growth had been relatively pro-poor. Finally, it presents the degree of relative pro-poor growth that would be required to reduce absolute inequality in the future, given today's levels of relative inequality.

What does past work on inequality suggest?

The number of studies on inequality has grown significantly in recent years, with most focusing on relative inequality (e.g. Ravallion, 2004; Klasen, 2008; Atkinson and Brandolini, 2010; Bosmans et al., 2011). These studies highlight that relative inequality between people has declined at the global level because people's standard of living in many developing countries, including China and India, has been growing faster than in the developed world. Within countries, however, there is a great deal of variation, with relative inequality declining in around half of developing countries over the last three decades (Hoy and Samman, 2015).

The trends in relative inequality do not match the popular discourse on how inequality has been worsening in recent decades, as shown by Piketty (2014) and Oxfam,[2] among others. For example, a frequently cited figure from Oxfam is that if current trends continue, by 2016 the richest 1% of the world's population will own half the world's wealth. The key reason for this disconnect between the existing literature and the popular discourse is that relative inequality does not measure the gap between the richest and poorest (Atkinson and Brandolini, 2010). In fact, some key papers (e.g. Atkinson and Brandolini, 2010; Bosmans et al. 2011) highlight that the disproportionate focus on relative inequality has overshadowed potentially more appropriate measures of inequality, such as absolute inequality.

Absolute inequality directly measures the gap between the rich and poor (Ravallion, 2007) and thus warrants greater attention. Many concerns over worsening inequality actually relate to absolute inequality. This is consistent with a study on perceptions of levels of inequality by Amiel and Cowell (1999), in which around half of the people surveyed thought of inequality in an absolute sense as opposed to in relative terms. Changes in absolute inequality, as opposed to relative inequality, capture more appropriately who accumulates the additional income generated from growth. For example, Edward and Sumner (2015) show that extreme poverty could have been eradicated in many countries if the additional income generated from growth had been distributed in favour of the poor. In other words, if absolute inequality had decreased, extreme poverty could have ended in many countries.

Klasen (2008) makes a helpful distinction by defining a reduction in relative inequality as 'relative pro-poor growth' and a reduction in absolute inequality as 'strictly absolute pro-poor growth'. Relative pro-poor growth implies that the incomes at the bottom of the distribution have grown faster than those at the top, while strictly absolute pro-poor growth implies that the additional income generated from growth was larger for those at the bottom end of the distribution than for those at the top. Livi Bacci (2001: 114) emphasises why simply achieving relative pro-poor growth could be considered as not addressing inequality adequately, stating that 'it is not much of a relief for somebody living on $1 day to see that his income, up by three cents, is growing as much as the income of the richest quintile' (authors' translation).

The small amount of work that has been done on absolute inequality has used a measure called the 'absolute Gini' and has not focused on cross-country comparisons of how absolute inequality has changed within countries. The absolute Gini is defined as the Gini coefficient (a measure of relative inequality) multiplied by the average income in a country (Araar, 2006). Ravallion (2007) and Milonavic and Lakner (2013), among others, mention how the absolute Gini has been growing at a global level and within countries. A few studies have looked at trends in absolute inequality within a particular country. Subramanian and Jayaraj (2015), for example, show that despite quite constant levels of relative inequality in India, absolute inequality has been growing dramatically.

There has to date been no analysis of how absolute inequality corresponds to a popular new measure of relative inequality known as the Palma ratio. The Palma ratio is the ratio of the share of income of the top 10% over that of the bottom 40%, and is a more policy-relevant measure of inequality than the Gini coefficient (Cobham and Sumner, 2013). It is based on Palma's (2011) finding that the share of the income that accrues to the half of the population from the 40th to 90th percentiles tends not to vary greatly between countries or over time.

This paper makes at least two important contributions to the existing literature. First, it conducts a detailed, cross-country comparison of how absolute inequality has changed within countries and compares this to changes in relative inequality. Second, by looking at how the gap in incomes between the top 10% and bottom 40% has changed over time, it lays the foundation for the notion of an 'absolute Palma'.

Methodology

Defining absolute inequality

Absolute inequality is measured in this paper as the difference between the average incomes of the top 10% and the bottom 40% of the distribution for two reasons. First, the Sustainable Development Goals and the World Bank have emphasised the importance of focusing on income growth of the bottom 40% of the distribution. Second, the Palma ratio measures relative inequality solely by examining the ratio of the income share of the top 10% over that of the bottom 40%. In addition, the Palma ratio also represents one quarter of the ratio of the average income of the top 10% over that of the bottom 40%,[3] which is advantageous for modelling changes in absolute inequality (this is formally shown in Annex 2).

Difference between absolute and relative inequality

To illustrate the difference between absolute and relative inequality, a country-specific example is used (the Philippines). The growth incidence curve[4] in Figure 1 represents how consumption levels changed for each percentile between the 1985 and 2009 household surveys. Growth is distributed roughly evenly for most of the distribution, which is on the cusp of being considered relative pro-poor. However, the absolute gain in income between the surveys was marginal for the poorest (given their very low base) and was much greater towards the top of the distribution. In fact, more than one third of the additional income generated was captured by the top 10% of the distribution.

To further illustrate the distinction, the following simple example shows how relative inequality can remain unchanged while absolute inequality increases dramatically. In a scenario in which the average income of the top 10% was $100 and that of the bottom 40% was $12, the Palma ratio would be around 2. A growth rate of 8% across the distribution (i.e. no change in relative inequality) would increase the average income of the top 10% by $8 and that of the bottom 40% by $1, leading to an increase in absolute inequality of $7.

Dataset

All the data used in this analysis are sourced from PovcalNET, the World Bank's publicly available database of all internationally comparable household surveys.[5] The data were retrieved prior to the latest update of the database at the end of 2014. However, given that the focus of this analysis is on long-term trends, there is little reason to believe that updated data will have a meaningful impact on its findings.

All countries with data in the World Bank's PovcalNET were included in this analysis as long as at least two surveys were available. In all cases, both the earliest and the most recent surveys were used. No income surveys (when consumption surveys were also available) or surveys broken down across rural and urban dimensions, were included to avoid double counting. This left a subset of 100 countries[6] that is identical to the subset used in Hoy and Samman (2015). On average, there were 17 years between surveys. Due to data availability, different time periods for different countries had to be used, with the gaps ranging from four years (Trinidad and Tobago) to 32 years (India).[7] This is clearly an illustrative rather than an indicative exercise.

The rest of the methodology section of this paper will match how the analysis is broken down to address three questions:
1. What actually happened?
2. What could have happened?
3. What will need to happen?

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3   This is due to the fact that, by definition, the top 10% contains one quarter of the population of the bottom 40%

4   Growth incidence curves give 'the rate of growth over the relevant time period at each percentile of the distribution (ranked by income or consumption per person)' See Ravallion, M. (2004), Pro-Poor Growth: A Primer. Development Research Group, World Bank.

5   PovcalNet is available at: http://iresearch.worldbank.org/PovcalNet/index.htm?1. There is widespread speculation that household surveys do not correspond with national accounts data, partly because those at the top end of the distribution either under-report their income or do not participate at all. If this were true, then current measures would underestimate inequality as the very top of the income distribution is under-represented. Regardless of the potential limitations, all measures of inequality are based on household surveys.

6   Six countries are excluded (Maldives, Sierra Leone, Namibia, West Bank and Gaza, Angola and Guinea-Bissau) because the data appear to be unreliable. In each of these countries, the difference in annual growth rates between the bottom 40% and the average was over five percentage points (almost 20 percentage points in the case of the Maldives).

7   Equally, because the data were so patchy, distinct sub-periods within the 30-year period were not analysed.

What actually happened?

The trend in terms of changes in relative inequality is determined for all the countries in the dataset described above. Change in relative inequality is measured in terms of the annualised percentage change in the Palma ratio, which can be expressed as follows:

$$\left(\left(\frac{\textbf{\textit{Palma Ratio}}_{t1}}{\textbf{\textit{Palma Ratio}}_{t0}}\right)^{\frac{1}{N}}\right) - 1$$

$((\text{Palma Ratio}_{t1}/\text{Palma Ratio}_{to})^{1/N}) - 1$

where where Palma Ratio$_{to}$ is the Palma ratio in the initial survey, Palma Ratio$_{t1}$ is the Palma ratio in the most recent survey, and N is the number of years between most recent and initial surveys.

Analysis of absolute inequality is limited to the 64 countries in the sample that had positive growth across the distribution, in order to avoid a situation whereby the gap between the top 10% and bottom 40% was reduced because of a fall in the income of the top 10%. In doing so, this analysis reflects the principle of 'leaving no one behind', in other words, the aim of lifting everyone's standard of living while also reducing inequality. Therefore, it does not represent the full diversity of country experiences over the last 30 years.

Change in absolute inequality is measured as the annualised percentage change in the difference between the top 10% and the bottom 40%, which can be expressed as:

$$\left(\left(\frac{\mu_{T10_{t1}} - \mu_{B40_{t1}}}{\mu_{T10_{t0}} - \mu_{B40_{t0}}}\right)^{\frac{1}{N}}\right) - 1$$

where $\mu T10_{t1}$ is the average income of the top 10% of the distribution in the most recent survey, $\mu B40_{t1}$ is the average income of the bottom 40% of the distribution in the most recent survey, $\mu T10_{to}$ is the average income of the top 10% of the distribution in the initial survey, $\mu B40_{to}$ is the average income of the bottom 40% of the distribution in the initial survey, and N is the number of years between most recent and initial surveys.

Figure 2: Equal growth across consumption distribution
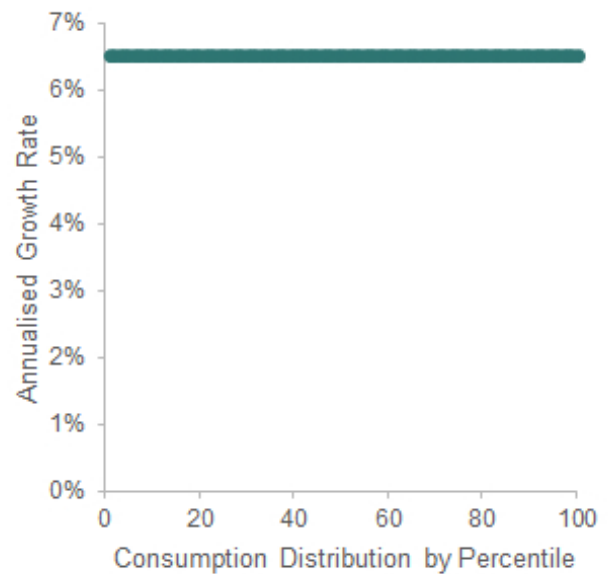
Source: World Bank, PovcalNET

What could have happened?

A number of scenarios are considered that are somewhat similar to those in Lakner et al. (2014) and Hoy and Samman (2015),[8] who model the impact of changes in relative pro-poor growth on global poverty using various growth incidence curves. A number of assumptions are made to assist in operationalising their modelling, which are discussed in detail in their papers. An important assumption is that the total growth rate will stay the same when altering the growth rates in different sections of the distribution (for example, the bottom 40% and the top 10%). A significant point of departure from their approach is that this paper focuses on changes in absolute inequality as opposed to poverty.

Various growth incidence curves were applied to the consumption levels of the initial surveys to determine what the consumption level of each percentile would have been in the most recent survey if it had grown at a certain rate. These scenarios are illustrated below using the example of China.

In the first scenario, it is assumed that the entire distribution experienced the average growth rate of the country (6.5%) (Figure 2). This is on the cusp of being considered relative pro-poor growth.

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8   A final adjustment was made in which the percentiles were re-ranked, as the rapid (slow) growth for the bottom 40% (top 10%) slightly changed which percentiles fell into these categories. A similar adjustment was made by Lakner et al. (2014).

Figure 3: Growth redistributed from top 10%
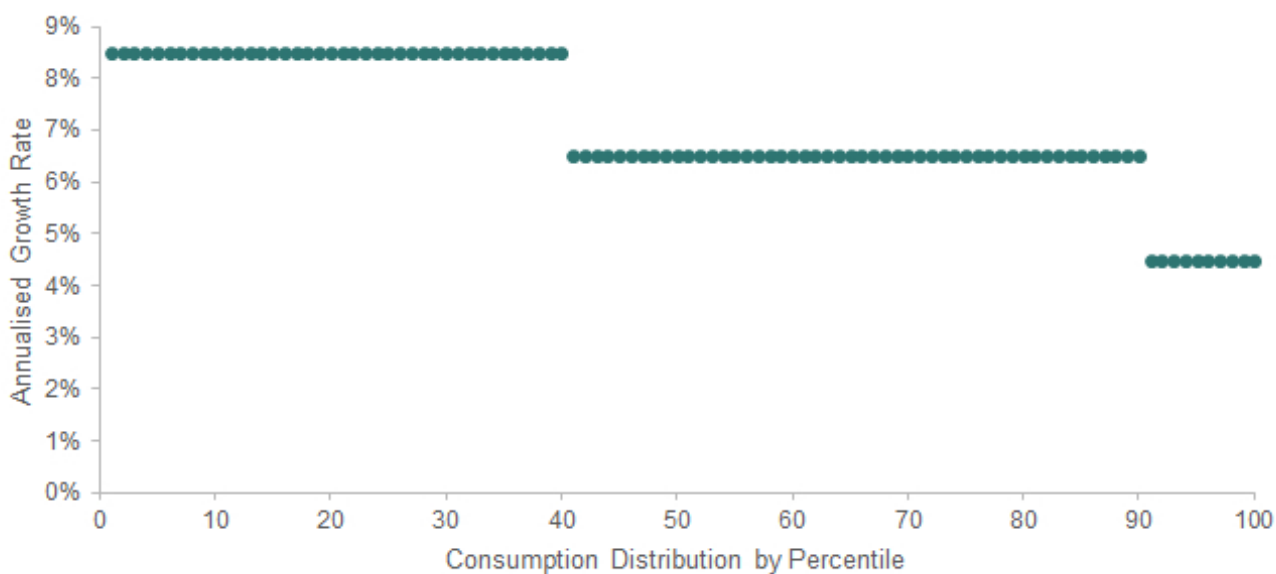
Source: World Bank, PovcalNET

Three relative pro-poor growth scenarios are used to illustrate the potential impact of the bottom 40% growing faster than the average – by simulating differences between the growth of the bottom 40% and the mean by 1, 2 and 3 percentage points, respectively. This roughly corresponds with the historical experience of the top third, the top 15% and the 10% of countries, respectively.

To ensure that the overall growth rate remains constant, another part of the distribution must experience lower than average growth so that the bottom 40% can achieve higher than average growth. The extreme case is taken whereby the faster growth for the bottom 40% is entirely offset by slower growth for the top 10%. Growth between the 40th and 90th percentiles is assumed to be at the average rate (Figure 3).[8] These extreme conditions are applied to simulate the most favourable circumstances possible under which absolute inequality could be reduced.

What will need to happen?

The final section of this paper determines how much faster the bottom 40% of the distribution will need to grow relative to the average to reduce absolute inequality, given today's level of relative inequality in each country (measured by the Palma ratio). This can be expressed formally as follows (see Annex 2 for detailed calculations):

$$\frac{(x)}{(gr_\mu)} > \frac{1}{5}(4 \times Palma\ Ratio_{to} - 1)$$

whereby gr_μ is the average growth rate between the initial and final surveys, x is the additional growth for the bottom 40% of the distribution, and Palma Ratio_to is the Palma ratio in the initial period.

This equation shows the additional growth required for the bottom 40% relative to the average (as a fraction of average growth) to reduce absolute inequality. For absolute inequality to decline, the left-hand side of the equation needs to be greater than the right-hand side. It is important to note that the initial level of relative inequality (measured by the Palma ratio) is the key determining factor of how much faster than the average the bottom 40% needs to grow in order to reduce absolute inequality.

What actually happened?

This section explores what the actual trends have been in terms of changes in relative and absolute inequality over the last three decades for developing countries.

Relative inequality

On average, relative inequality (as measured by the Palma ratio) has not changed (Figure 4). Roughly the same number of countries experienced a reduction in inequality as an increase in inequality.

Figure 4: Annualised percentage change in relative inequality (Palma Ratio)
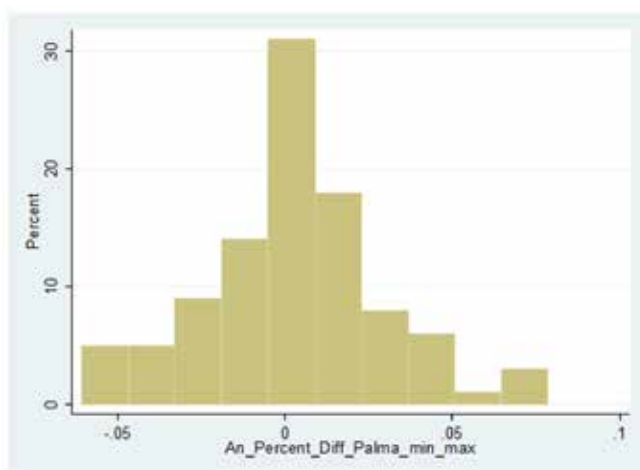
Source: World Bank, PovcalNET

The same story holds when looking at the growth of the bottom 40% compared to the average. Hoy and Samman (2015) show that on average for the countries in this sample, there was effectively no difference between the growth of the mean and the bottom 40%. In fact, there is an almost perfect relationship between countries that experienced an above-average growth rate of the bottom 40% and those countries that experienced a fall in relative inequality. This is consistent with the stylised fact mentioned above that the income share between the 40th and 90th percentiles remains relatively unchanged in the vast majority of countries overtime (Palma, 2011; Cobham et al., 2015). Therefore for the rest of the paper, relative pro-poor growth should be considered synonymous with a fall in relative inequality.

There is some variation between regions in terms of annual change in relative inequality. Developing countries in Europe and Central Asia experienced a significant annual increase in the Palma ratio, while most regions achieved a slight reduction (see Table 1).[9]

Table 1: Annual average change in relative inequality by region

Region	Countries	Annual average change in relative inequality
East Asia and Pacific	10	-0.60%
Europe and Central Asia	28	2.10%
Latin America and Caribbean	21	0.15%
Middle East and North Africa	7	-0.51%
South Asia	6	-0.40%
Sub-Saharan Africa	28	-0.86%

Source: World Bank, PovcalNET

Figure 5: Annualised percentage change in gap between top 10% and bottom 40%
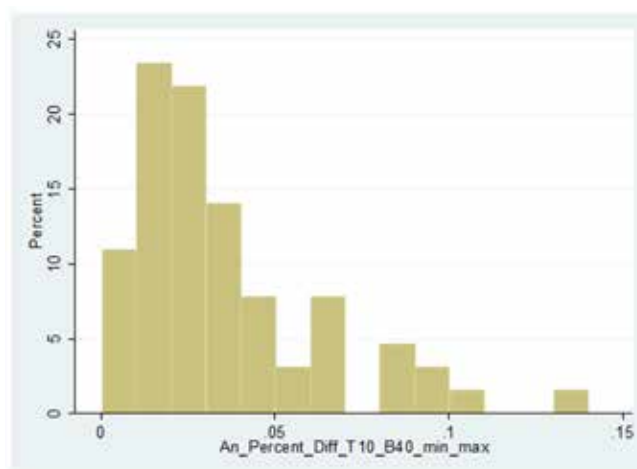
Source: World Bank, PovcalNET

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9   This is a simple average of countries in the region for which data are available.

Absolute inequality

Historical trends in absolute inequality tell a very different story to those in relative inequality. Absolute inequality always increased when growth was positive across the distribution[10] (Figure 5), and the median gap between the top 10% and bottom 40% grew by around 3% a year.

Absolute inequality increased in all regions by between 1% and 6% a year. The gap between the top 10% and bottom 40% increased fastest in Europe and Central Asia, and slowest in Middle East and North Africa (see Table 2).[11]

The average annual change in absolute inequality for countries that did and did not experience relative pro-poor growth is shown in the Table 3.[12] While it is entirely possible that a country could experience a decrease in absolute inequality with relative pro-poor growth (labelled A), it is not possible to experience a decrease in absolute inequality without relative pro-poor growth (labelled B).[13] This is because in order to close the income gap between the rich and poor, the ratio of their incomes must also shrink.

All countries that achieved relative pro-poor growth also experienced an increase in absolute inequality, but to a lesser extent than countries that did not experience relative pro-poor growth. The relationship between changes in absolute inequality and relative pro-poor growth is summarised in the simplified expression below. For absolute inequality to be reduced, the difference in growth rates between the top 10% and the bottom 40% needs to be larger than the average growth rate. As such, any degree of relative pro-poor growth will reduce the

Table 2: Annual average change in absolute inequality by region

Region	Countries	Annual average change in absolute inequality
East Asia and Pacific	9	3.93%
Europe and Central Asia	12	5.56%
Latin America and Caribbean	14	2.61%
Middle East and North Africa	3	1.10%
South Asia	6	2.66%
Sub-Saharan Africa	20	3.56%

Source: World Bank, PovcalNET

Table 3: Change in absolute inequality

	Increased	Decreased
Relative pro-poor growth	2.8% (45%)	A (0%)
No relative pro-poor growth	4.2% (55%)	B (0%)

Source: World Bank, PovcalNET

change in absolute inequality to less than the growth rate, but it needs to be dramatically pro-poor to actually reduce absolute inequality.

$$\Delta \text{Absolute inequality} \approx \text{Average Growth rate} + (\text{Top10\% Growth} - \text{Bottom40\% Growth})$$

An implication of this is that there is a tension between reducing absolute inequality and achieving high rates of growth. If countries want to achieve average per person growth rates in the order of, say, 4% a year,[14] the bottom 40% will need to grow four percentage points faster than the top 10%. This is close to the most extreme cases to have occurred in the past.[15] On average, there was effectively no difference between growth in the incomes of the top 10% and the bottom 40%.

This section illustrates that even though, on average, countries have experienced incomes growing at the same rate across the distribution, the top 10% experienced the greatest increase in absolute income. Despite only representing one tenth of the population, on average the top 10% accumulated around one third of the absolute gains in income from growth over the past two decades. In contrast, the bottom 40% accumulated only around half as much as the top 10% in terms of absolute gains in income, despite representing a segment of the population that is four times larger.

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10 Growth was only positive across the distribution in 64 of the 100 countries in the sample.

11 This is a simple average of countries in the region for which data are available.

12 This is based on the subset of countries that experienced positive growth across the distribution.

13 Assuming positive growth across the distribution.

14 This is an approximate translation of the SDG growth target for LDCs of 7% a year into per person terms.

15 This is only based on the subset of countries that experienced positive growth across the distribution.

What could have happened?

This section highlights that even if growth had been pro-poor in relative terms for all countries, absolute inequality would have increased in almost all cases. It is shown that even if extreme scenarios of relative pro-poor growth had prevailed, this would have been inadequate to address the widening gap between the rich and poor.

The four scenarios that are considered are:
a)   Equal growth across the distribution
b)   Bottom 40% growing by 1 percentage point (pp) faster than the average
c)   Bottom 40% growing by 2 pp faster than the average
d)   Bottom 40% growing by 3 pp faster than the average

Equal growth

This scenario models what would have happened to absolute inequality if the entire distribution had grown at the average rate. This is roughly what did occur on average over the last three decades. In other words, half of all countries actually achieved better than this and managed to achieve relative pro-poor growth.

Absolute inequality would have increased in all countries in this scenario.[16] The median gap between the bottom 40% and top 10% would have grown by around 3% a year (see Figure 6). In fact, the gap between the top 10% and bottom 40% would have widened at the exact same rate as the average growth rate. This is because relative inequality remained unchanged (i.e. there was no difference in the average growth rates of the top 10% and the bottom 40%).
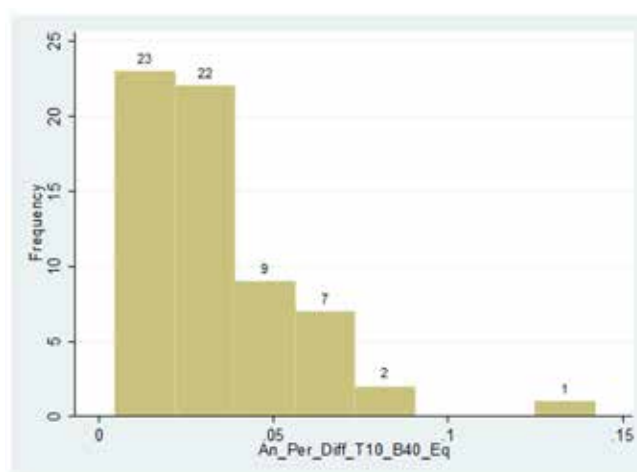
In this scenario, the top 10% accumulated, on average, around one third of the absolute gains in income from growth over the past two decades, whereas the bottom 40% only accumulated around half as much.

Pro-poor 1 pp scenario

This scenario models what would have happened if the bottom 40% had grown 1 percentage point faster than the average. This degree of relative pro-poor growth only occurred in around one in three countries over the last two decades.

Absolute inequality would have increased in around 90% of countries if this level of pro-poor growth had prevailed.[17] However, it would have fallen in the following countries: Uruguay, Slovenia, Madagascar, Croatia, Bangladesh and Albania. The median gap between the bottom 40% and top 10% would have grown by around 2% a year (see Figure 7).

Figure 6: Annualised percentage change in gap between top 10% and bottom 40% (equal growth scenario)

Source: World Bank, PovcalNET

In this scenario, on average the top 10% would have accumulated around one quarter of the absolute gains in income from growth over the last two decades, which is a similar amount to the bottom 40%.

Pro-poor 2 pp scenario

This scenario models what would have happened if the bottom 40% had grown 2 percentage points faster than the average. This level of relative pro-poor growth only occurred in around one in six countries over the last two decades.

Absolute inequality would have increased in around 90% of countries if this level of pro-poor growth

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16 Only the 64 countries that experienced positive average growth were included in this scenario.

17 This is based upon the subset of 61 countries that would have experienced positive growth across the distribution.

Figure 7: Annualised percentage change in gap between top 10% and bottom 40% (1pp growth scenario)

Source: World Bank, PovcalNET

prevailed.[18] However it would have decreased in the following countries: Turkey, Sri Lanka, Morocco, and Laos. The median gap between the bottom 40% and top 10% would have grown by around 1.5% a year (see Figure 8).

In this scenario, on average the bottom 40% would have accumulated around 30% of the absolute gains in income from growth over the last two decades, whereas the top 10% would have accumulated around 20%.
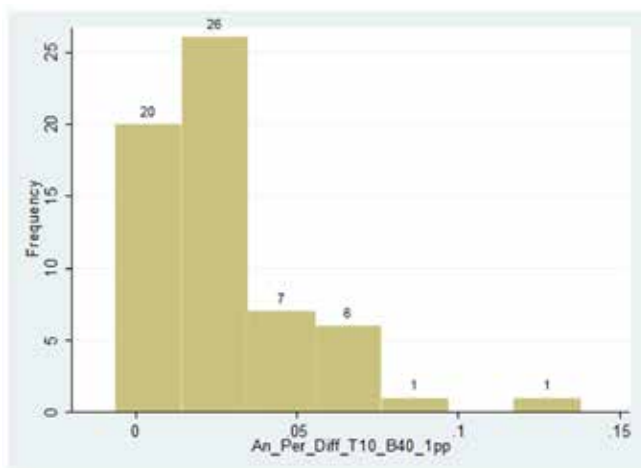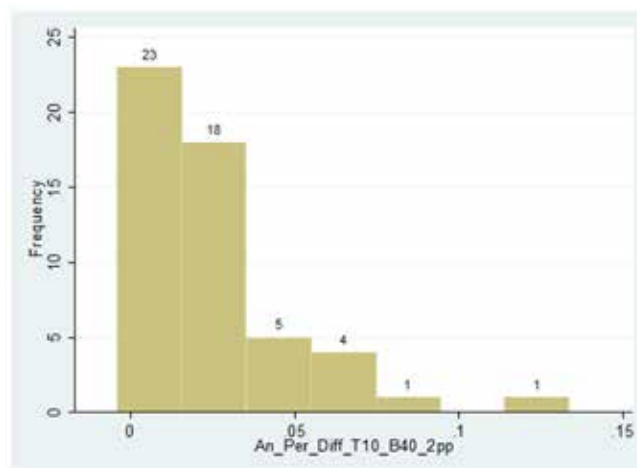
Pro-poor 3 pp scenario

This scenario models what would have happened if the bottom 40% had grown 3 percentage points faster than the average. This level of relative pro-poor growth only occurred in around one in ten countries over the last two decades.

Absolute inequality would have fallen in the following countries: Philippines, Pakistan, Niger, Nicaragua, Nepal, Montenegro, Mauritania, Indonesia and Cambodia, however it would have still increased in around 80% of countries even if this level of pro-poor growth had prevailed.[19] The median gap between the bottom 40% and top 10% would have grown by around 1% a year (see Figure 9).

In this scenario, on average the bottom 40% would have accumulated around twice as much of the absolute gains in income from growth over the last two decades as the top 10%.

Figure 8: Annualised percentage change in gap between top 10% and bottom 40% (2pp growth scenario)

Source: World Bank, PovcalNET

Collectively, these scenarios show that even if countries had experienced what would have been among the most extreme historical cases of relative pro-poor growth, absolute inequality would have increased in the vast majority of cases. Only once growth for the bottom 40% is around 3 percentage points above the average is there evidence of a significant proportion of countries starting to reduce absolute inequality (see table below).

Figure 9: Annualised percentage change in gap between top 10% and bottom 40% (3pp growth scenario)
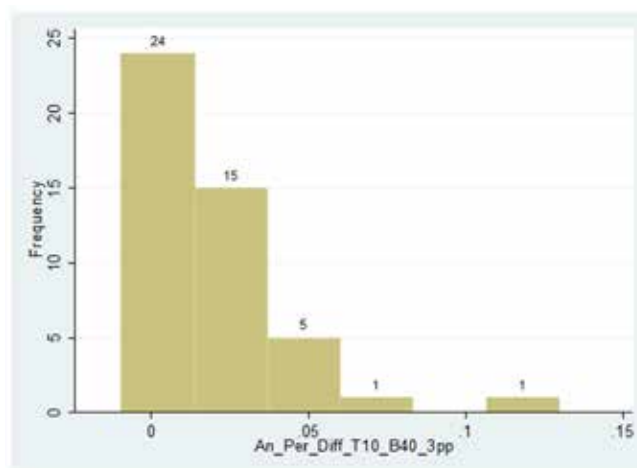
Source: World Bank, PovcalNET

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18 This is based upon the subset of 52 countries that would have experienced positive growth across the distribution.

19 This is based upon the subset of 46 countries that would have experienced positive growth across the distribution.

Table 4: Changes to absolute inequality under pro-poor growth scenarios

Scenario	Share of countries where absolute inequality increased	Change in gap with median	Top 10% share of total growth	Bottom 40% share of total growth
Actual	100%	3%	33%	17%
Equal	100%	3%	32%	17%
1pp	90%	2%	24%	25%
2pp	90%	1.5%	21%	29%
3pp	80%	1%	17%	35%

Source: World Bank, PovcalNET

What needs to happen?

This section quantifies just how pro-poor growth would need to be in relative terms to begin to reduce absolute inequality in the future, given today's levels of relative inequality. The bottom 40% would need to grow at least 50% 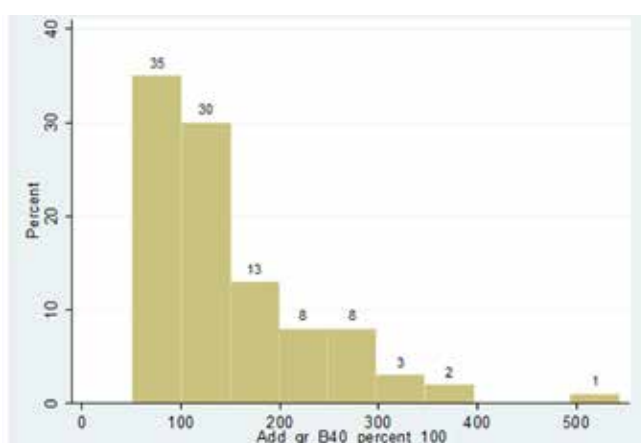faster than the average to reduce the income gap between the bottom 40% and the top 10% (see Figure 10). For example, if the average growth rate in a country is 2%, the bottom 40% would need to grow at least one percentage point faster (i.e. 3%) to begin to reduce absolute inequality. The median additional growth for the bottom 40% would have to be around 125% higher than the average. In other words, for more than half of countries, the rate of growth for the bottom 40% would need to be more than twice the average rate in order to reduce absolute inequality. Continuing the example above, for an average growth rate of 2%, the median country's bottom 40% would need to grow 2.5 percentage points above the average (i.e. 4.5%) to begin to reduce absolute inequality.

As discussed in the methodology section and in Annex 2, the formula to determine these results is based upon a function of the current level of relative inequality (in this case, measured by the Palma ratio). Included in Annex 1 is a table that shows the extra growth, above and beyond the average, that would be required among the bottom 40% to begin to close the gap with the top 10%.

This additional growth would need to be unprecedented. This can be determined by examining how the required additional growth for the bottom 40% compares to the historical experience of countries that did manage to achieve 'relative pro-poor' growth over the last two decades. On average, the additional growth beyond the average was only around 25% of the level required to be able to begin to close the absolute inequality gap (see Figure 11).[20] The growth rate of the bottom 40% relative to the average was thus far too slow, even in countries that managed to reduce relative inequality.[21]

Everyone's income would increase by the same absolute amount if the growth rates for the bottom 40% relative to the average that were shown in this section do occur in the future. In other words, growth would lead to the same additional income for everyone, regardless of where they are located on the income distribution. The incomes of the top 10% would increase by the same number of dollars per year as the incomes of the bottom 40%. In this example, everyone's standard of living would increase and the gap between the rich and the poor would stay the same. It could be argued that this is the bare minimum that the framers of the 'leave no one behind' principle had in mind.

Figure 10: Additional growth required for bottom 40% relative to average

Source: World Bank, PovcalNET

Figure 11: Fraction of additional growth required for bottom 40% relative to average
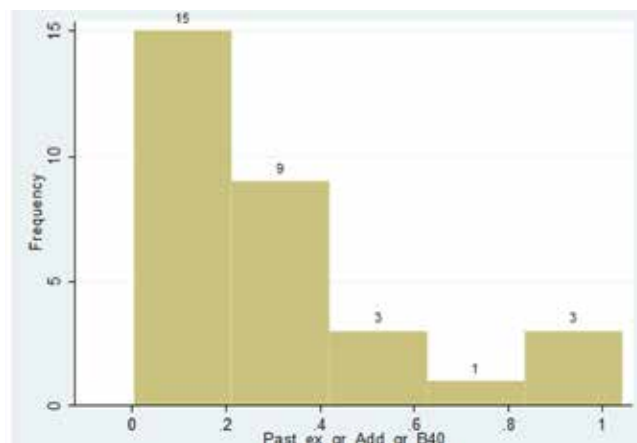
Source: World Bank, PovcalNET

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20 This is based upon the subset of 64 countries that had positive growth across the distribution.

21 The one exception is Egypt, where historically the bottom 40% grew fast enough relative to the average to be able to reduce absolute inequality in the future. The reason why this did not occur in the past was because its previous level of relative inequality was too high. However due to 'relative pro-poor' growth it has fallen to the point today that if it can be maintained, it could achieve a reduction in absolute inequality in the future.

Conclusion

This paper illustrates that prolonged periods of growth across the income distribution have always led to increases in the gap between the rich and poor. This would have occurred in the vast majority of countries even if relative pro-poor growth that exceeded the most extreme cases in history had occurred. In the future, on average the bottom 40% will need to grow more than twice as fast as the mean to begin to reduce absolute inequality. This would be unprecedented, and is much more ambitious than the SDG and World Bank targets.

A major implication of this analysis is that even if countries achieve the SDG and World Bank targets to successfully reduce relative inequality, the income gap between the rich and poor is still likely to increase. Given the limited analysis to date suggests that many people perceive inequality in absolute terms, as opposed to relative terms, the attainment of the SDG and World Bank targets may not be adequate to address public concerns about worsening inequality. This issue of whether people are more likely to perceive changes in inequality in absolute or relative terms requires further research.

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Annex 1 - Additional growth for the bottom 40%

Country	Palma ratio			Diff T10% - B40% (Daily Income)			
	Initial	Recent	An % Diff	Initial	Recent	An % Diff	Extra growth required for bottom 40%
Albania	1.05	1.35	2.31%	8.61	12.70	3.60%	88%
Algeria	1.64	1.46	-1.66%				96%
Armenia	2.37	1.22	-4.63%				78%
Azerbaijan	1.43	1.36	-0.38%	6.40	14.79	6.65%	89%
Bangladesh	0.91	1.28	1.31%	1.99	3.69	2.41%	82%
Belarus	0.76	0.91	0.84%	12.87	25.98	3.10%	53%
Belize	5.28	3.85	-5.11%				288%
Bhutan	2.70	1.76	-4.63%	10.68	14.33	3.32%	121%
Bolivia	2.09	4.83	5.04%				366%
Bosnia and Herzegovina	1.00	1.53	7.32%	19.74	35.57	10.31%	102%
Botswana	4.09	3.60	-1.60%				268%
Brazil	5.18	4.32	-0.65%	31.44	48.50	1.56%	325%
Bulgaria	0.80	1.00	1.27%				60%
Burkina Faso	2.82	1.86	-2.74%	4.41	5.14	1.03%	129%
Burundi	1.33	1.36	0.14%	1.85	2.18	1.18%	89%
Cambodia	1.50	1.55	0.23%	4.41	6.62	2.75%	104%
Cameroon	1.96	1.76	-0.94%	7.69	9.90	2.32%	121%
Central African Republic	6.89	3.03	-5.00%	3.75	4.81	1.58%	223%
Chile	4.52	3.50	-1.15%	34.57	64.42	2.87%	260%
China	1.01	2.43	3.18%	1.38	14.45	8.76%	175%
Colombia	3.47	4.51	1.47%				340%
Costa Rica	2.91	3.33	0.48%	12.59	48.70	4.95%	246%
Côte d'Ivoire	2.01	2.04	0.06%				89%
Croatia	0.76	1.37	2.95%	22.11	57.17	4.86%	53%
Czech Republic	0.65	0.91	4.35%				143%
Dominican Republic	2.90	2.76	-0.21%	15.26	27.92	2.55%	201%
Ecuador	3.37	3.07	-0.41%	22.15	31.00	1.47%	225%
Egypt, Arab Rep	1.27	1.11	-0.78%	7.12	7.19	0.06%	69%
El Salvador	3.05	2.96	-0.16%	17.79	23.01	1.30%	216%
Estonia	0.74	1.52	4.59%				102%
Ethiopia	1.19	1.35	0.42%	2.55	4.47	1.96%	88%
Fiji	2.75	2.03	-4.98%	9.45	13.21	5.74%	142%
Gambia, The	3.30	2.80	-3.23%	4.88	9.06	13.16%	204%
Georgia	1.60	2.10	1.97%				148%
Ghana	1.47	2.18	2.23%	3.46	7.65	4.51%	154%
Guatemala	4.25	4.54	0.35%	7.87	27.98	6.90%	343%
Guinea	2.80	1.83	-2.62%	1.42	4.89	8.04%	126%

(continued)

Country	Palma ratio			Diff T10% - B40% (Daily Income)			
Guyana	1.80	2.38	5.72%				170%
Honduras	4.57	5.19	0.64%	11.52	26.82	4.32%	395%
Hungary	0.71	1.20	2.68%				76%
India	1.28	1.39	0.26%	2.69	4.70	1.75%	91%
Indonesia	1.16	1.49	0.98%	2.46	6.42	3.76%	99%
Iran, Islamic Rep	2.81	1.71	-2.57%				117%
Jamaica	2.22	2.54	0.85%	18.81	29.74	2.91%	183%
Jordan	1.52	1.50	-0.07%				100%
Kazakhstan	0.87	1.07	0.99%				66%
Kenya	2.91	2.64	-0.74%				192%
Kyrgyz Republic	0.90	1.33	1.71%				87%
Lao PDR	1.17	1.60	1.97%	2.89	5.30	3.85%	108%
Latvia	0.74	1.42	3.18%				94%
Lesotho	4.70	3.87	-1.20%				290%
Lithuania	0.74	1.62	3.98%				110%
Macedonia, FYR	1.00	2.26	7.07%				161%
Madagascar	2.69	2.34	-0.46%	2.65	2.85	0.24%	167%
Malawi	2.06	2.31	0.94%	2.34	4.51	5.63%	164%
Malaysia	2.94	2.63	-0.45%	27.62	41.23	1.61%	190%
Mali	3.29	1.30	-5.62%	2.94	3.19	0.51%	84%
Mauritania	2.33	1.93	-0.89%	5.72	7.64	1.38%	134%
Mexico	2.63	2.71	0.12%	15.30	33.21	3.03%	197%
Moldova, Rep	0.81	1.30	2.18%	2.99	12.87	6.85%	84%
Montenegro	1.12	1.02	-1.96%	16.53	17.63	1.30%	61%
Morocco	1.56	1.86	0.80%	8.60	14.48	2.40%	129%
Mozambique	2.05	2.04	-0.02%	2.70	4.01	3.34%	143%
Nepal	1.14	1.30	0.55%	1.97	4.80	3.63%	84%
Nicaragua	3.82	2.76	-2.69%	14.84	14.89	0.03%	200%
Niger	1.53	1.44	-0.41%	2.79	4.09	2.43%	95%
Nigeria	1.72	1.85	0.30%				128%
Pakistan	1.35	1.16	-0.74%	2.81	4.42	2.18%	73%
Panama	3.06	3.61	0.54%	23.61	35.68	1.34%	269%
Paraguay	1.92	3.76	3.42%				281%
Peru	2.55	2.94	0.59%	15.21	28.77	2.69%	215%
Philippines	2.00	2.18	0.37%	6.48	10.15	1.89%	155%
Poland	0.86	1.28	1.56%				83%
Romania	0.77	0.95	0.94%				56%
Russian Federation	0.79	1.90	4.29%	6.30	40.49	9.27%	132%
Rwanda	1.08	2.02	2.43%				142%
Senegal	4.07	1.92	-3.69%	5.87	6.62	0.60%	134%

(continued)

Country	Palma ratio			Diff T10% - B40% (Daily Income)			
Serbia	1.27	1.08	-1.96%				67%
Seychelles	1.99	1.59	-3.17%				107%
Slovak Republic	0.66	0.92	1.57%				53%
Slovenia	0.81	1.17	2.15%	23.82	43.48	3.60%	73%
South Africa	5.69	7.05	1.35%	25.23	42.12	3.25%	544%
Sri Lanka	1.28	1.58	0.82%	5.10	9.78	2.64%	106%
Swaziland	4.13	3.51	-1.07%	3.67	9.79	6.76%	261%
Tajikistan	1.05	1.16	0.98%	2.52	6.25	9.52%	73%
Tanzania	1.37	1.66	1.31%	2.37	3.04	1.70%	113%
Thailand	2.50	1.80	-1.13%	10.72	19.34	2.06%	124%
Timor-Leste	1.84	1.26	-6.08%				81%
Togo	1.40	1.79	5.05%	4.11	6.31	8.94%	124%
Trinidad and Tobago	2.15	1.87	-3.42%				129%
Tunisia	2.25	1.50	-1.61%	14.01	17.27	0.84%	100%
Turkey	1.79	1.87	0.20%	17.22	24.59	1.56%	130%
Turkmenistan	0.92	1.96	7.85%				137%
Uganda	2.38	1.99	-0.89%	3.65	6.07	2.57%	140%
Ukraine	0.78	0.90	0.65%	4.46	16.33	6.08%	52%
Uruguay	2.28	2.47	0.27%	39.58	46.83	0.58%	177%
Venezuela, RB	4.54	2.41	-2.51%				172%
Vietnam	1.51	1.50	-0.06%	3.19	6.60	4.97%	100%
Yemen, Rep	1.33	1.56	2.31%				104%
Zambia	8.49	3.93	-3.97%				295%

Source: World Bank, PovcalNET

Annex 2 – Technical Annex

For absolute inequality to reduce, the following must hold:

$$\mu_{T10_{t1}} - \mu_{B40_{t1}} < \mu_{T10_{t0}} - \mu_{B40_{t0}}$$

$$\mu_{T10_{t0}}(1 + gr_{T10}) - \mu_{B40_{t0}}(1 + gr_{B40}) < \mu_{T10_{t0}} - \mu_{B40_{t0}}$$

$$\mu_{B40_{t0}} - \mu_{B40_{t0}}(1 + gr_{B40}) < \mu_{T10_{t0}} - \mu_{T10_{t0}}(1 + gr_{T10})$$

$$\mu_{B40_{t0}}(1 - (1 + gr_{B40})) < \mu_{T10_{t0}}(1 - (1 + gr_{T10}))$$

$$\mu_{B40_{t0}}(-(gr_{B40})) < \mu_{T10_{t0}}(-(gr_{T10}))$$

$$\frac{gr_{B40}}{gr_{T10}} > \frac{\mu_{T10_{t0}}}{\mu_{B40_{t0}}}$$

$$\frac{gr_{B40}}{gr_{T10}} > 4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}}$$

$$\frac{gr_{B40}}{gr_{T10}} > 4 \times Palma\ Ratio_{to}$$

The additional growth required for the bottom 40% (x) in order to reduce absolute inequality is:

$$\frac{gr_\mu + x}{gr_{T10}} > 4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}}$$

$$\frac{gr_\mu + x}{\left(\dfrac{gr_\mu - (gr_\mu + x)I_{B40_{t0}} - (gr_\mu)I_{4090_{t0}}}{I_{T10_{t0}}}\right)} > 4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}}$$

$$\frac{(gr_\mu + x)I_{T10_{t0}}}{gr_\mu - (gr_\mu + x)I_{B40_{t0}} - (gr_\mu)I_{4090_{t0}}} > 4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}}$$

$$(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu - (gr_\mu + x)I_{B40_{t0}} - (gr_\mu)I_{4090_{t0}})$$

$$(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu) - 4(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} - 4I_{T10_{t0}}(gr_\mu)I_{4090_{t0}}$$

$$5(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu) - 4I_{T10_{t0}}(gr_\mu)I_{4090_{t0}}$$

$$5(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu)(1 - I_{4090_{t0}})$$

$$5(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu)(1 - (1 - I_{T10_{t0}} - I_{B40_{t0}}))$$

$$5(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}(gr_\mu)(I_{T10_{t0}} + I_{B40_{t0}})$$

$$5(gr_\mu + x)I_{T10_{t0}}I_{B40_{t0}} > 4I_{T10_{t0}}I_{T10_{t0}}(gr_\mu) + 4I_{T10_{t0}}I_{B40_{t0}}(gr_\mu)$$

$$5(gr_\mu + x) > \frac{4I_{T10_{t0}}I_{T10_{t0}}(gr_\mu) + 4I_{T10_{t0}}I_{B40_{t0}}(gr_\mu)}{I_{T10_{t0}}I_{B40_{t0}}}$$

$$5(gr_\mu + x) > \frac{4I_{T10_{t0}}(gr_\mu)}{I_{B40_{t0}}} + 4(gr_\mu)$$

$$5(gr_\mu) + 5(x) > \frac{4I_{T10_{t0}}(gr_\mu)}{I_{B40_{t0}}} + 4(gr_\mu)$$

$$5(x) > \frac{4I_{T10_{t0}}(gr_\mu)}{I_{B40_{t0}}} - (gr_\mu)$$

$$5(x) > (gr_\mu)(4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}} - 1)$$

$$(x) > \frac{1}{5}(gr_\mu)(4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}} - 1)$$

$$\frac{(x)}{(gr_\mu)} > \frac{1}{5}(4 \times \frac{I_{T10_{t0}}}{I_{B40_{t0}}} - 1)$$

$$\frac{(x)}{(gr_\mu)} > \frac{1}{5}(4 \times Palma\ Ratio_{to} - 1)$$

Where

$\mu_{T10_{t1}}$ = average income of the top 10% of the distribution in the final period;

$\mu_{B40_{t1}}$ = average income of the bottom 40% of the distribution in the final period;

$\mu_{T10_{to}}$ = average income of the top 10% of the distribution in the initial period;

$\mu_{B40_{to}}$ = average income of the bottom 40% of the distribution in the initial period;

gr_{T10} = average income growth rate for the top 10% between periods;

gr_{40} = average income growth rate for the top 40% between periods;

$I_{T10_{to}}$ = income share of the top 10% of the distribution in the initial period;

$I_{B40_{to}}$ = income share of the bottom 40% of the distribution in the initial period;

$Palma\ Ratio_{to}$ = Palma ratio in the initial period;

gr_μ = average growth rate between initial and final periods;

x = additional growth for the bottom 40% of the distribution;

$I_{4090_{to}}$ = income share of the 40th to 90th percentiles in the initial period.

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