Review of Income and Wealth / Volume 63, Issue 4

Original Article | Open Access

Global Inequality: Relatively Lower, Absolutely Higher[†‡§]

Miguel Niño-Zarazúa, Laurence Roope, Finn Tarp

First published: 15 August 2016
https://doi.org/10.1111/roiw.12240
Cited by: 7

Abstract

This paper measures trends in global interpersonal inequality during 1975–2010 using data from the most recent version of the World Income Inequality Database (WIID). The picture that emerges using 'absolute,' and even 'centrist' measures of inequality, is very different from the results obtained using standard 'relative' inequality measures such as the Gini coefficient or Coefficient of Variation. Relative global inequality has declined substantially over the decades. In contrast, 'absolute' inequality, as captured by the Standard Deviation and Absolute Gini, has increased considerably and unabated. Like these 'absolute' measures, our 'centrist' inequality indicators, the Krtscha measure and an intermediate Gini, also register a pronounced increase in global inequality, albeit, in the case of the latter, with a decline during 2005 to 2010. A critical question posed by our findings is whether increased levels of inequality according to absolute and centrist measures are inevitable at today's per capita income levels. Our analysis suggests that it is not possible for absolute inequality to return to 1975 levels without further convergence in mean incomes among countries. Inequality, as captured by centrist measures such as the Krtscha, could return to 1975 levels, at today's domestic and global per capita income levels, but this would require quite dramatic structural reforms to reduce domestic inequality levels in most countries.

1 Introduction

Since the turn of the century, inequality has become one of the most prominent political issues of our time. The World Economic Forum's Global Risks 2013 report identified 'global income disparity' as the global risk most likely to manifest itself over the next ten years

(World Economic Forum, 2013). Issues of taxation and redistribution were central to the debate in the 2012 US presidential election and in a number of recent general elections in Europe. In 2014, Thomas Piketty (2014)'s treatise on wealth and inequality reached the number one slot on the New York Times Best Sellers List for best selling hardcover nonfiction.

There has recently been significant interest in the economic literature in the level of, and trends in, various concepts of global inequality. The earliest of these papers were predominantly focused on either 'within-country' inequality, as in Cornia and Kiiski (2001), or 'between-country' inequality (see, for example, Firebaugh, 1999, 2003, Melchior, Telle and Wiig, 2000). Much of the impetus for these studies came from concerns as to what impact the recent era of globalization may have had on inequality (see for example, Richardson, 1995, Wood, 1995, Williamson, 1999, and also UNDP, 1999, which explicitly called for policies to mitigate rising inequality caused by economic globalization).

To quote Milanovic (2002:52), a direct implication of globalization is "that national borders are becoming less important, and that every individual may, in theory, be regarded simply as a citizen of the world." The literature on global inequality trends began to focus on estimating levels of 'global interpersonal inequality.' In this approach, the global distribution of income of all the citizens of the world is constructed from national accounts and/or survey data.[4] Inequality is subsequently measured, based on this global interpersonal distribution of income. Notable contributions in this area have been made by Korzeniewicz and Moran (1997), Chotikapanich, Valenzuela and Rao (1997), Schultz (1998), Milanovic (2002, 2005, 2012), Bourguignon and Morrisson (2002), Bhalla (2002), Dowrick and Akmal (2005), Sala-i-Martin (2006), and Atkinson and Brandolini (2010).

This study contributes to the body of literature on trends in global interpersonal inequality which, for convenience, we will refer to hereafter simply as 'global inequality', in several respects: First, using the most recent version of UNU-WIDER's World Income Inequality Database (WIID), we estimate global inequality levels and their trends during the period 1975–2010. Most of the aforementioned studies consider trends in global inequality only up to the mid 1990s. To the best of our knowledge, this is one of the first comprehensive studies on global inequality which spans the pre- and post-2008 financial crisis periods.

Second, this is one of the first studies that analyses global inequality using not only 'relative' inequality measures, but also 'absolute' and 'centrist' measures, with their very different properties and normative underpinnings. It has long been accepted in the literature on social choice and welfare economics that arguments for 'relative' inequality measures vis-a-vis 'absolute' or 'centrist' measures are firmly in the domain of normative economics. Amiel and Cowell (1992, 1999a, 1999b), among others, have demonstrated in experimental work that people have a range of views regarding how distributions should be ranked with

respect to inequality. Yet relative notions of inequality remain dominant in the analysis of income distribution. In fact, there has been a paucity of empirical studies within Economics that have employed 'absolute' or 'centrist' measures, despite the fact that there is no economic theory that favours relative over absolute notions of inequality. There are though signs that this is beginning to change. A number of prominent studies, notably Ravallion (2003), Subramanian and Jayaraj (2014), Atkinson and Brandolini (2010) and Bosmans et al. (2014), have recently emphasised the importance of avoiding unnecessarily restricting the discourse on inequality to relative inequality alone. The growing international debate in political and popular fora about the rising gap between the rich and the poor seems to support this view. We find that what emerges from the evolution of inequality during the past 35 years using absolute, and even centrist measures of inequality, is very different from the results obtained using standard relative inequality measures such as the Gini coefficient or Coefficient of Variation. Our headline findings are that relative global inequality has declined steadily and substantially over the decades, driven primarily by declining inequality between countries. In contrast, absolute inequality, as captured by the Standard Deviation and the Absolute Gini, has increased dramatically and unabated throughout the period analysed. Like these absolute measures, our centrist inequality indicators, the Krtscha measure and the intermediate Gini recently advanced by Subramanian and Jayaraj (2013), also register a very pronounced increase in inequality over the decades.

Third, the divergent nature of the trends in inequality obtained using relative and absolute inequality measures poses some important questions and challenges for policymakers. One such critical question is whether increased levels of inequality according to absolute and centrist measures are inevitable at today's per capita income levels. We address this question by constructing counterfactual scenarios of income distributions, in which all countries in the world have their actual 2010 per capital income, measured by the Gross Domestic Product (GDP) per capita, but have Nordic levels of domestic inequality. When global inequality is re-estimated for such counterfactual distributions, it turns out that absolute measures continue to register a very large increase in inequality. Further analysis, in which inequality is decomposed into within- and between-country components, confirms that at 2010's global and domestic income levels, the between-country component alone of absolute inequality is higher than overall global absolute inequality in 1975. Analogous analysis using centrist inequality measures suggests that it is possible, if highly demanding, to match 1975 global inequality levels at 2010 income levels.

The rest of the paper is organized as follows. In Section 2 we discuss concepts and challenges involved in measuring global inequality. In particular, we discuss the relationship between global inequality and within-country and between-country inequality. In Section 3 we discuss some theoretical aspects of inequality measurement, with a particular focus on the different normative underpinnings of 'relative,' 'absolute' and 'centrist' inequality

measures. In Section 4 we describe the data and discuss some of the empirical challenges and techniques. We also formally describe a number of counterfactual analyses performed in the study. In Section 5 we provide all our estimates of trends in global inequality, for our different types of measures. We also provide the results for our various counterfactual analyses. In Section 6 we do some sensitivity analysis on our main results and discuss the robustness of our estimates. A concluding discussion is offered in Section 7.

2 Concepts and Challenges in Global Interpersonal Inequality Measurement

2.1 Within-Country, Between-Country, and Global Inequality

There are many reasons why one might have a concern for inequality and wish to measure it. Perhaps the most obvious is that high levels of inequality may be deemed to be socially unfair. Since the time of ancient societies, scholars have been concerned about the possible negative effects of inequality on peace and prosperity. In his dialogue with Adeimantus, and reproduced in Plato's *Republic* (1901:422), Socrates was aware of the pervasive effects of indiscriminate wealth in deteriorating peace and order. Also, under the influence of Plato, Aristotle (1954:1379a) saw in inequity a source of conflict and anger. In that context, the state was seen as fundamental to ensuring peace and prosperity through the procurement of justice and social equality (Plato, 1901).

Classical economists, from Adam Smith, and David Ricardo, to Karl Marx, were concerned about the effects of unfair distribution of income on factors of production, and social classes. These were, of course, discussions in the domain of normative principles.

Others have argued for the significance of inequality of opportunity as an obstacle for progress and development. Dworkin (1981a, 1981b), for example, argued that egalitarians should seek to equalize resources rather than outcomes. Roemer (1993, 1998) introduced a model which separates the determinants of the welfare outcomes a person experiences into circumstances and effort. He argued that individuals should only be held responsible for the latter. In contrast to effort, a person has no choice with respect to the circumstances of the environment they are born into. In Roemer's framework, an equal-opportunity policy is an intervention which 'levels the playing field' by ensuring that equal outcomes in achievement accrue to individuals who have expended the same amount of effort.

Some of the recent discussions on inequality are more obviously applicable to domestic, 'within-country,' inequality. However, as the world becomes increasingly inter-connected, it is natural that relations between global inequality and global levels of economic growth will become of interest. Both domestic and global inequality are important in these regards and this study is concerned with each of them. Milanovic (2005) has provided a useful

framework, subsequently extended by Anand and Segal (2008), for distinguishing between different concepts of inequality.[5] In this study we focus mainly on what Milanovic (2005) defines as 'Concept three' inequality. 'Concept three' inequality is global interpersonal inequality (or global inequality), the inequality inherent in the actual global distribution of income, of all the citizens of the world. We will also make some reference to 'Concept two,' which we refer to as between-country inequality. This is what the inequality among all the individuals in the world would be if each person received the average per capita income for his/her country.

We also consider the 'within-country' component of global inequality, but stop short of defining it as a new concept. This refers to the level of global inequality which is not attributable to between-country inequality. This is a more involved concept than it might appear at first glance and, as discussed in Section 5.1 can only be appropriately measured using a very specific class of inequality measures.

2.2 Income Inequality and Consumption Inequality

Thus far we have used the term 'income' rather loosely. It is important to distinguish between 'income' and 'consumption' inequality. It is well-known that, in general, income inequality is likely to be considerably higher than consumption inequality. The reason is quite straightforward. The lowest quantiles of a distribution based on consumption typically take a greater share of the 'consumption pie' than the corresponding quantiles of income do. In this study, we focus on income inequality but follow Deininger and Squire (1996) to make Gini coefficients based on expenditure comparable with income Gini coefficients. In order to increase our sample of country-year observations, we do resort to using expenditure data in places, but make adjustments. This procedure is described in Section 5. The measurement of global inequality also requires an appropriate set of exchange rates to convert the various national currencies into a common numeraire. The natural choice, and that adopted in most of the literature, is to convert national currencies into purchasing power parity (PPP). Therefore, we convert all domestic currencies into 2005 US$ at PPP using the conversation factors described in World Bank (2008).

3 Inequality Measures

Of central importance to any study on inequality is the selection of the index used to measure it. The choice of the index embodies fundamental normative judgements that are important to be aware of when interpreting any results. One especially important normative judgement regards the manner in which inequality is deemed to change as economies grow and the size of the 'pie' to be divided increases. One approach is the so-called 'relative' view of inequality, which deems inequality to remain unchanged under equiproportional increases in income. Measures which satisfy such a 'scale invariance' property are known as

relative inequality measures. The overwhelming majority of empirical studies use measures, such as the Gini, Theil, and Mean Log Deviation, which fall into this category. Yet such an approach is certainly not beyond criticism and can even be considered quite an extreme position. In his seminal work, Kolm (1976) famously described the relative inequality approach as "rightest." The key critique is that a strong case can also be made for attaching some importance to absolute differences in income. Consider a situation in which everyone's income doubles. Many might feel that if this change in the distribution means that the richest person can now buy two yachts rather than one, while the poorest can simply buy two chickens instead of one, inequality has surely increased.

At the other end of the spectrum is the so-called 'absolute' inequality approach, of regarding inequality as being unaffected by an increase of the same absolute amount to all incomes. Kolm (1976) described this approach as "leftist." The key criticism here is that no account is taken of relative income. Imagine a situation in which everyone's income increases by $1m a year. Such measures say that inequality has not changed; many might feel this is quite unreasonable, since everyone is now a millionaire.[6]

To address the concerns with each of these rather extreme positions, a number of authors, notably including Kolm (1976), Moyes (1987), Bossert and Pfingsten (1990), and Krtscha (1994), have proposed 'centrist' measures of inequality, which take an intermediate position between these two extremes. Such measures register an increase in inequality if all incomes increase equiproportionally, and a decrease if the same absolute amount of income is added to all incomes. Experimental evidence from Amiel and Cowell (1992, 1999a, 1999b) has given support for diverse views as to how distributions should be ranked with respect to inequality, with support for 'relative,' 'absolute,' and 'centrist' views. To account for some diversity of judgements about how inequality should be measured, we thus measure global inequality using a wide range of inequality measures - 'relative,' 'absolute' and 'centrist.'

A highly desirable property for any inequality measure, be it 'relative,' 'absolute,' or 'centrist,' is *unit consistency*. This property requires that the ranking which an inequality index assigns to any member of a set of income distributions is independent of the units in which income is measured. It would be most unsatisfactory, for example, if changing the denomination from, say, US dollars to Chinese RNB would result in a different judgement as to which of two income distributions were more unequal. While this requirement might not seem demanding, it turns out, in fact, that a number of well-known absolute and centrist measures of inequality are not unit-consistent. As Zheng (2007) shows, neither the centrist measures proposed by Kolm (1976), nor those of Bossert and Pfingsten (1990), are unit consistent, though the Krtscha (1994) measure is. Intermediate measures can range from being very close to being relative measures, to being very close to being absolute measures. The Krtscha measure lies very close to the middle of this range and might be described as being one of the most centrist of centrist measures (Bosmans et al., 2014). This is another

advantage for our purposes, as our goal is to assess quite broadly how conclusions about global inequality trends are affected in moving along a spectrum from relative, to centrist, to absolute inequality measures.

More precisely, the Krtscha (1994) measure is underpinned by the appealing notion of a "fair compromise," between relative and absolute inequality. The idea is that for inequality to remain unchanged while incomes grow, extra income should be allocated among individuals in the following way. The first marginal dollar should be distributed so that 50 cents go to the individuals in proportion to their present income shares, while the other 50 cents are divided among individuals in equal absolute amounts. The second marginal dollar is distributed in the same way, though using the income shares following the previous dollar's distribution as a starting point. As discussed by Del Río and Alonso-Villar (2008, 2010), a consequence of this approach is that, as mean incomes grow, this centrist invariance concept becomes closer to the absolute invariance concept. While a good case can be made for a "ray-invariance" principle, in which the same centrist attitude is maintained no matter how much income increases (Del Río and Alonso-Villar, 2010), there is some evidence from experimental studies that in fact a changing attitude, as incomes rise, is a better description of how people actually perceive inequality. Amiel and Cowell (1999a:78 Table 2), for example, found that while the proportion of people who feel inequality is invariant to adding fixed proportionate sums decreases somewhat as incomes rise, the proportion who feel inequality is invariant to adding fixed absolute sums substantially increases.

Table 1. Converting' Decile Quantile Shares to Income Quantile Shares

Decile	1	2	3	4	5	6	7	8	9	10
Mean consumption share (%)	2.45	3.67	4.68	5.60	6.69	7.89	9.49	11.67	15.69	32.17
Mean income share (%)	1.58	2.77	3.76	4.67	5.78	7.01	8.73	11.08	15.65	38.89
Adjustment (% points)	−0.87	−0.90	−0.92	−0.93	−0.91	−0.88	−0.76	−0.59	−0.04	6.72

Note: Based on N=127 country-year observations with both income and consumption data.

Source: Authors, based on the World Income Inequality Database.

Table 2. Global Inequality Estimates

Inequality Measure	1975	1985	1995	2000	2005	2010
Coeff. Of Variation (CV)	1.899	1.825	1.904	2.006	1.889	1.650
Standard Deviation (SD)	10183.830	11495.290	13833.720	15594.970	16957.500	17518.230
Krtscha (K)	19341.639	20976.605	26337.051	31281.327	32036.279	28901.751
Gini (G)	0.739	0.708	0.705	0.697	0.680	0.631
Absolute Gini (AG)	3964.290	4459.022	5121.878	5416.492	6108.163	6702.923
Intermediate Gini (IG)	2931.276	3157.389	3610.207	3773.670	4156.544	4232.225

Source: Authors, based on the World Income Inequality Database.

The Krtscha measure (*K*) can be defined as follows:

$$K(\boldsymbol{x})=\frac{1}{n\bar{x}}\sum_{i=1}^{n}(x_i-\bar{x})^2, \tag{1}$$

where $\boldsymbol{x}$ is is the income distribution of a given country, x_i measures the income of a person i in a country of n population, and $\bar{x}$ measures the mean of the distribution $\boldsymbol{x}$.

One way of thinking of this measure is as being equal to the variance divided by the mean. Equivalently, and of particular interest here, as noted by Subramanian and Jayaraj (2014), it can be expressed as the product of a well-known relative inequality measure, the coefficient of variation (CV), and a well-known absolute measure, the standard deviation (*SD*). The standard deviation is also unit consistent (Zheng 2007).

$$K(\boldsymbol{x})=CV(\boldsymbol{x})\cdot SD(\boldsymbol{x}), \tag{2}$$

where

$$CV(\boldsymbol{x})=\frac{1}{\bar{x}}\left[\sum_{i=1}^{n}\frac{(x_i-\bar{x}^2)}{n}\right]^{\frac{1}{2}}, \tag{3}$$

and

$$SD(\boldsymbol{x})=\left[\sum_{i=1}^{n}\frac{(x_i-\bar{x}^2)}{n}\right]^{\frac{1}{2}}. \tag{4}$$

Together, CV, SD and *K* provide a family of inequality measures which, while intimately related, make very different judgements regarding how growth in mean incomes must be divided in order for inequality to remain unchanged. We employ this family of measures to estimate trends in global inequality, as judged from very different normative standpoints.

We also employ a second family of measures, based on the Gini coefficient - by far the most widely used measure of inequality. The Gini coefficient itself, a relative measure, is often defined graphically, with respect to the Lorenz curve, which depicts the cumulative share of, e.g., income or consumption expenditure, corresponding to the cumulative population share. In a uniform, completely equal, income distribution the corresponding Lorenz curve is a 45 degree line, known as the line of equality. The Gini coefficient is the area which lies between the line of equality and the actual Lorenz curve, divided by the total area under the line of equality. More formally, without loss of generality, we assume to be rank-ordered so that $x_i \leq x_{i+1}$ for all $i \in \{1, \ldots, n-1\}$. Then the Gini coefficient (G) can be expressed as follows:

$$G(\boldsymbol{x}) = \frac{n+1}{n} - \frac{2}{n^2 \bar{x}} \sum_{i=1}^{n} (n+1-i) x_i, \tag{5}$$

The popularity of the Gini index is largely due to its attractive intuitive geometric interpretation, taking values between 0 and 1, with 0 reflecting perfect equality and 1, perfect inequality. A feature of the Gini coefficient is that it tends to give greater weight to income transfers in the middle of the distribution than at the tails; by contrast, the *CV* attaches equal weight to transfers at different income levels (Atkinson, 1970).

Furthermore, the Absolute Gini (AG) is given by:

$$AG(\boldsymbol{x}) = \bar{x} G(\boldsymbol{x}), \tag{6}$$

while various possible intermediate Gini coefficients can be entertained. We use a version recently advanced by Subramanian and Jayaraj (2013), IG, which is given simply by the product of the relative and absolute Gini coefficients:

$$IG(\boldsymbol{x}) = G(\boldsymbol{x}) \cdot \bar{x} G(\boldsymbol{x}). \tag{7}$$

Together, G, AG and *IG* provide a second family of inequality measures. The relationships between its relative, absolute and intermediate members parallel those between the corresponding members of our first family.

4 Data and Empirical Issues

4.1 Data Compilation

For analysis, we use the version (V3.0B) of UNU-WIDER's World Income Inequality Database

(WIID), which contains repeated cross-country information on Gini coefficients and income (or consumption) quantiles for 174 countries, spanning the period 1970–2013.[7] It is the most comprehensive and reliable dataset of worldwide distributional data currently available.[8]

The focus in this study centres on six specific years - 1975, 1985, 1995, 2000, 2005 and 2010. The gaps since 1995 are shorter, mainly due to increased data availability. In each of the years analysed, there is an inevitable trade-off between using data as close as possible to the desired years, while maintaining as high a coverage as possible of the global population at those times. The compromise adopted was to choose these six years and to include observations within a maximum of five years of each data point - with a preference, naturally, for observations as close to each of these years as possible.[9] So, for example, all country observations for 1985 come from the 1980–1990 interval, but are concentrated around 1985 as much as possible.

As well as favouring data close to the six specified years, all other things being equal, we had a number of other preferences. Our inequality estimates are ultimately built up from quantile share data. In order to obtain more precise estimates, we had a preference for data based on deciles or, better still, the lower nine deciles plus the top two vingtiles, rather than quintile shares. Since we study global interpersonal inequality, we also had a preference for those data in which the person, rather than the household, was the unit of analysis. Naturally, we preferred data based on surveys with a more representative coverage of the entire population and those in which the quality of the data is deemed to be highest.

We had one final important preference. As highlighted in Section 2.2, our focus is on global income (rather than expenditure) inequality. All other things being equal, we used income data rather than expenditure data. Nevertheless, ignoring the consumption based data completely would have dramatically reduced the coverage of the desired countries and years. Where no suitable income-based data were available but we had data on expenditure, we used the expenditure data and adjusted it as described in subsection 4.2.

Before turning to the adjustment procedure, we note that when there was no way to choose between more than one source for a given country-year based on these criteria, we took an average of the quantile shares from these different sources. At the end of the process we were left with 55, 86, 122, 119, 135 and 107 country-year observations in 1975, 1985, 1995, 2000, 2005 and 2010 respectively. This provided us with a sample which covers 77% of the world's population in 1975, 85% in 1985, 93% in 1995, 87% in 2000, 94% in 2005 and 83% in 2010. The full list of country-year observations for each of the respective years, divided into regional categories, and detailing regional coverage, is outlined in Tables B.1–B.7 in Appendix B.

4.2 Converting Consumption Quantile Shares into Income Quantile

Shares

Deininger and Squire (1996), in the context of their dataset, suggest adding 6.6 Gini points to Gini coefficients based on consumption to obtain the corresponding income Gini coefficients. In this study, all our inequality estimates are made directly using quantile share data. This clearly requires a different approach to that of Deininger and Squire (1996), which can however be regarded as being similar in spirit. We began by comparing the average quantile shares for income with the corresponding quantile shares for consumption. However, in order to ensure that we were comparing like with like as far as possible, we focused only on those country-years for which there are income and consumption data in exactly the same year. Where there was a choice of sources for a given country-year's income or consumption data, we had a preference for instances where the sources for the income and consumption data where the same. This was done to minimize differences due to other factors, such as different survey designs. The average shares per decile for consumption and for income, and the average differences between them, are displayed in Table 1.

As expected, the lowest deciles for consumption have a higher share than the corresponding deciles for income, while the highest decile for consumption has a lower share than the highest decile for income. Where we had consumption-based decile data for a given country-year, the shares were adjusted by the amounts indicated in Table 1.[10]

4.3 Estimating Global Inequality Indices from Country Quantile Data

Thus far we have discussed the collation of income-based quantile share data, at the country level, for each of the countries and years indicated. Estimating global inequality requires constructing a global distribution of income, using these country-level quantile data. To do this, we need to consider both the number of individuals and the income per capita within each country. The number of individuals per country were obtained from population data from a number of sources.[11] The income levels per capita were then calculated using GDP data. GDP for the various country-years, in 2005 US$ at PPP, were obtained from the World Bank's databank, with a few exceptions (see Appendix A).

A common approach in previous studies has been to make the simplifying assumption that all individuals in the same country-quantile-year have the same income. As Milanovic (2002) has discussed, there are some reasonable grounds for taking this approach. Nevertheless, as is well recognized, the method should be expected to bias the resulting inequality estimates downwards (see Anand and Segal, 2008). Like Bhalla (2002) and Sala-i-Martin (2006), though using a different method, we constructed smooth within-country distributions, and based our global inequality figures on these estimates. We used a

technique developed by Shorrocks and Wan (2009), which constructs a synthetic sample of observations which conform exactly with the known quantile shares. In the first stage of the method, a lognormal distribution is fitted to the reported quantile data and an equal-weighted synthetic sample of 1,000 observations is generated. The resulting sample is approximately consistent with the known quantile shares. The second stage then adjusts the values of the observations within each quantile until the quantile shares for the synthetic sample exactly match the actual quantile shares.

Formally, the synthetic global income distribution in year *t* can be denoted as follows. Each country $c \in \{1, \ldots, C\}$ in year $t \in \{t_1, \ldots t_T\}$ has an income distribution $x_{ct} \in \mathbb{R}_+^{n_{ct}}$, where $n_{ct} \in \mathbb{N}$ denotes its population at that time. Let $N_t = \Sigma_{c=1}^{C} n_{ct}$ denote the global population size at time t. The global income distribution is then given by a concatenation of all domestic distributions at this time, as follows:

$$x_{wt} \in R_+^{N_t} = \begin{bmatrix} x_{1t} \\ x_{2t} \\ \vdots \\ x_{Ct} \end{bmatrix}.$$

Shorrocks and Wan (2009) find that while some other functional forms tend to provide a better initial fit to income distributions, particularly in the upper tail, the second stage procedure improves the accuracy of the lognormal based sample so much that the outcome is as good as, or better then, leading alternatives.

For each of our years of analysis, this smoothing method was applied separately to each country. This provided us with a sample of 1,000 synthetic individual income-share observations for each country, which were consistent with the reported income shares (or those estimated based on expenditure shares). These shares were then scaled up by the country's mean GDP (in 2005 US$ at PPP), weighted by the country's population size, and merged into a single synthetic global income distribution, upon which our global inequality estimates are based.

A note of caution is in order here. We would have preferred to use mean income data derived from the same household surveys upon which the quantile data in the WIID were calculated. Unfortunately, given that there were many missing observations for the country-year mean incomes of interest, we chose to use GDP per capita instead. Our choice, however, does not come without a cost. If the GDP data are biased upwards (or downwards) for low income countries, or downwards (or upwards) for high income countries, measured global inequality will be biased downwards (or upwards), due to the resulting impact on the between-country component of global inequality. Unfortunately, it is not at all clear what the direction of the net bias due to this measurement error should be expected to be, let alone

its size. It is fair to say though that a similar uncertainty would have also arisen from the use of mean incomes from survey data. As Anand and Segal (2008) have pointed out, household surveys are likely to suffer from underreporting of the incomes of the rich and from undersampling of both the richest and the poorest. These dynamics would be expected to bias domestic inequality downwards, but with uncertain implications for the direction of bias in global inequality estimates, as the net effect of this undersampling on the between-country component of inequality is unclear.

4.4 Estimating Counterfactual Global Inequality Indices

As mentioned in the introduction, we explore two counterfactual scenarios. Without loss of generality, it will be helpful in what follows to refer to Sweden as country 1, and Iceland as country 2. Since we focus on analysing six particular years, we also have that $T = 6$; $t_1 = 1975$, $t_2 = 1985$, $t_3 = 1995$, $t_4 = 2000$, $t_5 = 2005$ and $t_6 = 2010$.

Counterfactual Scenarios:

In counterfactual scenario 1 (CF1), all countries are assumed to have their actual incomes per capita and population sizes in 2010. However, we suppose that instead of their actual domestic distributions of income, all countries have the same quantile shares as those of Sweden in 2010. Counterfactual scenario 2 (CF2) is essentially the same as counterfactual 1, except that all countries are assumed to have the same quantile shares as those of Iceland in 2010. The two Nordic countries have had historically two of the lowest relative income inequalities in the world, reflecting very unique social and economic models of redistribution. More specifically, the two counterfactual scenarios consider the hypothetical situation in which all the countries in the world had arrived at social contracts that favoured welfare regimes and redistributive systems of the type of these Nordic nations. Formally, this amounts to estimating the inequality of the counterfactual distribution given by

$$\dot{x}_{wt_6} \in R_+^{N_{t_6}} = \begin{bmatrix} \dot{x}_{1t_6} \\ \dot{x}_{2t_6} \\ \vdots \\ \dot{x}_{Ct_6} \end{bmatrix},$$

where, for $c \in \{1, \ldots, C\}$, $\dot{x}_{ct_6} \in \mathbb{R}_+^{n_{ct_6}}$ is a counterfactual income distribution with the same same mean as x_{ct_6} but the same quantile shares as x_{1t_6}. Our results are discussed in the next section.

5 Results and Analysis

In this section we provide global inequality estimates for 1975 to 2010, using the chosen relative, absolute and centrist measures. The overall findings are summarized in Table 2.

The results indicate that relative global inequality fell during 1975 to 2010, from 0.739 to 0.631 according to the Gini coefficient, and from 1.899 to 1.650 according to the Coefficient of Variation. However, while this decline occurred fairly steadily over this time period according to the Gini coefficient, the pattern is much less clear with the Coefficient of Variation, which increased from 1985 to 2000, when it reached its peak.

In sharp contrast, global inequality has increased, steadily and substantially, during 1975 to 2010 according to both absolute measures. The standard deviation increased from 10,184 to 17,518, and the Absolute Gini from 3,964 to 6,702. Global inequality also increased substantially according to the two centrist measures; from 19,342 to 28,902 according to the Krtscha, and from 2,931 to 4,232 according to our Intermediate Gini. The latter measure increased steadily, while the Krtscha considers inequality to have increased in each period analysed up until 2005, but, having increased at a rather slower rate between 2000 and 2005, to have then decreased markedly between 2005 and 2010. Nevertheless, the Krtscha still regards global inequality in 2010 as being at a higher level than at any period prior to 2000.

5.1 Are Increased Absolute and Centrist Levels of Inequality Inevitable at 2010 GDP Levels?

Could a different world income distribution have evolved, with the same GDP per capita as today, but in which absolute or centrist indicators of inequality registered no increase? At a purely arithmetic level, abstracting from issues of political economy or how growth is achieved, the answer is yes. As Roope (2015) demonstrates, incremental growth is necessarily inequality reducing providing it always occurs below some "critical point." In the case of the Absolute Gini, for example, this critical point is the median individual.[12] If incremental growth always occurs below the median, it will always reduce inequality according to the Absolute Gini. Eventually, following a maximin approach, everyone up to and including the individual ranked one place above the median individual would have the same income, and inequality thus far would have declined with growth. Once this happens however, any further incremental growth must go (at best) to the individual $i=\frac{n+3}{2}$ ranked immediately above the median, and this will now increase inequality. However, starting again with the bottom individual, and bringing everyone below i up to i's income level, inequality will decrease once again. The eventual end result of such a process would be to bring the whole world to the same income level, at which point the absolute Gini would register zero inequality. A similar, if slightly more involved, analysis can be entertained for other inequality measures.

Growth of any magnitude, together with falling absolute inequality, is technically possible. In practice, of course, there will be all sorts of obstacles to such a process. From a political economy perspective, it is rather unclear whether societies would favor redistribution that

augments incomes below the median. Since the pioneering work of Frohlich et al. (1987a, 1987b), and Frohlich and Oppenheimer (1992), experimental studies in the area of political philosophy and redistributive justice have found that perceptions of fairness do not always favor Rawls (1971)'s maximin principle. Indeed, these earlier studies find that under certain conditions individuals seem more utilitarian, favoring efficient distributions over those that maximize the income of the worst-off.

Perceptions of fairness also seem to be associated with individual characteristics such as sex and race (Michelbach et al., 2003), context and education (Faravelli 2007), individual preferences (Traub et al., 2005), and cultural differences (Bond and Park, 1991).

From a growth perspective, one important constraint to consider is whether such an outcome, i.e. growth in incomes with falling absolute inequality, is achievable without imposing limits on growth in specific countries. In particular, for example, could absolute and centrist notions of inequality have matched 1975 levels in 2010 in a context where individual countries grew domestically at their actual rates, albeit with possibly quite different domestic distributions of income? Or, to put it another way, at 2010's overall global GDP level, could absolute or centrist notions of global inequality have remained at 1975 levels without even greater convergence among countries than that which actually occurred?

The Nordic countries stand out as being high income countries with comparatively low levels of relative inequality. Arguably, for many countries, achieving today's income per capita levels, or even higher, while emulating Nordic levels of relative inequality, would have been a very considerable achievement. What would our absolute and centrist measures of inequality say about global inequality in 2010 in such a scenario? Would it still be higher than in 1975? In the counterfactual scenarios 1 and 2, all countries are assumed to have their actual incomes per capita in 2010, but their quantile shares -and therefore domestic relative inequality levels- are the same as those of Sweden and Iceland in 2010, respectively.[13]

The results of the counterfactual scenarios are displayed in Table 3, which also includes, for comparison, the corresponding relative inequality estimates.

Table 3. Counterfactual Scenarios: Global Inequality Levels Assuming Actual Growth in per capita Income Globally but Domestic Income Shares at 2010 Swedish / Icelandic Levels

Inequality Measure	1975	2010 Counterfactual 1– Swedish quantile shares	2010 Counterfactual 2– Icelandic quantile shares	2010 Counterfactual 3 – Zero domestic inequality
Absolute measures				

Inequality Measure	1975	2010 Counterfactual 1– Swedish quantile shares	2010 Counterfactual 2– Icelandic quantile shares	2010 Counterfactual 3 – Zero domestic inequality
Standard Deviation	10183.830	13898.230	14483.090	11860.9
Absolute Gini	3964.290	6043.034	6092.717	5568.693
Centrist measures				
Krtscha	19341.639	18191.254	19754.500	13248.863
Intermediate Gini	2931.276	3439.937	3496.732	2920.445
Relative measures				
Gini	0.739	0.569	0.574	0.524
Coeff. of Variation	1.899	1.309	1.364	1.117

Source: Authors, based on the World Income Inequality Database.

As expected, both relative inequality measures register a very substantial decline in inequality in such scenarios, with inequality far below actual 2010 levels. The situation is, however, very different for the two absolute inequality measures; both the Standard Deviation and the Absolute Gini increase very substantially under both counterfactual scenarios. Thus, even worldwide domestic achievement of Nordic levels of relative inequality would not be enough to keep global absolute inequality at 1975 levels given 2010's global and domestic GDP levels. Turning to our centrist measures, like the absolute measures, the Intermediate Gini registers a very steep increase in inequality under both counterfactual scenarios. In contrast, the Krtscha registers a decrease under CF1, and a very slight increase under CF2. These results suggest that given actual levels of GDP per capita in 2010, Icelandic relative inequality levels are loosely speaking, an approximate upper bound to the domestic relative inequality levels that would be required globally to reduce the Krtscha to its 1975 level. As with absolute measures though, Nordic domestic relative inequality levels would not be sufficient for the Intermediate Gini to equal its 1975 level in 2010.

A natural question is whether it is possible to achieve levels of global intermediate and absolute inequality as they were in 1975 with today's domestic and global income levels. To shed light on this, we re-estimate our results in a further counterfactual scenario in which all individuals in each country assume their country's GDP per capita income, so that domestic inequality is completely eliminated. This is equivalent to the ultimate result of repeated application of a maximin approach, as discussed above. The results are displayed in the final column of Table 3. Even in this extreme scenario, both the Standard Deviation and the Absolute Gini would be well above 1975 levels, while even the Intermediate Gini is just very marginally lower than in 1975. The Krtscha, in contrast, and as expected in light of the previous counterfactuals, is estimated to be very substantially below 1975 levels in this scenario. These results suggest that for each of these measures, apart from the Krtscha, it is probably impossible to emulate 1975 global inequality levels, without further economic convergence, or a decline in between country inequality. There is, however, an important technical caveat to this.

A feature which can be very useful, in certain contexts, for inequality measures to satisfy, is sub-group decomposability (see Shorrocks, 1984). An inequality measure with this property can be decomposed exactly into a within-group component, and a between-group component. Unfortunately, not all inequality measures satisfy this property. In fact, as Zheng (2007) demonstrated, the only known absolute and centrist inequality measures which are both decomposable and unit-consistent are, respectively, the Variance (which is simply the square of our *SD* measure) and the Krtscha (or, more precisely, a class of measures which generalise the Krtscha). The implications of this for the results in the final column of Table 3 are that, in the case of the Standard Deviation, Absolute Gini and Intermediate Gini, minimising domestic inequality levels (holding domestic GDP constant) might not actually yield the minimum possible overall global inequality levels, as these indices are not subgroup consistent. Thus, to test for further confirmation that lack of sufficient convergence alone is enough to ensure that absolute inequality in 2010 is higher than in 1975, in Table 4 we decompose the Variance into its within-country and between country components, for each of these two years.

Table 4. Decomposing Global Inequality 1975 & 2010

Inequality Measure	1975	2010
Absolute inequality		
Variance	103,710,000	306,888,000
Variance: Within-country	48,727,000	166,207,000

Inequality Measure	1975	2010
Variance: Between-country	54,984,000	140,681,000
Centrist inequality		
Krtscha	19,341.64	28,901.75
Krtscha: Within-country	9,087.38	15,652.89
Krtscha: Between-country	10,254.26	13,248.86
Relative inequality		
MLD	1.349	0.805
MLD: Within-country	0.262	0.297
MLD: Between-country	1.087	0.507

Source: Authors, based on the World Income Inequality Database.

The analysis confirms that the between-country component alone of absolute inequality in 2010, according to the Variance, is substantially higher than overall global absolute inequality in 1975. Table 4 also provides a corresponding decomposition for the Krtscha, and for the Mean Log Deviation, the latter, an important member of the Generalized Entropy Class of measures, which are the only additively decomposable relative inequality measures (Shorrocks, 1984). The results show that the between-country component of the Krtscha in 2010 is less than that of the overall global Krtscha measure in 1975. In contrast to both the Variance and the Krtscha, the relative Mean Log Deviation regards between-country inequality to be dramatically lower in 2010 than in 1975 and, in fact, this is the sole reason this measure deems global inequality overall to have declined over the period, since its within-country component actually increased.

5.2 Regional Inequality Trends

While a detailed analysis of regional inequality patterns is beyond the scope of this paper, it is of interest, in passing, to highlight some broad trends. Inequality estimates for 1975 to 2010, using each of our two families of measures, are summarized in Table 5.

Table 5. Global Inequality Estimates

Inequality Measure	1975	1985	1995	2000	2005	2010
East Asia & Pacific						
Coeff. Of Variation (CV)	2.644	2.235	1.990	1.703	1.664	1.326
Standard Deviation (SD)	5395.897	3468.993	9200.877	5653.267	11068.690	11822.960
Krtscha (K)	14266.644	7753.997	18307.721	9628.475	18421.067	15681.265
Gini (G)	0.761	0.557	0.679	0.509	0.582	0.514
Absolute Gini (AG)	1552.557	864.861	3137.612	1689.899	3873.928	4582.664
Intermediate Gini (IG)	1181.108	481.961	2128.995	860.361	2256.447	2355.947
Europe & Central Asia						
East Asia & Pacific						
Coeff. Of Variation (CV)	0.685	0.790	1.990	1.703	0.966	0.840
Standard Deviation (SD)	11297.730	11819.460	15729.890	17689.140	19140.670	18040.570
Krtscha (K)	7743.125	9334.537	16090.891	18048.583	18491.418	15146.863
Gini (G)	0.328	0.381	0.499	0.494	0.461	0.418
Absolute Gini (AG)	5412.429	5707.365	7666.690	8565.410	9143.340	8987.439
Intermediate Gini (IG)	1777.117	2176.561	3822.458	4231.826	4219.560	3759.176
Latin America & Caribb						
Coeff. Of Variation (CV)	1.503	1.412	1.565	1.600	1.446	1.307
Standard Deviation (SD)	10799.290	10427.910	12584.000	13395.960	13055.440	13578.710
Krtscha (K)	16228.309	14722.019	19697.358	21434.072	18871.769	17749.139
Gini (G)	0.563	0.542	0.567	0.577	0.544	0.512
Absolute Gini (AG)	4049.009	4000.509	4561.950	4832.972	4912.611	5313.855
Intermediate Gini (IG)	2281.293	2166.715	2588.633	2789.881	2672.116	2718.196
Middle East & N. Africa						
Coeff. Of Variation (CV)	2.078	1.252	1.307	1.243	1.184	0.863
Standard Deviation (SD)	10151.900	7741.818	6482.113	6967.308	6929.870	4738.835

Inequality Measure	1975	1985	1995	2000	2005	2010
Krtscha (K)	21094.735	9692.137	8474.066	8663.778	8204.481	4091.084
Gini (G)	0.656	0.519	0.529	0.476	0.469	0.381
Absolute Gini (AG)	3203.705	3210.280	2621.505	2668.319	2743.021	2090.486
Intermediate Gini (IG)	2100.798	1666.553	1385.990	1270.734	1285.462	796.141
North America						
Coeff. Of Variation (CV)	0.678	0.718	0.789	0.841	0.866	0.872
Standard Deviation (SD)	15359.110	20763.050	27117.510	33750.230	37573.760	37574.880
Krtscha (K)	10412.248	14913.684	21387.038	28385.968	32530.986	32772.435
Gini (G)	0.337	0.362	0.384	0.393	0.399	0.412
Absolute Gini (AG)	7632.694	10462.433	13208.108	15757.475	17312.952	17754.628
Intermediate Gini (IG)	2571.378	3786.773	5073.763	6187.645	6906.656	7317.037
South Asia						
Coeff. Of Variation (CV)	0.944	0.859	0.829	1.114	1.306	1.038
Standard Deviation (SD)	803.623	883.320	1155.274	1876.087	2680.569	2910.322
Krtscha (K)	758.765	758.533	957.272	2089.323	3502.003	3020.012
Gini (G)	0.406	0.350	0.347	0.433	0.509	0.430
Absolute Gini (AG)	345.817	359.662	484.260	730.265	1044.784	1206.038
Intermediate Gini (IG)	140.505	125.756	168.198	316.563	532.004	518.620
Sub-Saharan Africa						
Coeff. Of Variation (CV)	1.406	1.666	3.325	2.705	3.247	3.143
Standard Deviation (SD)	2337.863	1770.683	5288.443	5021.646	5574.384	7627.560
Krtscha (K)	3287.082	2950.808	17585.289	13582.448	18098.074	23972.658
Gini (G)	0.541	0.547	0.685	0.675	0.631	0.633
Absolute Gini (AG)	898.915	581.416	1090.042	1252.412	1083.352	1535.171
Intermediate Gini (IG)	485.971	318.151	747.104	844.852	683.563	971.088

Source: Authors, based on the World Income Inequality Database.

The results indicate substantially different trends in inequality across regions during the period analysed. It is interesting to note that, in contrast to global inequality, at a regional level, relative and absolute inequality measures often concur on the direction of change of inequality. Inequality increased substantially and steadily throughout 1975–2010 in North America, which for present purposes does not include Mexico, according to all measures. Inequality also increased according to all measures in Europe and Central Asia, South Asia and Sub-Saharan Africa, though with some ups and downs along the way according to relative measures. In the case of Europe and Central Asia, inequality peaked in 1995 according to relative measures and has since been in decline. All measures agree that inequality fell in this region during 2005–2010. All measures are also in agreement that inequality in the Middle East and North Africa decreased substantially over the period. Inequality rose overall during 1975–2010 in Latin America and the Caribbean according to absolute and centrist measures, but fell according to relative measures.[14] All measures show that inequality rose in the region during 1975–2000, while only the absolute measures registered an increase in inequality during 2000–2010. In East Asia and Pacific, inequality fell overall according to relative measures, but increased according to absolute and centrist measures. Even there though there is some agreement between different concepts of inequality: all measures regard inequality as having fallen during 1975–1985, and during 1995–2000. All measures except the Coefficient of Variation deem inequality to have risen during both 1985–1995 and 2000–2005.

It should also be noted that within regions, there is typically considerable variation with respect to levels of, and changes in, domestic inequality over the period of analysis. For example, in Europe, the UK's Gini has increased by 38%, while France's has fallen by 16%; in Latin America, Argentina's Gini has increased by 25%, while Brazil's has fallen by 10%; in South Asia, Bangladesh's Gini has increased by 60%, while Nepal's has decreased by 38% and in East Asia, China's Gini has increased by 39%, while the Republic of Korea's has decreased by 14%. The latter comparison is an interesting one. China and Korea have both been extraordinarily successful with respect to growth in mean incomes over the period studied, yet have had very different experiences with respect to changes in domestic inequality.

There is an important caveat to the regional patterns just painted. The coverage in our sample is typically more limited for the Middle East and North Africa, and for sub-Saharan Africa. There are also some issues of comparability over time in these regions in terms of the countries which compose the regional sample changing over time. See Tables B.1–B.7 in Appendix B for full details of regional composition and population coverage.

6 Sensitivity Analysis and Robustness of Estimates

As in any study on global inequality, there are a multitude of potential sources of error in our estimates, including sampling error, measurement error and assuming a single PPP price level for each country. Unfortunately, providing meaningful confidence intervals is a virtually insurmountable task (see Anand and Segal, 2008 for the definitive account of these issues). However, recognising the considerable impact on our overall inequality estimates of India and China, given both their large populations and dramatic growth performance over the period, we consider the sensitivity of our estimates to substantial measurement error in those quantile share data.

Our key findings are that relative global inequality has fallen substantially during 1975–2010, while absolute and centrist measures of inequality have increased dramatically. As the analyses in Table 3 and Table 4 indicate, the latter findings would be most unlikely to change using almost any conceivable quantile data for India and China; we therefore focus on the former results. Perhaps the most obvious concern to these findings comes from the possibility that relative inequality was much lower in India and China in 1975 than our data indicate, and much higher in 2010 than our data suggest. In our sensitivity analysis we therefore estimate the Gini coefficient and Coefficient of Variation for a counterfactual situation where, in 1975, India and China had the same quantile shares as Hungary, which had among the lowest levels of relative inequality in our sample in 1975, and the same quantile shares in 2010 as South Africa, which had among the highest levels in our sample at that time. All other countries are assumed to have the same quantile shares as in our main analysis. The results are presented in Table 6.

Table 6. Sensitivity Analysis: Relative global inequality levels assuming extreme measurement error in India's and China's quantile data

Inequality Measure	1975	2010
Coeff. Of Variation (CV)	1.898	1.810
Standard Deviation (SD)	10178.15	19217.43
Krtscha (K)	19320.081	34780.288
Gini (G)	0.735	0.691
Absolute Gini (AG)	3943.179	7334.207
Intermediate Gini (IG)	2899.774	5065.810

Source: Authors, based on the World Income Inequality Database.

As expected, a comparison of the Gini coefficient and Coefficient of Variation estimates to those in Table 2 indicates lower inequality in 1975, and higher inequality in 2010, than in our main analysis. However, the direction of change is not affected: relative inequality has still fallen according to both the Gini and *CV*, from 0.735 to 0.691, and from 1.898 to 1.810, respectively. To put the sensitivity analysis in context, the scenario just computed is tantamount to assuming measurement error so high that China's and India's Gini coefficients in 2010 were incorrectly measured as 0.398 and 0.417, respectively, when they should actually have been 0.696. Furthermore, they were incorrectly measured in 1975 as 0.287 and 0.412, respectively, when they should actually have been 0.226. Overall, the sensitivity analysis strongly suggests that the main findings regarding inequality trends are robust to imprecise measurement of China's and India's income distributions.

7 Conclusion

Using the most up-to-date and reliable dataset of worldwide distributional data presently available, we have estimated global interpersonal inequality levels and their trends during the period from 1975 to 2010. To the best of our knowledge, this is the most comprehensive study on global inequality to employ a range of inequality measures with very contrasting normative underpinnings; 'relative,' 'absolute' and 'centrist.' Taken together, the results in the paper echo Atkinson and Brandolini (2010) in emphasising just how central the choice of measure is to any discussion of what has happened to global inequality levels during recent decades. As highlighted above, constructing a global distribution of income upon which to base inequality estimates, is inevitably subject to many kinds of challenges. Yet whatever errors may remain in constructed distributions such as ours and those of other authors, the resulting error in, say the Gini coefficient, is nothing compared to the differing conclusions reached about what has happened to inequality in moving even to a centrist measure such as the Krtscha, let alone an absolute one.

According to our results, relative global inequality, as captured by the Gini coefficient and Coefficient of Variation, while still staggeringly high, has fallen quite substantially over the decades. This has been driven by a dramatic decline in relative inequality between countries, largely arising from India's and China's outstanding growth performances. In stark contrast, we find that absolute global inequality, measured by the Standard Deviation and Absolute Gini, rocketed during 1975 to 2010. Moreover, even our two centrist measures, an intermediate Gini and the Krtscha, one of the most intermediate of the centrist measures, deem global inequality to have been considerably higher in 2010 than in 1975.

What should policymakers with a concern for global inequality take from these apparently disparate findings? The evidence from experimental work on political philosophy and redistributive justice suggests that people do have diverse views about what exactly consitutes fair redistribution. Perceptions of inequality may be likely related to increasingly obvious absolute differences in income, not only to the perhaps less apparent relative differences, which have been in focus in empirical studies in the Economics literature. Income differences are increasingly obvious to people both because they have become so large, and because of the increased awareness globalisation has brought of life in far-flung corners of the globe. One notable implication of our findings for those with a concern for global inequality is the important role which continued convergence in global incomes must play. As in previous studies, our evidence suggests that declining relative inequality between countries has been the main, if not only, factor in reducing global relative inequality. Yet *insufficient* convergence, together with substantial growth in per capita incomes, has meant that the increased absolute differences in mean incomes between countries have resulted in increased absolute (and even some centrist) notions of global interpersonal inequality, regardless of domestic inequality levels.

The other method for reducing global inequality is, of course, reducing inequality within individual countries. Our analysis found that if all countries could attain Nordic levels of relative inequality, at least some centrist indicators would suggest similar inequality levels as forty years ago.

There is, in our view, a possible danger, in giving more absolute indicators of inequality too much focus, especially in poor countries - even if one's normative judgement is that absolute measures capture the essence of inequality better than relative ones. During the timeframe analysed, millions of people around the world have been lifted out of absolute notions of poverty, driven largely by dramatic growth in India and China. This growth has been accompanied by a striking rise in absolute inequality in those countries, no doubt, but it has transformed countless lives. Whether such growth, and such poverty reduction could have occurred without any increase in inequality, at least in its absolute form, is surely a highly moot point.

In the end, one interpretation of our results might be that, for better or for worse, a degree of increased inequality, at least in its absolute form, is an inevitable by-product of economic ‘progress’. This would rather echo the findings of Ravallion (2004), who showed that the absolute gap between the rich and the poor rises in growing economies while falls in contracting ones. There would be huge implications for the fight against global absolute poverty if attempts were made to halt or reverse economic growth in order to appease absolute inequality. In fact, Ravallion (2005) has shown that declining absolute inequality is associated with a rise in absolute poverty. There is, however, increasing evidence that lowering high levels of relative inequality may not only be desirable in its own right but may

also be growth promoting. Policies aimed at reducing high levels of relative inequality may have multiple benefits. In the short-run, redistributive policies are an obvious channel to achieve this. In the longer run, devoting greater resources to the promotion of human capital, especially, as Heckman (2013) and others have recently convincingly argued, in early childhood, and especially among disadvantaged children, is perhaps an even more potent tool.

The conflicting results from relative versus absolute measures of inequality highlight the importance of having a more open discussion about the implications of normative notions of inequality when setting global developmental agendas such as the sustainable development goals. What scenario would be more desirable: i) a society that enjoys high average incomes with no absolute poverty, but suffers from high absolute inequality, or ii) a society that has low average incomes and high levels of absolute poverty, but with more contained absolute inequality?

These questions bring us to the point on which we wish to conclude. All too often people on lower incomes suffer from lack of attainment across multiple domains. Progress, with or without increased income inequality, is not real progress if improvements are not also apparent in non-income domains, be they people's health, education, life satisfaction, or, as Sen (1979, 1985, 1999) has forcefully argued, the freedom to live the kind of life one has reason to value. Monetary outcomes are only one facet of wellbeing. In our view, a key challenge for policymakers is to employ a dashboard of indicators to assess progress and, to whatever extent income inequality, relative or absolute, is unavoidable, policymakers should do all they can to minimise its replication in other domains, by promoting equality of opportunities.

Footnotes

1 We are grateful to Olga Alonso-Villar, François Bourguignon, Andrea Cornia, Gary Fields, Stephen Jenkins, Nora Lustig, Subbu Subramanian, and seminar participants at the Universities of Helsinki, Oxford, Bielefeld, Beijing Normal University, the September 2014 UNU-WIDER Conference on “Inequality - measurement, trends, impact and policy” in Helsinki, and the 2015 ECINEQ Meeting in Luxembourg, for their helpful comments on earlier versions of this paper. We are in particular grateful to Conchita D'Ambrosio and the anonymous references for their suggestions that helped improve our analysis. Naturally, any remaining errors are ours.

2 Email: laurence.roope@dph.ox.ac.uk

3 Email: Finn@wider.unu.edu

4 Actually some studies have focused on income and others on consumption. We use the term 'income' loosely for now but will discuss some of the issues arising from the important distinction between the two in Section 2.

5 This subsection follows the discussion in Anand and Segal (2008).

6 Note that Kolm (1976)'s nomenclature in which relative measures are deemed to be "leftist" and absolute ones "rightest" is reserved for a situation in which mean income is increasing. The interpretation is reversed in the context of declining mean income. Atkinson (1983, p. 6) illustrates this intuition with a nice historical example; in 1931, sailors of the British Navy's Atlantic Fleet at Invergordon opposed a reduction in their pay of one shilling a day on the basis that "… they did not regard it as fair that they should bear a bigger proportionate cut than the officers."

7 The WIID contains further data, dating as far back as 1867, but the focus in this study is on the 1970s onwards. The dataset is available on the following link: http://www.wider.unu.edu/research/WIID3-0B/en_GB/database/

8 For a review of the WIID, see Jenkins (2015).

9 We regarded five years as an absolute cut-off in this respect. If there were only observations more than five years from the desired country-year, these were not used. For the latter three years analysed, observations more than three years from the desired country-year were not used.

10 In a few exceptional cases, where the adjustment took some of the bottom quantiles' shares below zero, these were instead simply taken to be zero and an equivalent subtraction taken from the top quantile.

11 The main sources were: (1) United Nations Population Division. World Population Prospects, (2) United Nations Statistical Division. Population and Vital Statistics Report (various years), (3) Census reports and other statistical publications from national statistical offices, (4) Eurostat: Demographic Statistics, (5) Secretariat of the Pacific Community: Statistics and Demography Programme, and (6) U.S. Census Bureau: International Database.

12 'Incremental growth' in Roope (2015)'s framework means that an increment $\varepsilon > 0$ is added to the income of some individual $i \in \{1, \cdots, n\}$, while the incomes of all individuals $j \in \{1, \cdots, n\} \setminus \{i\}$ remain unchanged. Thus, for example, incremental growth which occurs below the median refers to a situation where an increment $\varepsilon > 0$ is added to the income of an individual $i < (n+1)/2$ while the incomes of all individuals $j \in \{1, \cdots, n\} \setminus \{i\}$ remain unchanged.

13 Sweden had the fourth lowest Gini coefficient in our sample of countries in both 1975 and 2010 and was virtually unchanged, from 0.239 in 1975 to 0.241 in 2010. In 2010, Iceland had a Gini coefficient of 0.256, the eighth lowest in the world according to our estimates.

14 This is consistent with earlier studies on inequality trends in the Latin American region (see e.g. López-Calva and Lustig 2010; Gasparini et al. 2011; Lustig et al. 2013; Cornia 2014; Székely and Mendoza 2015).

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Filename	Description
roiw12240-sup-0001-suppinfo1.docx 19.4 KB	**Appendix A**
roiw12240-sup-0002-suppinfo2.docx 26.6 KB	**Appendix B** Appendix Tables B.1 - B.7

Please note: The publisher is not responsible for the content or functionality of any supporting information supplied by the authors. Any queries (other than missing content) should be directed to the corresponding author for the article.

References

Amiel, Y. and F. Cowell, "Measurement of Income Inequality: Experimental Test by Questionnaire," *Journal of Public Economics*, **47**, 3–26, 1992.
Crossref | Web of Science® | Google Scholar

Amiel, Y. and F. Cowell, *Thinking about Inequality*, Cambridge University Press, Cambridge, MA, 1999a.
Crossref | Google Scholar

Amiel, Y. and F. Cowell, "Income transformations and income inequality," in D. Slottje, ed., *Advances in Econometrics, Income Distribution and Scientific Methodology*, Physica Verlag, Heidelberg, 209–32, 1999b.
Crossref | Google Scholar

Anand, S. and P. Segal, P., "What Do We Know About Global Income Inequality?," *Journal of*

Economic Literature, **46**, 57–94, 2008.
Crossref | Web of Science® | Google Scholar

Aristotle, Rhetoric, Book II, Chapter 2, 1379a, 1954. Translation of Rhys Roberts. Compiled by Lee Honeycult, web edition at www.public.iastate.edu .
Google Scholar

Atkinson, A.B., "On the Measurement of Inequality," *Journal of Economic Theory*, **2**, 244–263, 1970.
Crossref | Web of Science® | Google Scholar

Atkinson, A.B., "Introduction to Part I," in A.B. Atkinson, ed., *Social Justice and Public Policy*, 3–13, Wheatsheaf, Brighton, 1983.
Google Scholar

Atkinson, A.B. and A. Brandolini, "On Analysing the World Distribution of Income," *The World Bank Economic Review*, **24**, 1–37, 2010.
Crossref | Web of Science® | Google Scholar

Banerjee, A. and E. Duflo, "Inequality And Growth: What Can The Data Say?," *Journal of Economic Growth*, **8**, 267–299, 2003.
Crossref | Web of Science® | Google Scholar

Bhalla, S., *Imagine There's no Country: Poverty, Inequality and Growth in the Era of Globalization*, Institute for International Economics, Washington, D.C., 2002.
Web of Science® | Google Scholar

Bond, D. and J.-C. Park, "An Empirical Test of Rawls.s Theory of Justice: A Second Approach, in Korea and the United States," *Simulation & Gaming*, **22**, 443–462, 1991.
Crossref | Web of Science® | Google Scholar

Bosmans, K., K. Decancq, and A. Decoster, "The Relativity of Decreasing Inequality Between Countries," *Economica*, **81**, 276–292, 2014.
Wiley Online Library | Web of Science® | Google Scholar

Bossert, W. and A. Pfingsten, "Intermediate Inequality: Concepts, Indices, and Welfare Implications," *Mathematical Social Sciences*, **19**, 117–134, 1990.
Crossref | Web of Science® | Google Scholar

Bourguignon, F. and C. Morrisson, "Inequality among World Citizens: 1820–1992," *American Economic Review*, **92**, 727–744, 2002.
Crossref | Web of Science® | Google Scholar

Chotikapanich, D., R. Valenzuela, and D.P. Rao, "Global and Regional Inequality in the Distribution of Income: Estimation with Limited and Incomplete Data," *Empirical Economics*, **22**, 533–546, 1997.
Crossref | Google Scholar

Cornia, G.A., ed., *Falling Inequality in Latin America: Policy Changes and Lessons*. Oxford University Press, Oxford, 2014.
Crossref | Google Scholar

Cornia, G.A. and S. Kiiski, "Trends in Income Distribution in the Post-World War II Period: Evidence and Interpretation," Discussion Paper 89, UNU-WIDER, Helsinki, 2001.
Google Scholar

Deininger, K. and L. Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review*, **10**, 565–591, 1996.
Crossref | Web of Science® | Google Scholar

del Río, C., and O. Alonso-Villar, "Rankings of Income Distributions: A Note on Intermediate Inequality Indices," Inequality and Poverty II, Papers from the Second Ecineq Society Meeting, 16. 2008.
Google Scholar

del Río, C. and O. Alonso-Villar, "New Unit-Consistent Intermediate Inequality Indices," *Economic Theory*, **42**, 505–521, 2010.
Crossref | Web of Science® | Google Scholar

Dowrick, S. and M. Akmal, "Contradictory Trends in Global Income Inequality: A Tale of Two Biases," *Review of Income and Wealth*, **51**, 201–229, 2005.
Wiley Online Library | Google Scholar

Dworkin, R., "What is Equality? Part One: Equality of Welfare," *Philosophy & Public Affairs*, **10**, 185–246, 1981a.
Web of Science® | Google Scholar

Dworkin, R., "What is Equality? Part two: Equality of Resources," *Philosophy & Public Affairs*,**10**, 283–345, 1981b.
Web of Science® | Google Scholar

Faravelli, M., "How context matters: A Survey Based Experiment on Distributive Justice," *Journal of Public Economics*, **91**, 1399–1422, 2007.
Crossref | Web of Science® | Google Scholar

Firebaugh, G., "Empirics of World Income Inequality," *American Journal of Sociology*, **104**,

1597–1630, 1999.
Crossref | Web of Science® | Google Scholar

Firebaugh, G., *The New Geography of Global Income Inequality*, Harvard University Press, Cambridge and London, 2003.
Crossref | Web of Science® | Google Scholar

Frohlich, N. and J.A. Oppenheimer, *Choosing Justice: An Experimental Approach to Ethical Theory*, University of California Press, Berkeley and Los Angeles,1992.
Google Scholar

Frohlich, N., J.A. Oppenheimer, and C.L. Eavey, "Choices of Principles of Distributive Justice in Experimental Groups," *American Journal of Political Science*, **31**, 606–636, 1987a.
Crossref | Web of Science® | Google Scholar

Frohlich, N., J.A. Oppenheimer, and C.L. Eavey, "Laboratory Results on Rawls's Distributive Justice," *British Journal of Political Science*, **17**, 1–21, 1987b.
Crossref | Web of Science® | Google Scholar

Gasparini, L., G. Cruces, L. Tornarolli, and D. Mejia, "Recent Trends in Income Inequality in Latin America," *Economia*, **11**, 147–201, 2011.
Google Scholar

Heckman, J.J., *Giving Kids a Fair Chance*, MIT Press, Cambridge (MA), 2013.
Google Scholar

Islam, N., "Growth Empirics: A Panel Data Approach," *Quarterly Journal of Economics*, **110**, 1127–70, 1995.
Crossref | Web of Science® | Google Scholar

Jenkins, S.P., "World Income Inequality Databases: An Assessment of WIID and SWIID," *The Journal of Economic Inequality (In Press)*, **13**, 629–671, 2015.
Crossref | Web of Science® | Google Scholar

Kolm, S., "Unequal Inequalities I and II," *Journal of Economic Theory*, **12**, 416–442, and 13, 82–111, 1976.
Crossref | Web of Science® | Google Scholar

Korzeniewicz, R. and T. Moran, "World-Economic Trends in the Distribution of Income, 1965–1992," *American Journal of Sociology*, **102**, 1000–1039, 1997.
Crossref | Web of Science® | Google Scholar

Krtscha, M., "A New Compromise Measure of Inequality,". in W. Eichorn, ed., *Models and Measurement of Welfare and Inequality*. Springer-Verlag, Heidelberg, 1994.
Crossref | Google Scholar

López-Calva, L.F. and N. Lustig, *Declining Inequality in Latin America. A Decade of Progress*?, Brookings Institution Press, Washington, D.C., 2010.
Google Scholar

Lustig, N., L.F. Lopez-Calva, and E. Ortiz-Juarez, "Declining Inequality in Latin America in the 2000s: The Cases of Argentina, Brazil, and Mexico," *World Development*, **44**, 129–141, 2013.
Crossref | Web of Science® | Google Scholar

Melchior, A., K. Telle, and H. Wiig, "Globalization and Inequality: World Income Distribution and Living Standards, 1960–1998," Studies on Foreign Policy Issues Report, 34, Royal Norwegian Ministry of Foreign Affairs, 2000.
Google Scholar

Michelbach, P.A., J.T. Scott, R.E. Matland, and B.H. Bornstein, "Doing Rawls Justice: An Experimental Study of Income Distribution Norms," *American Journal of Political Science*, **47**, 523–539, 2003.
Wiley Online Library | Web of Science® | Google Scholar

Milanovic, B., "True World Income Distribution, 1998 and 1993: First Calculation Based on Household Surveys Alone," *Economic Journal*, **112**, 51–92, 2002.
Wiley Online Library | Web of Science® | Google Scholar

Milanovic, B., *Worlds Apart: Measuring International and Global Inequality*, Princeton University Press, Princeton and Oxford, 2005.
Google Scholar

Milanovic, B., "Global Inequality Recalculated and Updated: The Effect of New PPP Estimates on Global Inequality and 2005 Estimates," *The Journal of Economic Inequality*, **10**, 1–18, 2012.
Crossref | Web of Science® | Google Scholar

Moyes, P., "A New Concept of Lorenz Domination," *Economics Letters*, **23**, 203–207, 1987.
Crossref | Web of Science® | Google Scholar

Piketty, T., *Capital in the 21st Century*, Harvard University Press, Cambridge, MA, 2014.
Google Scholar

Plato, The Republic, Chapter 4 on Wealth, Poverty and Virtue, No. 422, 1901. Translation of Benjamin Jowett, web edition at www.mdx.ac.uk , Stephanus page numbers used.
Google Scholar

Ravallion, M., "The Debate on Globalization, Poverty and Inequality: Why Measurement Matters," *International Affairs*, **79**, 739–53, 2003.
Wiley Online Library | Web of Science® | Google Scholar

Ravallion, M., "*Pro-Poor Growth: A Primer,"* Policy Research Working Paper, World Bank, Washington D.C., 2004.
Crossref | Google Scholar

Ravallion, M., "A Poverty-Inequality Trade Off?," *The Journal of Economic Inequality*, **3**, 169–181, 2005.
Crossref | Google Scholar

Rawls, J.A., *Theory of Justice*, Harvard University Press, Cambridge (MA), 1971.
Google Scholar

Richardson, D., "Income Inequality and Trade: How to Think, What to Conclude," *Journal of Economic Perspectives*, **9**, 33–56, 1995.
Crossref | Web of Science® | Google Scholar

Roemer, J.E., "A Pragmatic Theory of Responsibility for The Egalitarian Planner," *Philosophy & Public Affairs*, **22**, 146–166, 1993.
Web of Science® | Google Scholar

Roemer, J. E., *Equality of Opportunity*, Harvard University Press, Cambridge (MA), 1998.
Google Scholar

Roope, L., "*Critical Percentiles for Equalizing Growth,"* CSAE Working Paper, 2015–16, University of Oxford, Oxford, 2015.
Google Scholar

Sala-i-Martin, X., "The World Distribution of Income: Falling Poverty and…Convergence, Period," *Quarterly Journal of Economics*, **121**, 351–397, 2006.
Crossref | Web of Science® | Google Scholar

Schultz, P., "Inequality in the Distribution of Personal Income in the World: How it is Changing and Why," *Journal of Population Economics*, **11**, 307–344, 1998.
Crossref | Web of Science® | Google Scholar

Sen, A., "Issues in the Measurement of Poverty," *Scandinavian Journal of Economics*, **81**, 285–307, 1979.
Crossref | Web of Science® | Google Scholar

Sen, A., *Commodities and Capabilities*, North-Holland, Amsterdam, 1985.
Google Scholar

Sen, A., *Development as Freedom*, Oxford University Press, Oxford, 1999.
Google Scholar

Shorrocks, A.," Inequality Decomposition by Population Subgroups," *Econometrica*, **52**, 1369–1385, 1984.
Crossref | Web of Science® | Google Scholar

Shorrocks, A. and G. Wan, "Ungrouping Income Distributions: Synthesizing Samples for Inequality and Poverty Analysis," in K. Basu and R. Kanbur, eds., *Arguments for a Better World: Essays in Honor of Amartya Sen, 414–434, Vol. I, Ethics, Welfare and Measurement*, Oxford University Press, Oxford, 2009.
Google Scholar

Subramanian, S. and D. Jayaraj, "The Evolution of Consumption and Wealth Inequality: A Quantitative Assessment," *Journal of Globalization and Development*, **4**, 253–281, 2013.
Crossref | Google Scholar

Subramanian, S. and D. Jayaraj, "Growth and Inequality in the Distribution of India's Consumption Expenditure: 1983 2009–10." Paper presented at UNU-WIDER Conference on Inequality. Measurement, Trends, Impacts, and Policies, Helsinki, 5–6 September, 2014.
Google Scholar

Székely, M. and P. Mendoza, "Is the Decline in Inequality in Latin America Here to Stay?," *Journal of Human Development and Capabilities*, **16**, 397–419, 2015.
Crossref | Web of Science® | Google Scholar

Traub, S., C. Seidl, U. Schmidt, and M. Levati, "Friedman, Harsanyi, Rawls, Boulding or Somebody Else? An Experimental Investigation of Distributive Justice," *Social Choice and Welfare*, **24**, 283–309, 2005.
Crossref | Web of Science® | Google Scholar

UNDP, Human Development Report, 1999, Oxford University Press, New York and Oxford, 1999.
Google Scholar

UNU-WIDER, "World Income Inequality Database (WIID3.0b)," September 2014. Available at: http://www.wider.unu.edu/research/WIID3-0B/en_GB/database/1 , accessed 14 March 2016.
Google Scholar

Williamson, J., "Globalization and Inequality Then and Now: The Late 19th and Late 20th Centuries

Compared," National Bureau of Economic Research Working Paper, 5491, Cambridge University Press, Cambridge (MA), 1999.
Google Scholar

Wood, A., "How Trade Hurt Unskilled Workers," *Journal of Economic Perspectives*, **9**, 57–80, 1995.
Crossref | Web of Science® | Google Scholar

World Bank, "Global Purchasing Power Parities and Real Expenditures: 2005 International Comparison Program, 2008," available at:
http://siteresources.worldbank.org/ICPINT/Resources/icp-.nal.pdf , accessed 24 February 2013.
Google Scholar

World Economic Forum. (2013). *Global Risks 2013*. Eighth Edition. Geneva, Switzerland: World Economic Forum.
Google Scholar

Zheng, B., "Unit-Consistent Decomposable Inequality Measures," *Economica*, **74**, 97–111, 2007.
Wiley Online Library | Web of Science® | Google Scholar

Citing Literature

Number of times cited according to CrossRef: 7

Claire R. McNellan, Emily Dansereau, Marielle C. G. Wallace, Danny V. Colombara, Erin B. Palmisano, Casey K. Johanns, Alexandra Schaefer, Diego Ríos-Zertuche, Paola Zúñiga-Brenes, Bernardo Hernandez, Emma Iriarte and Ali H. Mokdad, Antenatal care as a means to increase participation in the continuum of maternal and child healthcare: an analysis of the poorest regions of four Mesoamérican countries, *BMC Pregnancy and Childbirth*, 10.1186/s12884-019-2207-9, **19**, 1, (2019).
Crossref

David Wilkins, Understanding Historical Slavery, Its Legacies, and Its Lessons for Combating Modern-Day Slavery and Human Trafficking, The Palgrave International Handbook of Human Trafficking, 10.1007/978-3-319-63192-9_1-1, (1-16), (2019).
Crossref

Michael Dauderstädt, Konvergenz als Ziel und Auftrag der Europäischen Union, Handbuch Europäische Union, 10.1007/978-3-658-17436-1_43-1, (1-26), (2018).
Crossref

Philip Nel, Redistribution with African Characteristics, *Politikon*, (1), (2017).

Crossref

Joonha Jeon and So Young Kim, Is the gap widening among universities? On research output inequality and its measurement in the Korean higher education system, *Quality & Quantity*, (2017).
Crossref

Soondong Hong, Heejoon Han and Chang Sik Kim, World distribution of income for 1970–2010: dramatic reduction in world income inequality during the 2000s, *Empirical Economics*, 10.1007/s00181-019-01657-w, (2019).
Crossref

Omar Shahabudin McDoom, Celia Reyes, Christian Mina and Ronina Asis, Inequality Between Whom? Patterns, Trends, and Implications of Horizontal Inequality in the Philippines, *Social Indicators Research*, 10.1007/s11205-018-1867-6, (2018).
Crossref