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## Global inequality when unequal countries create unequal people

Martin Ravallion<sup>1</sup>

Department of Economics, Georgetown University, Washington, DC 20057, USA



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### ABSTRACT

Current global inequality measures assume that national-mean income does not matter to economic welfare at given household income as measured in surveys. The paper questions that assumption on theoretical and empirical grounds and finds that prominent stylized facts about global inequality are not robust. At one extreme, theories of relative deprivation yield nationalistic measures whereby global inequality is average within-country inequality, which is rising. However, other theories and evidence point instead to the benefits of living in a richer country. Parameter values consistent with research on global subjective wellbeing imply higher inequality than prevailing measures, though falling since 1990.

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### 1. Introduction

The prevailing approach to measuring global inequality pools all household incomes in the world and measures inequality in this global distribution the same way one measures inequality within one country. This has been dubbed the “cosmopolitan” approach in that everyone in the world is treated the same way.<sup>2</sup> Three stylized facts have emerged from the literature following this approach:<sup>3</sup> (i) the bulk of global inequality (two-thirds to three-quarters) is between countries rather than within them; (ii) inequality between countries has been falling since around 1990, while average inequality within countries has been rising; and (iii) on balance, global inequality has been falling.

We have seen diverse reactions to this pattern. Some observers have applauded the decline in global inequality, while others have focused much more on inequality within countries. Some observers have argued that falling global inequality

E-mail address: [mr1185@georgetown.edu](mailto:mr1185@georgetown.edu)

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<sup>2</sup> This is the term used by [Brandolini and Carta \(2016\)](#), in keeping with the usage in [Caney \(2005\)](#) and [Nagel \(2005\)](#).

<sup>3</sup> Further discussion of these stylized facts can be found in [Bourguignon \(2016\)](#), [Lakner and Milanovic \(2016\)](#), [Milanovic \(2015, 2016\)](#) and [Ravallion \(2018\)](#). Stylized facts (ii) and (iii) represent marked reversals in the long-run pattern back to the early 19<sup>th</sup> century, as documented by [Bourguignon and Morrisson \(2002\)](#).

diminishes the need for further redistributive effort, including in addressing inequality within countries.<sup>4</sup> Another view one hears is that rising inequality in rich countries is an unwelcome consequence of the falling inequality between-countries, as jobs appear to move to the developing countries that are far poorer but are enjoying higher growth rates during the current period of globalization and convergence.<sup>5</sup>

However, there is a salience to nationality that appears to be missing from the cosmopolitan approach to measuring global inequality, at least as it is commonly implemented empirically.<sup>6</sup> The arguments typically made against high inequality relate to residents of a given country rather than the world as a whole.<sup>7</sup> An example is the commonly-heard concern about economically-powerful elites dominating political and judicial decision making at national and local levels. Similarly, the relevant domain for personal evaluations of status and self-respect in unequal societies often appears to be national rather than global. The standard cosmopolitan approach can be in tension with the idea that ideals of “equity” or “justice” are confined to a set of “moral comparators,” being people who are bound in some personal relationship, as in the approach found in [Walster et al. \(1978\)](#). It has often been argued that for most people such relationships are quite localized—rarely extending beyond the borders of the country of residence.

One possible response to these concerns is to reject cosmopolitanism by down-weighting foreigners. In the limit, “global inequality” is then nothing more than the average inequality within countries. That can be thought of as an implication of political nationalism—that distributional concerns and redistributive efforts are confined to fellow nationals.<sup>8</sup> For example, [Rawls \(1999\)](#) argues that people living in rich countries only have a moral obligation to help those in poor countries when (and only when) the latter are not well governed, such that the people live in “burdened societies.”<sup>9</sup> Such arguments have motivated abandoning cosmopolitanism in favor of a more nationalistic approach for measuring global inequality.<sup>10</sup>

Yet, to many observers, including this author, a cosmopolitan approach to measuring global inequality is compelling. Yes, nations exist and their governments address (in various ways) inequality within their borders (and beyond them, such as through development assistance). While the institutional fact of nation states and the limitations of global institutions constrain what global redistribution can be achieved in practice, these facts cannot dull the moral case for a cosmopolitan perspective in thinking about “global inequality”—a perspective that values all people of the world equally, no matter where they may happen to have been born. This echoes the arguments of [Nagel \(2005\)](#), [Singer \(2010\)](#) and others that national borders are not morally relevant to the case for helping disadvantaged fellow human beings. That implies an unconditional commitment to the cosmopolitan view in measuring global inequality. Can such a commitment be reconciled with a concern about national identity?

This paper offers an approach to measuring global income inequality that maintains cosmopolitanism but recognizes that national income matters to individual economic welfare. Here “economic welfare” is taken to reflect command over commodities, but in a broader commodity space and over a longer time period than is captured by survey-based measures of disposable income or consumption expenditure, as currently used in measuring national and global inequality. Those measures have proved to be invaluable but they have some well-known limitations in terms of the goods covered and the time period for responses. The paper argues that these data deficiencies create real-income inequalities at given own-income as measured in the surveys. Furthermore, those inequalities are likely to be reflected in differences in national income. Indeed, it would seem unlikely that a person living in a rich country is no better off economically than someone at the same survey-based measure of own-income living in poor country. The contextual factors that generate a positive external effect of living in a wealthier country are transmitted via (*inter alia*) better in-kind public services and institutions that allow greater economic security. All of these factors can be expected to depend positively on mean income in the country of residence. Yet these are essentially excluded from the survey-based measures of household income that enter global inequality measures.

The paper shows that allowing national income to matter positively to real income at given measured income has some strong implications for measures of global inequality. To the extent that those living in richer countries are better off at given own-income there is even greater inequality in the world than suggested by survey-based own-incomes. The inequality between countries becomes an extra source of inequality between people. In short, unequal countries create (horizontally) unequal people at the same observed income. Surprisingly, this possibility has been ignored in the literature on measuring global inequality. While the literature has long recognized the existence of a “citizenship premium” ([Milanovic, 2016](#), p.131) from living in a rich country, it has implicitly assumed that this premium is fully reflected in household income or consumption expenditure per person as measured in a household survey (normalized to constant prices). As this paper will argue, that seems quite unlikely.

<sup>4</sup> For example, [Cowen \(2014\)](#) uses declining inequality between countries as an argument against intra-national redistribution. See the comments by [Bhattacharya \(2015\)](#) and the [Economist \(2014\)](#).

<sup>5</sup> These views are discussed further in [Bourguignon \(2015\)](#), [Milanovic \(2016\)](#) and [Rodrik \(2017\)](#).

<sup>6</sup> [Kanbur \(2006\)](#) makes a similar point about “between-group” inequalities such as based on gender or ethnicity.

<sup>7</sup> This applies to most of the arguments for “non-intrinsic egalitarianism” made by [O’Neill \(2008\)](#).

<sup>8</sup> The term “nationalistic” can be used in different ways. Here it refers solely to how one thinks about global inequality. In that context, the present usage is broadly consistent with others, such as [Beck \(2006\)](#).

<sup>9</sup> See [Buchanan \(2000\)](#) for a critical assessment of this and other aspects of [Rawls \(1999\)](#).

<sup>10</sup> For example, [Brandolini and Carta \(2016\)](#) postulate a social welfare function that treats people equally within the country of residence but puts lower weight on foreigners.

The paper's approach does not presume that higher national income is the direct transmitter of higher economic welfare. Rather, higher national income matters via the extra command over commodities (broadly defined) that it makes possible for a citizen, given her own income, as measured in surveys. This is not fundamentally different to the way we currently use own income as a welfare indicator; there too, it is not own-income itself that conveys wellbeing, but rather it is the things that income permits one to do.

Nor is the approach taken here intended to subsume the use of other “non-income” dimensions of welfare in international comparisons, either as a “dashboard” or in a composite index, such as the Human Development Index (UNDP, 2010) or more theoretically-grounded indices such as in Becker et al. (2005) and Jones and Klenow (2016). The aim here is to explore the implications of allowing for the possibility that national income matters to a household's real income at given measured own-income. That does not presume that real income is all that matters to welfare broadly defined. This is no different to the (sensible) prevailing view that existing measures of income inequality or poverty are only partial indicators of overall social progress. Nonetheless, they are indicators that can be improved for their purpose.

In the literature, there is another, very different, way that national income has been seen to matter to individual welfare, namely the idea of “relative deprivation” (Duesenberry, 1949; Runciman, 1966). Following this approach, Ravallion and Chen (2011) and Milanovic and Roemer (2016) assume that individual welfare depends on *both* own-income and relative income, defined as own-income relative to the mean for the country of residence.<sup>11</sup> Then higher mean income has a *negative* welfare effect. Intuitively, this suggests less global inequality than implied by standard measures. If the effect of relative deprivation is large enough then we end up with a strongly nationalistic perspective on global inequality, which depends solely on the within-country component in current measures.

The paper takes an encompassing approach, allowing for both positive and negative effects of higher national income. The proposed measure of global inequality is not simply a re-weighting of the “between” and “within” components of inequality, but requires a new measure, consistent with the underlying valuations of differences in national income. At one extreme, a purely nationalist measure emerges. Another special case is the prevailing implementation of the cosmopolitan approach. However, the paper focuses on the implications of the neglected case in the literature, whereby higher national income matters positively at given own income.

A key finding is that stylized facts (i) and (iii) are not robust. Over a defensible range of parameter values, one can obtain rising or falling global inequality, and the “between-within” decomposition changes substantially. Even a seemingly modest weight on national income can generate anything from a large reduction in measured inequality to a large increase. And the changes are greater than one sees over time, or that one obtains even with seemingly large adjustments for underreporting of incomes by the rich. The paper argues that there is a stronger case for the view that higher national income has a positive intrinsic value, implying higher global inequality than is thought, though falling since 1990. Indeed, the trend decline in global inequality since 1990 is robust to all except a strongly nationalistic view.

The following section points to reasons why national income matters at given own income, implying that a new approach to measuring global inequality is called for. Section 3 outlines the paper's approach. Section 4 presents the results on global inequality measures. Section 5 concludes.

## 2. Arguments and evidence as to why national income matters

The primary data used by standard measures of global inequality refer to either household disposable income or consumption expenditure, both derived from a household survey for each country. (For brevity I will refer to both as simply household “income.”) This is then normalized for differences in the prices faced and household size. The resulting measure is taken to be a sufficient statistic for household real income. Yet there are some limitations of such data. The constraint of relying on respondent recall in surveys entails that income (or consumption) is typically only measured over a relatively short stipulated recall period. Nor is the use of many public services typically accounted for. This section argues that these data limitations have important implications for measuring global income inequality—implications that have been ignored in the practice of measuring global inequality.

### 2.1. Why national income matters

In the standard approach to measuring global inequality, mean national income only matters in so far as it influences individual own income, as measured in surveys.<sup>12</sup> It is plausible that the country of residence matters to personal income.<sup>13</sup> This is the instrumental case for why national income matters. What is at issue here is the assumption is that national income does not matter to individual real income at given own income as measured in surveys. There are a number of reasons to question this (popular) assumption. One way it can be questioned starts with the “relative income hypothesis”

<sup>11</sup> In the context of measuring relative poverty, Ravallion and Chen (2011) consider a welfare function of the form  $w(y, y/m)$  where  $y$  is own-income,  $m$  is the country mean and the function  $w$  is strictly increasing in both arguments. Milanovic and Roemer (2016) consider a welfare function of the form  $y^{1-\lambda} (y/m)^\lambda$  where  $0 \leq \lambda \leq 1$ . Neither formulation allows a positive external welfare effect of living in a country with a higher mean income.

<sup>12</sup> This dependence of own-income on national income is typically implicit in past approaches, but is made explicit in Milanovic (2015).

<sup>13</sup> There is supportive evidence in the results of Clemens et al. (2008) on the determinants of labor market earnings and the results of McKenzie et al. (2010) on the income gains from migration.

of [Duesenberry \(1949\)](#). This postulates that individual welfare depends on how the individual is doing relative to a set of comparators.<sup>14</sup> In this context, a higher mean in the country of residence is taken to give disutility at given own-income through perceptions of relative deprivation.<sup>15</sup> [Easterlin \(1974\)](#) argues that the only way income matters to subjective welfare is through its relative value, i.e., relative to national income.<sup>16</sup> This is how he explains the seemingly weak response of average national happiness to aggregate economic growth. Proponents of this approach advocate that evaluations of individual real income are purely relative, and in the context of measuring global inequality it is natural to think of the mean national income as the deflator for own income. (The discussion will return to the evidence on relative deprivation, based subjective wellbeing data.)

There are other reasons to postulate an independent welfare effect of national income. And these reasons are relevant even if one is only trying to measure individual real income, or economic welfare (rather than some broader concept of “happiness”). The starting point is to recognize the limitations of the measures commonly used for “own-income.” One limitation is that we would ideally measure real income over a longer time period than that for which current income is measured in surveys. This is well recognized in principle, but largely ignored in the practice of inequality measurement. For example, [Milanovic \(2016, p.131\)](#) discusses the role that country of residence plays in determining “lifetime income” through the aforementioned citizenship premium. But lifetime income is not what is measured in surveys. Current national mean income may then be a relevant dynamic indicator of expected future own-income, given that this need not be reflected well in the available income metric.

What then might national mean income reveal about expected future income? In a neoclassical growth model, higher mean income is taken to imply a higher capital stock per person. With diminishing returns to capital and a given technology, future growth rates will then be lower in countries with a higher current mean—giving a process of economic convergence among countries with a similar long-run (steady-state) mean income.<sup>17</sup> This argument points to a negative effect of higher national income at given (survey-based) own-income even without perceptions of relative deprivation.

Against this, there are likely to be external benefits of living in a society with a better educated population, as postulated in the [Lucas \(1988\)](#) model of endogenous economic growth. As is well recognized, this can readily modify the convergence property, which assumes similar fundamentals (including technology) and (hence) a similar long-run mean income across countries. The citizenship premium of living in a country that is richer today will then entail a higher expected long-run (steady-state) level of real income. This can be interpreted as a positive real-income effect of current national mean income at given current own-income.

Yet another way that national income matters stems from the fact that some important things are missing from survey-based measures of income (even if the time period is right). It can be argued that higher mean income in the country of residence is associated with advantages that are not reflected in the prevailing implementations of the cosmopolitan approach. Even without the aforementioned dynamic effects, the prevailing implementation of the cosmopolitan approach excludes direct gains from better provision of in-kind public services. (Direct income transfers are typically included in standard household income aggregates.) Almost all public services are provided at the national (or more local) level, not globally. Nation states are clearly important institutions for providing local public goods, generating positive externalities for those living in well-endowed countries. Across countries and over time, public spending tends to rise with mean income—a pattern known as Wagner’s Law ([Musgrave, 1969; Peacock and Scott, 2000; Akitoby et al., 2006; Afonso and Alves, 2017](#)).<sup>18</sup> While Wagner’s Law need not apply to all types of public spending, it is a plausible assumption that richer countries have better public goods and that these deliver gains to economic welfare. (This can also be thought of as another source of differences in long-run mean income in a dynamic model.) Administrative and judicial capabilities tend also to improve, creating more secure economic opportunities that need not be well reflected in current incomes, as measured in surveys. There is no guarantee that higher average income yields such benefits; that depends crucially on domestic policy choices. However, mean income is clearly relevant, and in a positive way.

Richer countries tend also to be less prone to costly forms of civil conflict. This has been well documented in the case of civil wars, the incidence of which tends to fall with higher average income ([Collier and Hoeffler, 1998; Blattman and Miguel, 2010](#)). The evidence is more mixed with respect to crime, with some types of crime falling in incidence with higher national income (homicides for example) while others rise (property crime).<sup>19</sup> Nonetheless, it is plausible that residents of richer countries are better protected from most forms of violence, and not more vulnerable to other types of crime.

<sup>14</sup> Important early contributions in sociology were made by [Davis \(1959\)](#) and [Runciman \(1966\)](#). In economics, social effects on welfare have been used to explain self-assessed welfare and aspects of behavior, including [Duesenberry \(1949\)](#), [Easterlin \(1974\)](#), [Frank \(1985\)](#), and [Clark et al. \(2008\)](#).

<sup>15</sup> [Rayo and Becker \(2007\)](#) show that such utility functions can emerge endogenously (interpreted as the end-point of an evolutionary process) given the difficulty in distinguishing close options and the boundedness of happiness.

<sup>16</sup> Subjective welfare (also called “subjective wellbeing”) here refers to self-assessed happiness or “satisfaction with life” based on survey questions.

<sup>17</sup> See, for example, [Barro and Sala-i-Martin \(1995\)](#).

<sup>18</sup> Wagner’s Law is sometimes defined as a rising share of national income devoted to government spending as income rises. [Afonso and Alves \(2017\)](#) provide a review of the empirical literature. Wagner’s Law is generally thought to be a feature of industrialized countries, but the same pattern is found in data for developing countries, as shown by [Akitoby et al. \(2006\)](#).

<sup>19</sup> [Soares \(2004, Table 2\)](#) provides a compilation of studies across types of crime. The picture is blurred by the fact that (conditional on a crime occurring) crime reporting tends to be more likely in richer countries; [Soares \(2004\)](#) finds that the positive correlations with national income for theft, burglaries and contact crime vanish when one corrects for this reporting bias.

Having better off co-residents can also facilitate economic security through both formal and informal risk-sharing arrangements. There is evidence consistent with the view that publically-provided social protection tends to be better in countries with a higher mean income (Ravallion, 2016, Chapter 10). Many forms of social protection take the form of in-kind transfers and services that facilitate some degree of insurance. A similar dependence on average income emerges in models of informal (non-governmental) risk-sharing (Coate and Ravallion, 1993; Ligon et al., 2002; Ravallion, 2008) and the prediction has found empirical support in lab experiments (Charness and Genicot, 2009). Positive externalities can arise via one's current income or be an independent effect, such as through greater personal security in the presence of uninsured risks. Since it is repeated interaction that facilitates both social comparison and mutual support or collective action, it is not surprising that these conceptually distinct theoretical perspectives point to similar social groups—neighbors, friends, co-workers—as the generators of the external effects. While the most relevant co-insurance group is unlikely to be the whole population of the country of residence, it is reasonable to assume that living in a country with a higher mean income will generally entail greater opportunities for private support when current income is low.

Note that all these reasons why national income matters can be present at once. For example, a negative effect stemming from relative deprivation can coexist with a positive effect stemming from better public goods in a richer country. For the present purpose, the salient issue for measuring global inequality is whether the net effect is positive or negative on balance.

## 2.2. Evidence from data on self-assessed welfare

Much of the evidence that has been presented in the literature in support of the relative deprivation hypothesis has come from country-level studies using self-reported welfare (typically measured from a survey question on “happiness” or “satisfaction-with-life”) as the dependent variable in a regression with both own income and income for a comparator group as regressors (often along with other controls).

As is well recognized in the literature, self-reported subjective welfare depends on personality and other idiosyncratic individual characteristics. Real income is clearly one factor relevant to subjective welfare but only one. Even so, the regression function can be taken to provide relevant information on the influence of national income on economic welfare at given own income.

Some of the regressions reported in this literature indicate that self-reported happiness or satisfaction with life rises with own-income relative to a comparison group, often defined by co-residents, as in (for example) Luttmer (2005) and Knight et al. (2009).<sup>20</sup> Using data for the US, Luttmer (2005) cannot reject the null hypothesis that subjective wellbeing is homogenous (of degree zero) in own income and neighborhood income, implying that subjective wellbeing depends on relative income not own-income. Similar findings have been reported for Latin America (Graham and Felton, 2006), the US, Germany and other countries in Western Europe (Layard et al., 2010) and Britain, Germany and Australia (Clark et al., 2017). We can call this the strongly relative view, as distinct from the weakly relative view, which assumes that own income still has a positive weight at given relative income (Ravallion and Chen, 2011).<sup>21</sup>

Not all the evidence has found support for the hypothesis of relative deprivation. In testing for such effects in self-reported happiness data from Russia and South Africa (respectively) Senik (2004) and Kingdon and Knight (2007) found evidence of *positive* external effects of neighbors' income, controlling for own income; the latter paper finds evidence of a negative effect for more distant co-residents of the same country. In another example for Russia, Huffman and Rizov (2018) also find that living in a richer region increases satisfaction-with-life controlling for own household income and other household characteristics. In a study for Malawi, Ravallion and Lokshin (2010) also found evidence of both positive and negative effects depending on income level, with the positive effect dominant among the poor. They suggest that the informal coinsurance institutions found in rural Malawi can explain this empirical finding.

When considering *global* inequality, the large disparities in living standards between countries come into play—differences that obviously cannot be identified in the studies reviewed above using data for a single country.<sup>22</sup> There are some studies using cross-national data, such as Di Tella and MacCulloch (2010), Diener et al. (2010) and Diener and Tay (2015). These typically find a positive correlation between mean subjective welfare and national income per capita.<sup>23</sup> However, these studies cannot tell us whether the effect of higher national income is internal (via own income) or external (at given own income).

There are three papers in the literature that allow one to separate these two effects, and all three point to the existence of (positive) net gains from higher national income at given own income. The first two are Helliwell (2008) and Helliwell et al. (2010), which use different models but are similar enough to be grouped together. These papers estimate regressions for individual (self-reported) subjective wellbeing responses in both the World Values Surveys and the Gallup World Poll, pooling data across countries. The regressors include both own-household income and GDP per capita of the country of

<sup>20</sup> Also see the survey by Clark et al. (2008) and the discussion in Ravallion (2014a).

<sup>21</sup> Luttmer's (2005) point estimates imply weak relativity but he cannot reject the null of strong relativity.

<sup>22</sup> Using micro data for 1000 households from 18 countries in Latin America, Graham and Felton (2006) find that country-average wealth has no significant effect on subjective wellbeing at given own-wealth. However, one can question whether there is enough cross-country variability in Latin America to identify the effect of national income. In this respect, the global studies discussed further below have greater statistical power.

<sup>23</sup> The relationship is also found to be nonlinear, specifically concave, with a marked flattening out at high mean income levels; see, for example, Di Tella and MacCulloch (2010).

residence. In both cases, there is a positive and statistically significant “own-income” effect. The data from the World Values Surveys also indicate a positive and significant effect of national income, at given own income. This is not indicated by the results using the Gallup data set for the sample as a whole, but is found for the OECD sub-sample. Note, however, that the regressions include other national characteristics that are clearly correlated with GDP per capita, such as an index of corruption (with a significant negative effect on subjective welfare) and, in Helliwell et al. (2010), country life expectancy (with a significant positive effect). Thus the total effect of higher national income on subjective wellbeing is undoubtedly higher. Helliwell et al. (2010, p.308) conclude that their global regressions “...suggest that any relative income effects at the national level are being substantially offset by the effects of other excluded variables that support life satisfaction in the richer countries.”

The third paper is Diener et al. (2013), also using the micro data from the Gallup World Poll. For the bulk of their analysis, the authors averaged the household income variable (and other variables) to national level. However, at one point they compare the effects on reported subjective wellbeing of income differences within nations to those between them. The authors report that there is at best a small effect of relative income *within* countries but a strong positive effect of the between-nation differences in average income. Diener et al. (2013, p.273) conclude that “...a richer person in a rich nation would be better off than a rich person in a poor country.” The authors conjecture that this may be because of better infrastructure in rich countries though there are other possible explanations as discussed above.

### 2.3. In summary

The literature does not leave one very confident about the size of, or even sign of, the personal real-income effect of higher national income at given own income. One finds arguments and empirical support for both negative and positive effects, although the only papers in the literature that tested for an effect of national income on subjective wellbeing using global micro data suggest that the effect is more likely to be positive. Yet the only paper on global inequality measurement that allowed for an independent effect of national income assumed a negative effect through relative deprivation (Milanovic and Roemer, 2016). So the evidence on global subjective welfare sits uncomfortably with how global inequality has been measured in the past.

In the light of these observations from the literature, it is important to know how much prevailing measures of global inequality are affected by allowing national income to matter at given own-income, either positively or negatively. The rest of the paper takes up that issue.

## 3. Measuring global inequality when national income matters

The approach taken here encompasses the various views on the welfare effects of higher national income discussed in the previous section. Household income per capita is scaled up or down by a country-specific multiplicative factor based on the national mean. The approach allows for both a non-negative relative-income effect on household welfare and a non-negative effect at given relative income.

The focus here is on *relative* inequality, as is almost invariably measured in the literature on global inequality. Relative measures satisfy the usual scale independence axiom, whereby multiplying all incomes by a constant does not change the measure of inequality. Not everyone agrees with this axiom; indeed, surveys of university students suggest that a sizeable minority do not, preferring instead a translation invariance property (whereby adding a constant does not change the measure), which yields absolute inequality measures.<sup>24</sup>

### 3.1. The proposed measure

Let  $y_{ijt} > 0$  denote the income of household  $i$  in country  $j$  at time  $t$ . We can treat  $y_{ijt}$  as a continuous random variable, and also presume that its values have been normalized for differences in prevailing prices. Let  $m_{jt}$  be the corresponding mean in country  $j$  where  $m_t$  is the global mean with a global population size of  $n_t$ . Global inequality is then measured here for the distribution of mean-adjusted real income  $y_{ijt}^*$  defined by:

$$\ln y_{ijt}^* \equiv \ln y_{ijt} + \alpha \ln m_{jt} \quad (1)$$

The parameter  $\alpha$  reflects the extra value attached to national income, i.e., its weight relative to own-income.

A range of values for  $\alpha$  will be allowed. The standard approach has  $\alpha = 0$ . A value of  $\alpha < -1$  is ruled out under the assumption that  $y_{ijt}^*$  is non-decreasing in the mean at given relative income (noting that  $\ln y_{ijt}^* = (1+\alpha)\ln y_{ijt} - \alpha \ln(y_{ijt}/m_{jt})$ ). When  $\alpha = -1$  we have the strongly relative view of Easterlin (1974) and others whereby only relative income matters ( $y_{ijt}^* = y_{ijt}/m_{jt}$ ).

In considering the upper bound for  $\alpha$ , it will be recalled that the results of past global studies of subjective wellbeing suggest that positive values are more plausible than negative ones. The study by Helliwell et al. (2010) reports regression

<sup>24</sup> The first surveys of students to show this were reported in Amiel and Cowell (1999) and it has been confirmed by other surveys since; for further discussion see Ravallion (2014b).

coefficients of subjective wellbeing on both own-income and national income (GDP per capita), both in logs; the ratio of the coefficient on log national income to that on log own-income gives  $\alpha$ . The regressions suggest a positive value with an upper bound estimate around  $\alpha = 0.5$ , though a narrower interval of 0.3–0.5 is suggested for most regression specifications. However, recall that there are also indirect effects of national income through the other control variables used in this study, so the true value of  $\alpha$  is likely to be somewhat higher. For example, the indirect effect via life expectancy alone would probably add about 0.05 to the effect of log national income on satisfaction with life, which would raise the upper bound estimate for  $\alpha$  to 0.6.<sup>25</sup> A higher value might be defended if one allows for other covariates that are correlated with national income (such as exposure to corruption, as an aspect of institutions, which was also found to be a significant predictor of subjective wellbeing by Helliwell et al.). The following analysis will consider values of  $\alpha$  over the closed interval  $[-1, 1]$ .

The restriction that  $\alpha$  is a constant can be questioned (as is also true of the prevailing literature, for which  $\alpha$  is also a constant, namely zero). The extra value attached to higher national income when measuring household welfare need not be constant across countries. Higher national income may deliver larger welfare gains at given own income in some countries than others. For example, cross-country differences in the distribution of income may generate such heterogeneity. Or it might be hypothesized that the negative relative-deprivation effect becomes more important at higher income levels, suggesting a switch in the sign of  $\alpha$  (as found by Ravallion and Lokshin, 2010). However, given that the present purpose is to explore the robustness of prevailing measures of global inequality, it does not seem unreasonable to focus here on the simple one-parameter specification in (1) as a generalization of past practice.

In choosing a measure of global inequality, the mean-log deviation (MLD)—given by the log of mean income less the mean of log income—is known to have a number of desirable features. The fact that (unlike the Gini index) MLD is additively decomposable by population sub-groups is clearly an attractive feature for the present purpose. There are other such decomposable measures including other measures in the class proposed by Theil (1967). However, MLD is the only measure that satisfies both the Pigou–Dalton transfer axiom and the Monotonicity in Distance axiom of Cowell and Flachaire (2017); the former axiom requires that mean-preserving transfers in which the recipient is poorer (richer) than the donor will decrease (increase) measured inequality while the Monotonicity in Distance axiom says that, when comparing two distributions that differ in one person’s income, the greater the distance from equality, the higher the inequality. Note that MLD is not bounded above by unity.

The MLD based on the distribution of  $y_{ijt}^*$  over all  $i, j$  is given by:<sup>26</sup>

$$L(\alpha)_t = \sum_i \sum_j \ln(m_t^*/y_{ijt}^*)/n_t \tag{2}$$

where the global mean of the mean-adjusted incomes in (1) is denoted  $m_t^*$ . As usual, the decomposability of MLD entails that  $L(\alpha)_t = L^B(\alpha)_t + L^W(\alpha)_t$  where

$$L^B(\alpha)_t = \sum_j s_{jt} \ln(m_t^*/m_{jt}^*) \tag{3.1}$$

$$L^W(\alpha)_t = \sum_j s_{jt} L(\alpha)_{jt} \tag{3.2}$$

are the between and within-country components respectively, and where  $m_{jt}^*$  is the country-specific mean of the adjusted incomes,  $L(\alpha)_{jt} = \sum_i \ln(m_{jt}^*/y_{ijt}^*)/n_{jt}$  and  $s_{jt} = n_{jt}/n_t$  is the population share of country  $j$ . The standard approach in the literature is the special case:

$$L(0)_t = \sum_i \sum_j \ln(m_t/y_{ijt})/n_t \tag{4}$$

By contrast, when  $\alpha = -1$ , global inequality is average inequality across countries (noting that  $L^B(-1)_t = 0$ ). This is “nationalistic” in that inequality between countries receives no weight.

### 3.2. Properties of the measure

Eq. (1) entails that all incomes within a given country are multiplied by a constant ( $m_{jt}^\alpha$ ). So under the scale-independence axiom, the within-country component of global inequality is independent of  $\alpha$ ; all that changes is the between-country component. It is not sufficient to simply re-weight the between- and within-country components of the standard measure. With some straightforward algebraic manipulation one can derive the following relationship between the two inequality measures in (2) and (4):<sup>27</sup>

$$L(\alpha)_t = L(0)_t + \alpha L^B(0)_t + \ln \sum_j s_{jt} \left( \frac{m_{jt}}{m_t} \right)^{\alpha+1} \tag{5}$$

<sup>25</sup> I have used an elasticity of life expectancy to mean income of 0.015 (Pritchett and Summers, 1996), mean life expectancy of 70 years and a regression coefficient of satisfaction with life on log GDP per capita of 0.05 (Helliwell et al., 2010). This calculation is only intended to be broadly indicative.

<sup>26</sup> Recall that it is assumed that  $y_{ijt} \geq 0$ . This clearly holds for consumption but need not hold for incomes. For a modification of MLD to allow non-positive values see Ravallion (2017).

<sup>27</sup> The derivation of the following equation is found in the online documentation for this paper. (A key step is to note that  $m_{jt}^\alpha = m_{jt}^{\alpha+1} \cdot (1/END)$  .

We see that  $L(\alpha)_t$  puts extra weight on the between-country component of the standard measure ( $\alpha = 0$ ). However, we also see that an extra term appears, reflecting the between-country disparities in mean incomes; this extra term only vanishes when  $\alpha = 0$ . (Also note that Eq. (5) is a computationally convenient formula since it only requires the standard measure,  $L(0)_t$ , and the country means.)

To better understand the relationship between  $L(\alpha)_t$  and the usual measure,  $L(0)_t$ , we need to look more closely at the last term on the right hand side of (5). Consider the limiting case in which  $m_{jt} = m_t$  for all  $j$  whereby  $L^B(\alpha)_t = L^B(0)_t$ . On noting that  $m_{jt}^{\alpha+1}$  is convex (concave) for  $\alpha > (<) 0$ , we have (by Jensen's inequality) that  $E(m_{jt}^{\alpha+1}) > (<) (Em_{jt})^{\alpha+1}$  as  $\alpha > (<) 0$ . Thus  $\sum_j s_{jt} (m_{jt}/m_t)^{\alpha+1} > (<) 1$  as  $\alpha > (<) 0$ . As long as  $m_{jt}$  has positive variance, the term  $\ln[\sum_j s_{jt} (m_{jt}/m_t)^{\alpha+1}]$  is positive (negative) for positive (negative)  $\alpha$ . We see then that negative (positive) weights on national income imply lower (higher) global inequality, i.e.,  $L(\alpha)_t < (>) L(0)_t$  for  $\alpha < (>) 0$ .

A stronger monotonicity property also holds, namely that  $L(\alpha)_t$  is a strictly increasing function of  $\alpha$  as long as  $m_{jt}$  varies across countries. To verify this, note that, since the within-country component is independent of  $\alpha$ , we only need look at how the between-country component varies with  $\alpha$ . Differentiating w.r.t.  $\alpha$  we have:

$$L^{B'}(\alpha)_t = \sum_j s_{jt} \left( \frac{m_{jt}^*}{m_t^*} - 1 \right) \ln m_{jt} = \frac{\sum_j (s_{jt} m_{jt}^{\alpha+1} \ln m_{jt}) - (\sum_j s_{jt} m_{jt}^{\alpha+1}) (\sum_j s_{jt} \ln m_{jt})}{\sum_j s_{jt} m_{jt}^{\alpha+1}} \quad (6)$$

On noting that  $m_{jt}$  is a random variable with positive variance, the expression on the right-hand side of (6) is the difference between the expected value of the product of the two random variables,  $m_{jt}^{\alpha+1}$  and  $\ln m_{jt}$ , and the product of the expected values of those variables. That difference is positive since the variables have positive covariance (given  $\alpha + 1 > 0$ ). Thus we have verified that  $L^{B'}(\alpha)_t > 0$  and (hence) that  $L(\alpha)_t$  is also an increasing function of  $\alpha$ .

#### 4. New measures of global inequality

The sources of the household survey data used for implementing the proposed measures are the World Bank's *PovcalNet*, the Luxembourg Income Study (LIS) and the European Union Statistics on Income and Living Conditions (EU-SILC).<sup>28</sup> I have used data for 144 countries, being all those with two surveys.<sup>29</sup> Both surveys for a given country use the same indicator, either current household consumption or income per person. Given a degree of predictable variability over time in household incomes, consumption is used in preference to income when there is a choice; consumption is used for about two-thirds of countries, while disposable income is used for the rest. Current-year population weights are used, as provided in *PovcalNet*.

The relevant measure of mean income is taken to be the mean household income from the same surveys used to measure inequality. There are arguments for and against this choice. The choice is internally consistent, in keeping with the theoretical framework of the previous section in which the country mean ( $m_{jt}$ ) is the mean of the survey-based incomes within each country ( $y_{ijt}$ ). Using the survey means is also in keeping with the bulk of the literature on the measurement of global inequality and poverty, which has generally used survey means rather than national accounts.<sup>30</sup> Against these advantages, it can be argued that national accounts data may better reflect access to public services in-kind, which one would want to include in a comprehensive measure of household real-income.<sup>31</sup> However, mixing survey-based incomes (as used for the inequality measures) with national accounts aggregates creates a number of conceptual and practical difficulties in this context.<sup>32</sup> To assure internal consistency one would need to re-estimate the household income distributions for each country consistently with the national accounts aggregates. An important step in this direction has been taken by [Piketty et al. \(2018\)](#). Naturally, this requires a great many assumptions, and (especially for developing countries) there are errors in the national accounts as well as the surveys. Nonetheless, when it becomes feasible, it would be of interest in the future to re-calculate the present paper's global inequality measures consistently with the [Piketty et al.](#) approach to distributional national-accounts.

There are other concerns about using mean income (from either surveys or the national account). For international migrants one might distinguish the mean income of the country of birth from that of current residence, although the two are the same for 97% of the world's population ([United Nations, 2015](#)), so this is a moot point. Another possibility is that one might prefer to use the median rather than the mean; relative deprivation measures have at times used the median. In principle, the present approach can be readily modified, replacing the mean with the median.

Also following standard practice, country-specific consumer price indices are used to convert to a common base year, in this case 2011, and survey means in local currency units are converted to \$s at 2011 purchasing power parity (PPP) using the consumption PPPs from the International Comparison Program. PPPs deal with the fact that many goods and services are not globally traded so their prices vary, depending (in particular) on local wage rates.

<sup>28</sup> The specific data set used here is described more fully in [Ravallion and Chen \(2017\)](#).

<sup>29</sup> This is not essential, but avoids concerns about non-random attrition when the set of countries changes over time.

<sup>30</sup> An exception is [Sala-i-Martin \(2006\)](#) who mixes within-country inequality measures from surveys with mean incomes based on the national accounts in measuring global poverty. Also see the discussion in [Chen and Ravallion \(2010\)](#).

<sup>31</sup> There is also evidence that GDP per capita from the national accounts tends to be more highly correlated with night-lights data and some other social indicators than is the case for survey means ([Pinkovskiy and Sala-i-Martin, 2016](#)).

<sup>32</sup> For a discussion in the context of global poverty measurement (where the issues are similar) see [Chen and Ravallion \(2010\)](#).

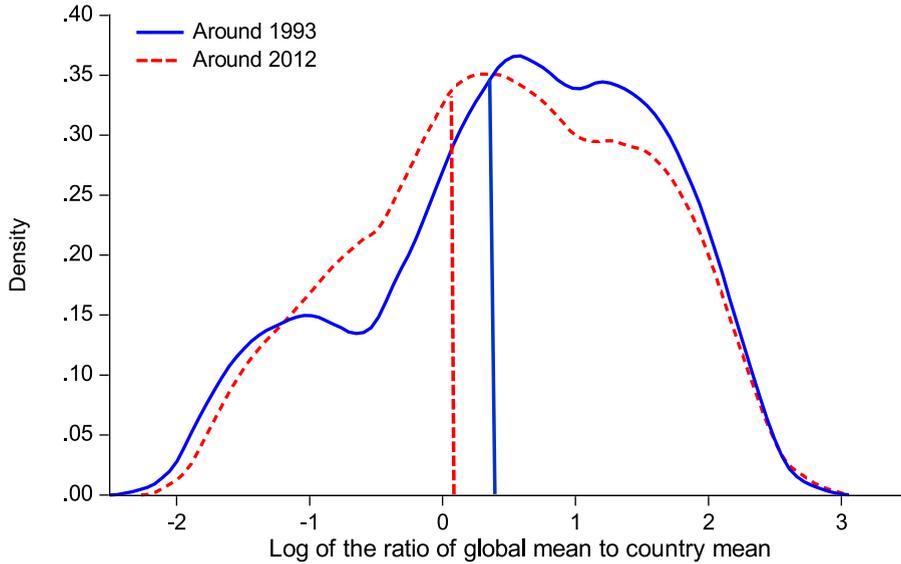


Fig. 1. Densities of  $\ln(m_t/m_{jt})$ .

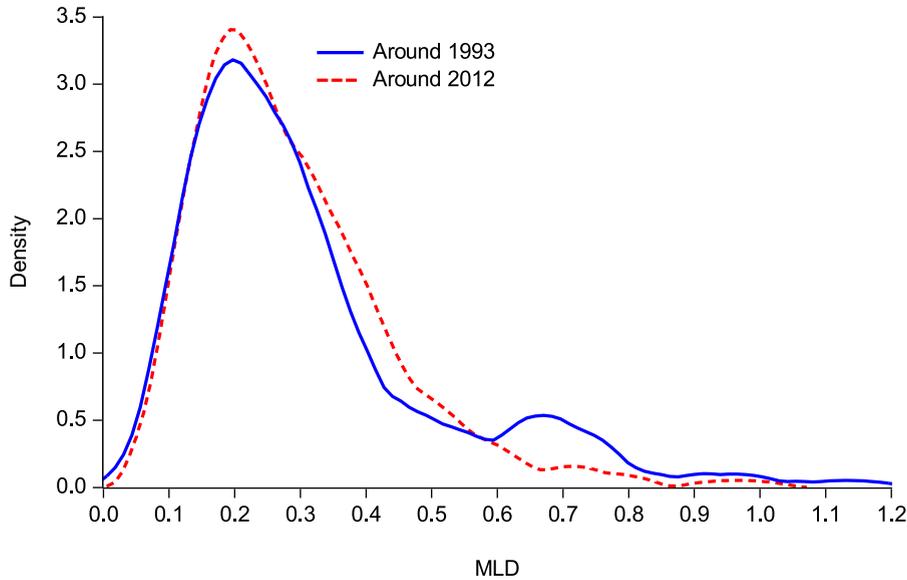


Fig. 2. Densities of MLD across countries.

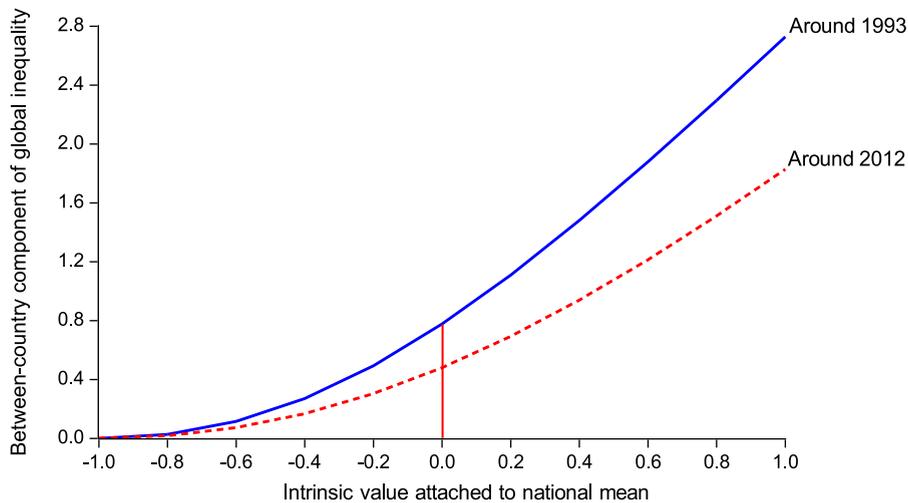
The median year for the first survey is 1993 and it is 2012 for the second. Fig. 1 gives the kernel densities of  $\ln(m_t/m_{jt})$  around these two dates. The decline in inequality between countries is evident; the between-country component of MLD (as conventionally measured) is the (population-weighted) mean of the densities in Fig. 1 which falls from 1.03 to 0.76. Fig. 2 provides the corresponding densities of the national MLDs. We see the expected shift to the right (higher inequality within countries) across most of the range of MLD. There is an exception, however, for high-inequality countries (MLD over 0.6) for which there are fewer cases around 2012. This could be due to corrections to initial measurement errors, although prior research has also suggested there is a process of inequality convergence across countries when one allows for classical measurement errors in the estimation method (Ravallion, 2003). There is only a small positive correlation ( $r = 0.191$ ;  $n = 144$ ) between the annualized changes in MLD between the earliest and latest surveys and the annualized growth rates in the mean, and it is not statistically significant.<sup>33</sup> Thus these estimates conform to one of the stylized facts identified by Ferreira and Ravallion (2009), namely that growth in the mean tends to be distribution-neutral on average.

<sup>33</sup> The t-test on the regression coefficient of the annualized change in log MLD on the annualized change in log mean gives  $t = 1.27$  (prob. = 0.20) using a heteroscedasticity-consistent standard error.

**Table 1**  
Global inequality measures.

	Around 1993		Around 2012		Change in MLD (2012–1993)
	MLD ( $L(\alpha)$ )	Between country share	MLD ( $L(\alpha)$ )	Between country share	
Standard measures ( $L(0)$ ):	1.028		0.761		–0.267
Of which:					
between-country component ( $L^B(0)$ ):	0.777		0.479		–0.298
within-country component ( $L^W(0)$ ):	0.251		0.282		0.031
$\alpha =$					
–1	0.251	0.00	0.282	0.00	0.031
–0.8	0.278	0.10	0.300	0.06	0.021
–0.6	0.366	0.32	0.355	0.20	–0.012
With an intrinsic value on national income (MLD for various values of $\alpha$ ):					
–0.4	0.522	0.52	0.449	0.37	–0.073
–0.2	0.745	0.66	0.585	0.52	–0.160
0	1.028	0.76	0.761	0.63	–0.267
0.2	1.361	0.82	0.975	0.71	–0.386
0.4	1.731	0.86	1.221	0.77	–0.510
0.6	2.129	0.88	1.495	0.81	–0.634
0.8	2.547	0.90	1.793	0.84	–0.754
1	2.978	0.92	2.110	0.87	–0.869

Sources: Author's calculations (see text). The underlying country-level data are available on the journal's web site for replication, along with code in R.



**Fig. 3.** Between-country component of global inequality.

Table 1 gives  $L(\alpha)_t$  for various values of  $\alpha$  while Fig. 3 plots  $L^B(\alpha)_t$  against  $\alpha$ . (Recall that the within-country component does not vary with  $\alpha$ .) For the standard case of  $\alpha = 0$  we see a decrease in the MLD based on observed consumptions or incomes, driven by the fall in the between-country component. As expected given monotonicity (section 3), negative values of  $\alpha$  yield a lower between-country component, bringing down the overall inequality index (Table 1). The opposite holds for positive values (implying that people in richer countries are better off at given own-consumption). This is all in line with the theoretical expectation.

We see that the quantitative magnitudes are sizeable. By construction, going from  $\alpha = 0$  to  $\alpha = -1$  brings the global measure down to average inequality within countries—a large (63–76%) reduction (Table 1). If proportionate increases in national consumption matter about as much as those for own consumption then the global inequality measure is more than doubled, with the between-country component rising to about 90% of the total.

Three observations help put the numbers in perspective. First, the differences in MLD over the range of  $\alpha$  greatly exceed the range in levels of inequality found across countries using the standard approach. This is evident on comparing Table 1 with Fig. 2; the MLDs across countries for the earliest (latest) years range from 0.07 (0.10) to 1.13 (0.96). Going from  $\alpha = -1$  to  $\alpha = 1$  increases the inequality measure by 14 of the standard deviations of the cross-national distribution of MLD for the earliest surveys, and 12 standard deviations for the latest. Across the range of  $\alpha$ , the implied differences in MLD swamp the cross-country differences in MLD for  $\alpha = 0$ . If we focus on  $\alpha = 0.6$  then the global MLD for the more recent surveys is up to twice the global value at  $\alpha = 0$ , and over 50% higher than the highest value for any country.

Second, even over a much restricted range for  $\alpha$  of  $[-0.2, 0.2]$  (say), the inequality index (for 1990) changes by an amount that is greater than the absolute change observed over this 20 year period. Differences over the value of  $\alpha$  also swamp the differences over time at given  $\alpha$ .

The third observation relates to the concern in the recent literature on the implications for measured inequality of a systematic under-estimation of the incomes of the rich in household surveys.<sup>34</sup> The differences in measures of inequality according to  $\alpha$  are comparable to, or even larger than, those implied by even a seemingly large underestimation of the incomes of the rich. Suppose, for example that incomes of all the richest 1% in the world are actually double the numbers in Lakner and Milanovic (2016) for 2008.<sup>35</sup> This would add about 0.1 to MLD,<sup>36</sup> which is about the same as adding 10% of log national-mean income to log own income to allow for the gains from living in an economically-better off country.

As expected, a higher weight on national income implies higher global inequality. As is evident from Fig. 3, I also find that the claim that the between-country component of global inequality has fallen over this period is robust to the choice of  $\alpha$ . Given that the within-country component of  $L(0)_t$  has risen over time, it turns out that the qualitative conclusion that overall global inequality fell over the period is only robust for  $\alpha > -0.66$  (Table 1).

## 5. Conclusions

It is surely remarkable that measures of global inequality attribute no economic advantage to living in a richer country beyond what is already reflected in the household incomes measured from standard household surveys. The paper has argued that this restriction is hard to defend on either theoretical or empirical grounds. Furthermore, the paper finds that some prominent stylized facts about global inequality are not robust to attaching an independent value to higher national income.

Competing theories have been considered. The longstanding idea of relative deprivation postulates negative externalities from economic gains to co-residents. Then the nationalistic view that “global inequality” is just the average national inequality across countries emerges as the limiting case in which it is relative income within the country of residence that matters.

However, one can point to plausible arguments for positive external effects of living in a richer country at given own income. Examples of the transmission mechanisms include the likely positive correlation between national income and factors conducive to a higher long-run personal income, better public services, and greater security. None of these gains are likely to be properly reflected in current incomes as measured in surveys. And there is evidence to suggest that all these mechanisms may be at work. The implication is clear: the (large) differences in average incomes found between rich and poor countries create an extra (horizontal) inequality between their residents, not reflected in their observed current incomes. This is a source of downward bias in prevailing measures of global inequality.

The paper's results suggest that this issue is highly salient to the quantitative measures obtained for global inequality. If one defines economic welfare in terms of relative income alone then one sees far less inequality in the world than if one puts a sizeable value on the external benefits of living in a richer country. Using what can be considered the ideal inequality measure for this purpose, the paper finds that relative deprivation theory implies that global interpersonal inequality is far lower than prevailing measures suggest since it is then entirely within countries.

This changes dramatically when one allows a positive value of national income (at given own-income), such as when living in a richer country brings benefits in terms of access to non-market goods and services, and better opportunities for private support in times of need. From what we know based on past global studies using micro data, the national income effect could well be 50% or more of the own-income effect on subjective wellbeing. Then global inequality is far higher than prevailing measures suggest, and far higher than found in even the most unequal country. Indeed, the differences in levels of inequality due to even rather modest differences in how one values national mean income tend to swamp the differences seen over time in standard measures, or the differences we see between countries, and are also large relative to the impact of even a substantial underestimation of the incomes of the rich.

The stylized fact that overall inequality has been falling since around 1990 is not robust, though one only finds rising inequality with a seemingly high negative weight on national income, such as due to relative deprivation. The finding of falling between-country inequality since 1990 is robust whatever value (positive or negative) one attaches to national income in assessing individual economic welfare.

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.eurocorev.2018.09.003](https://doi.org/10.1016/j.eurocorev.2018.09.003).

<sup>34</sup> Lakner and Milanovic estimate that in 2008 the world's richest 1% had an average income of \$64,213 (converted at PPP for 2005) while the overall mean was \$4097.

<sup>35</sup> Let all incomes of the richest  $p'$  proportion of the population, with income share  $s'$ , be underestimated by a factor  $k$ . Then the change in MLD is  $(s' - p') \ln k$ .

<sup>36</sup> For example, Korinek et al. (2006) estimate that correcting for selective compliance in household surveys would add around 0.05 to the Gini index for the U.S. Similarly, on using income tax records to supplement survey data one finds higher inequality measures; see, for example, Piketty and Saez (2003).

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