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GLOBAL INEQUALITY: LEVELS AND TRENDS, 1993-2005

How sensitive are these to the choice of PPPs and Real Income measures?

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Abstract

Increasing global interaction between economies over the last few decades has lead to growing interest on the implications of globalization. Of particular interest has been the distributional impact of globalization and whether this has been equity enhancing. Chotikapanich et al (2011) estimated global and regional inequalities for 1993 and 2000. The main objective of this paper is to update their results to be based on the purchasing power parity data in the latest 2005 ICP round. A related aim is to examine the sensitivity of the inequality results to the use of alternative sets of real incomes derived using different sets of purchasing power parity data to convert income data into a common currency unit. The main finding of the paper is that the populist view that globalisation has increased inequality does not hold when inequality is measured at the global level. Between 1993 and 2005, inequality has consistently declined as measured both by the Gini coefficient and the Theil index. This decline in global inequality was the result of declines in inequality between countries. Thus, claims that globalisation is increasing inequality at an international level also lack support. The estimates do suggest that there is an upward trend in inequality within countries overall, as measured by the contribution to global inequality by within country inequality, which does add support for protestors against globalisation as it may be worsening within country inequality. While the levels of global inequality vary greatly the downward trend in global inequality is evident with different choices of PPP's and real incomes.

1. Introduction

Increasing global interaction between economies over the last few decades has lead to growing interest on the implications of globalization. Of particular interest has been the distributional impact that globalization may have had and whether this has been equity enhancing because for many, the nature of the relationship between globalization and inequality amounts to a verdict on globalization. Equity here may concern distribution of income within a country or between countries within a region or the world as a whole. Increasing inequality as a result of globalization can be a potential threat to the current international order and, on the other hand, declines in inequality along with significant growth in real incomes would reinforce the benefits of globalization.

Assessment of the distributional impact of globalization must be preceded by proper modeling of income distributions and the measurement of income inequality at the national and international level. The broad consensus among the economists and analysts is that the level of global inequality is high with estimates of Gini coefficients ranging from 1980 to 2000 between 0.60 and 0.69 (Milanovic, 2002a; 2005a; and 2005b). The recently released results from the International Comparison Program 2005 at the World Bank indicate a global inequality level at 0.71 (Deaton, 2010). The United Nation's Human Development Report 1999 cites that since the 1980s, income inequality has been rising within many countries, as well as at a global level. It is also implicit in much of the work on globalization and in the rhetoric of those critical of globalization that inequality has been increasing. However, there is an increasing body of empirical literature such as the work of Milanovic (2002, 2005a and 2005b), Bhalla (2002); Sala-i-Martin (2002a, 2002b, 2006), Sutcliffe (2003) and Chotikapanich, Griffiths, Rao and Valencia (2010) that shows a declining inequality during the period of globalization. Bourguignon and Morrison (2002) on the other hand conclude that there has been little change in inequality between the 1980s and early 1990s. Further analysis of the results based on various decompositions suggest that the main driving force behind changes to income inequality has been the catch-up in incomes rather than by changes to the inequality within countries.

The apparent inconsistency or disagreement between results from various studies are attributable to the differences in methodologies, differing measures of income, differing sources of income data, and due to the price data used to convert incomes into a common currency unit. Against this background, the principal objective of the paper is to compile a comparable set of inequality statistics derived using identical methodology and a single

consistent source of data on incomes and inequality data. A related aim of the paper is to examine the sensitivity of the inequality results to the use of alternative sets of real incomes derived using different sets of purchasing power parity data to convert income data into a common currency unit. For example, there are alternative sets of real income data available from the fairly popular source, the Penn World Tables (PWT 6.3) compiled by Heston, Summers and Aten (2009) and those published by the World Bank (2008) through the World Development Indicators (WDI). Finally the paper examines the differences in inequality estimates arising out of the use of real income data for different countries and different periods expressed in current and constant prices.

The paper is organized as follows. Section 2 sets out the conceptual framework and describes the econometric methodology for modeling country-specific income distributions with aggregated data. The sources of data and country coverage are presented in Section 3. Empirical results from the study are presented in Section 4. The paper is concluded in Section 5.

2. Measurement of Global and Regional Inequality

2.1 Concept of global inequality

A clear definition of global or world inequality is necessary since different studies, with varying objectives, have used a number of different concepts and measures. Some of the earlier studies focus on between-country inequality, treating each country as a single entity and using only real per capita income in each of the countries included in the study. Inequality measured in this way, with each country treated as equally important without according any weights to the size of the countries involved, has been called inter-country inequality (Concept 1) by Milanovic (2005a). This is a measure commonly used for studies of catch-up and convergence which aim to look at the convergence of incomes of different countries. A modified version of this measure, called population-weighted inter-country inequality (Concept 2) by Milanovic (2005a), considers the population size explicitly but assumes that every individual in a given country receives the same income. Examples of studies along these lines, which ignore within-country inequality, are Schulz (1998), Firebaugh (1999) and Melchior et al. (2000). Global inequality properly defined is obtained when inequality is calculated for all individuals around the globe, thereby taking into account inequality in the distribution of income within each of the countries considered. This approach is termed global inequality between world citizens (Concept 3) by Milanovic

(2005a). In a number of influential studies Theil (1967, 1979, 1989, 1996) makes a similar distinction, referring to inter-country inequality as international inequality and global inequality as world inequality. Theil's studies focus on international inequality with the exception of Theil (1979) where some rough estimates of within-country inequality are used in the estimation of world inequality. It is only since the study of Chotikapanich et al. (1997) that the problem of accounting for inequality within countries has been given serious consideration.

In this paper the global inequality that we consider is the Concept 3 where inequality is estimated by taking into account the inequality within each country. In the next section we describe how the country-specific income distributions are estimated and combined to obtain the global distribution. The methodology for estimating the country-specific income distributions is that suggested by Chotikapanich, Griffiths and Rao (2007). The properties of the function and how to estimate are described in the next section.

2.2 Methodology for Fitting Income Distributions with Aggregate Data

This section consists of three parts. In the first part, we summarize the properties of the beta-2 income distribution that is used to fit single-country income distribution, and describe how to compute inequality coefficients and the Lorenz curves from values of the parameters of a beta-2 distribution. In the second part the estimator used to estimate the single country distributions, namely, the method-of-moments estimator introduced by Chotikapanich et al. (2007) is reviewed. The third part contains the methodology for examining regional and global income distributions. These distributions are mixtures of the country-specific distributions introduced in the first and second parts. Expressions for the regional and global Gini and Theil coefficients, and their decompositions into within-country inequality and between-country inequality, are written in terms of the parameters of the component distributions.

Modelling Country-Specific Income Distributions

The probability density function (pdf) for the three-parameter beta-2 distribution used to model the country income distributions is defined as:

$$f(y) = \frac{y^{p-1}}{b^p B(p,q)\left(1+\frac{y}{b}\right)^{p+q}} \qquad y > 0 \qquad (1)$$

where y denotes income, $b>0$, $p>0$ and $q>0$ are parameters; $B(p,q)$ is the beta function. The cumulative distribution function (cdf) for income is given by

$$F(y) = \frac{1}{B(p,q)} \int_0^{[y/(b+y)]} t^{p-1}(1-t)^{q-1}dt = B_{y/(b+y)}(p,q) \tag{2}$$

where the function $B_t(p,q)$ is the cdf for the normalized beta distribution defined on the (0,1) interval. This representation is convenient because $B_t(p,q)$ is readily-computed by most statistical software. Mean income is given by $\mu = bp/(q-1)$. The beta-2 distribution is a member of the generalized beta of the second kind family. It has been widely acknowledged to be an adequate model of income distributions, providing satisfactory goodness of fit with relatively parsimony, and including many other models as special or limiting cases (Bandourian, McDonald, and Turley, 2002; Jenkins, 2009; McDonald and Xu, 1995)

For measuring inequality, the most popular index is the Gini coefficient, which, when expressed in terms of the parameters of the beta-2 distribution, is given by (McDonald, 1984)

$$G = \frac{2B(2p,2q-1)}{pB^2(p,q)} \tag{3}$$

The other inequality measure that we consider is Theil index (Theil 1967, p. 127; Theil 1979). The continuous version of this index is

$$L = \int_0^{\infty} \ln\left(\frac{\mu}{y}\right) f(y)\, dy \tag{4}$$

Using results in McDonald and Ransom (2008), this measure can be expressed in terms of the parameters of the beta-2 distribution as

$$L = \ln\left(\frac{p}{q-1}\right) + \psi(q) - \psi(p) \tag{5}$$

where $\psi(x) = d\ln\Gamma(x)/dx$ is the digamma function. Like the beta function, this function is readily calculated by most statistical software.

Also of interest are the Lorenz curves for each country, relating the cumulative income proportion $\eta(y)$ to the cumulative proportion of population $F(y)$. A visual comparison of two Lorenz curves across time or across countries reveals whether or not inequality has unambiguously increased or decreased. Given values *b*, *p* and *q* for a beta-2

distribution, points from which to graph a Lorenz curve can be obtained as follows. First a grid of values for *y* is selected – values at equal intervals of $\ln(y)$ are likely to be suitable. Then, values of $F(y)$ are calculated from (2) and values for $\eta(y)$ can be found from

$$\eta(y) = \frac{1}{\mu}\int_0^y z\, f(z)\, dz = B_{y/(b+y)}(p+1, q-1) \tag{6}$$

Equation (6) uses the fact that the first-moment distribution of the beta-2 distribution is another beta-2 distribution with different parameters. This result is a convenient one for computation.

An income distribution $F_1(y)$ Lorenz dominates another income distribution $F_2(y)$ (i.e. income inequality is less in distribution 1 than in distribution 2) if $\eta_1(y) \geq \eta_2(y)$ for all *y*, and $\eta_1(y) > \eta_2(y)$ for at least one *y*. Given that the values of *p* and *q* outline the distribution of income within a country, they can also be used to outline a sufficient condition for Lorenz dominance. Distribution 1 is said to Lorenz dominate distribution 2 if $p_2 \leq p_1$ and $q_2 \leq q_1$ and at least one of these inequalities is strict (Wilfling, 1996). This can be done across countries or for a given country across time.

All the above quantities – the means of the distributions, the density and distribution functions, the Lorenz curves, and the Gini and Theil coefficients – depend on the unknown parameters of the beta-2 distributions *b*, *p* and *q*. We turn now to the problem of estimating these parameters. A summary of the method-of-moments procedure suggested by Chotikapanich et al. (2007) follows.

Estimation

Suppose we have *N* income classes $(a_0, a_1), (a_1, a_2), \ldots, (a_{N-1}, a_N)$, with $a_0 = 0$ and $a_N = \infty$. Let the mean class incomes for each of the *N* classes be given by $\bar{y}_1, \bar{y}_2, \ldots, \bar{y}_N$; and let the population proportions for each class be given by $c_1, c_2, \ldots, c_N$. Given the data on $c_1, c_2, \ldots, c_N$ and $\bar{y}_1, \bar{y}_2, \ldots, \bar{y}_N$, the parameters b, p and q of a beta-2 distribution are estimated along with the unknown class limits $a_1, a_2, \ldots, a_{N-1}$. The approach is to fit a beta distribution to the data such that the sample moments $\bar{y}_i$ and c_i are "close" to their population counterparts. This approach is equivalent to fitting a distribution such that $\varepsilon_1, \varepsilon_2, \ldots, \varepsilon_{2N}$ are "close to zero" where

$$c_i = \int_{a_{i-1}}^{a_i} f(y)dy + \varepsilon_i \qquad i = 1, 2, \ldots, N \tag{7}$$

and

$$\bar{y}_i = \frac{\int_{a_{i-1}}^{a_i} yf(y)dy}{\int_{a_{i-1}}^{a_i} f(y)dy} + \varepsilon_{N+i} \qquad i = 1, 2, \ldots, N \tag{8}$$

Chotikapanich et al. (2007) show how to find estimates of the parameters, *b*, *p*, *q* and the class limits $a_1, a_2, \ldots, a_{N-1}$ that minimize the weighted sum of squares function

$$\sum_{i=1}^{N}\left[\left(\frac{\varepsilon_i}{c_i}\right)^2 + \left(\frac{\varepsilon_{N+i}}{\bar{y}_i}\right)^2\right] \tag{9}$$

This can be achieved by recognizing that equations (7) and (8) can be rewritten in terms of the beta distribution function as

$$c_i = B_{a_i/(b+a_i)}(p,q) - B_{a_{i-1}/(b+a_{i-1})}(p,q) + \varepsilon_i$$

and

$$\bar{y}_i = \frac{bp}{q-1}\left(\frac{B_{a_i/(b+a_i)}(p+1,q-1) - B_{a_{i-1}/(b+a_{i-1})}(p+1,q-1)}{B_{a_i/(b+a_i)}(p,q) - B_{a_{i-1}/(b+a_{i-1})}(p,q)}\right) + \varepsilon_{N+i} \tag{10}$$

where $B_{a_0/(b+a_0)}(p,q) = 0$ and $B_{a_N/(b+a_N)}(p,q) = 1$. Chotikapanich et al (2007) have shown that the estimation can be done using the non-linear least squares options available in a standard econometric package like EViews.

Modelling Regional/Global Income Distributions

Once income distributions for each of the countries have been estimated, they can be combined to create regional income distributions. To obtain density and distribution functions for a region, and their corresponding Lorenz curves, Gini coefficients and Theil coefficients, we need to express these quantities in terms of the parameters of the country-level beta distributions. Regional density and distribution functions are population-weighted averages of their country-level counterparts. Specifically, if the *K* countries have beta income pdf's, $f_k(y), \quad k = 1, 2, \ldots, K$, and population proportions $\lambda_1, \lambda_2, \ldots \lambda_K$, the pdf for the income

distribution for the region is given by the mixture $f(y) = \sum_{k=1}^{K} \lambda_k f_k(y)$. Henceforth a *k* subscript denotes a quantity for the *k*-th country, whereas regional quantities will carry no subscript. The regional cumulative distribution function is given by

$$F(y) = \sum_{k=1}^{K} \lambda_k F_k(y) = \sum_{k=1}^{K} \lambda_j B_{y/(y+b_k)}(p_k, q_k) \tag{11}$$

Regional mean income is given by

$$\mu = \sum_{k=1}^{K} \lambda_k \mu_k = \sum_{k=1}^{K} \frac{\lambda_k b_k p_k}{q_k - 1} \tag{12}$$

where $\mu_k = b_k p_k / (q_k - 1)$ is mean income for the *k*-th country. The regional cumulative income shares are given by

$$\begin{aligned} \eta(y) &= \frac{1}{\mu} \int_0^y z\, f(z)\, dz = \frac{1}{\mu} \sum_{k=1}^{K} \lambda_k \int_0^y z\, f_k(z)\, dz \\ &= \frac{1}{\mu} \sum_{k=1}^{K} \lambda_k \mu_k B_{y/(y+b_k)}(p_k + 1, q_k - 1) \end{aligned} \tag{13}$$

A regional cumulative distribution function can be graphed by using equation (11) to compute $F(y)$ for a grid of values of *y*. A regional Lorenz curve, relating income shares to population shares, can be graphed by using equations (11) and (13) to compute $F(y)$ and $\eta(y)$ for a grid of values of *y*.

As shown in Chotikapanich et al. (2007), the regional Gini coefficient can be written as

$$G = -1 + \frac{2}{\mu} \sum_{j=1}^{K} \sum_{i=1}^{K} \lambda_j \lambda_i m_{ij} \tag{14}$$

where

$$m_{ij} = \int_0^{\infty} y\, F_j(y)\, f_i(y)\, dy = E_{f_i}\left[y\, F_j(y) \right] \tag{15}$$

A closed form expression for m_{ij} when $i \neq j$ is not available. In this case m_{ij} needs to be evaluated numerically, or, it can be estimated by drawing observations $y_i^{(h)}$, $h = 1, 2, \ldots, H$

from the beta-2 pdf's for each country $f_i(y)$, computing values $y_i^{(h)} F_j\left(y_i^{(h)}\right),\ j=1,2,\ldots,K$ for each draw, and finding the averages

$$\hat{m}_{ij} = \frac{1}{H}\sum_{h=1}^{H} y_i^{(h)}\, F_j\left(y_i^{(h)}\right) \tag{17}$$

For large H the $\hat{m}_{ij}$ are accurate estimates of the m_{ij}.

The regional Theil coefficient can be expressed in terms of the parameters of the beta distributions by writing

$$\begin{aligned} L &= \int_0^{\infty} \ln\left(\frac{\mu}{y}\right)\sum_{k=1}^{K}\lambda_k f_k(y)\,dy \\ &= \ln(\mu) - \sum_{k=1}^{K}\lambda_k \int_0^{\infty} \ln(y)\, f_k(y)\,dy \\ &= \ln(\mu) - \sum_{k=1}^{K}\lambda_k \ln(b_k) + \sum_{k=1}^{K}\lambda_k\left[\psi(q_k) - \psi(p_k)\right] \end{aligned} \tag{20}$$

It is informative to decompose total inequality into the inequality contributions from within countries and between countries. In this paper we will consider the decomposition using Theil coefficient. This is because this measure is additively decomposable into these two types of inequality, while the Gini coefficient is not.[1]

It is decomposed into within and between components $L = L_W + L_B$ as follows. Inequality within countries is defined as the population weighted average of the Theil coefficients for each country (Theil 1979). That is, using (5),

$$\begin{aligned} L_W &= \sum_{k=1}^{K}\lambda_k L_k \\ &= \sum_{k=1}^{K}\lambda_k \ln\left(\frac{p_k}{q_k - 1}\right) + \sum_{k=1}^{K}\lambda_k\left[\psi(q_k) - \psi(p_k)\right] \end{aligned} \tag{21}$$

Subtracting (21) from (20), and using the result $p_k/(q_k - 1) = \mu_k/b_k$, yields between inequality as

[1] It should be noted that the Gini coefficient is more sensitive to transfers of income around the middle of the distribution, while Theil's L is more sensitive to transfers at the low end of the distribution (Cowell 1995).

$$L_B = \ln(\mu) - \sum_{k=1}^{K} \lambda_k \ln(\mu_k) = \sum_{k=1}^{K} \lambda_k \ln\left(\frac{\lambda_k}{s_k}\right) \tag{22}$$

3. Data and Country Coverage

Chotikapanich et al (2011) estimated global and regional inequalities for 1993 and 2000. One of the aims of this paper is to extend their results to include the year 2005 where the data are now readily available. We also revised their results for 1993 and 2000 to include extra countries for which data are now available. The regional/global income distributions in this paper are therefore estimated for the years 1993, 2000 and 2005. In the next two subsections we discuss data sources and issues for (a) the income distribution data, and (b) per capita income at the country level. A third subsection contains information on the countries covered in our analysis.

3.1 Income distribution data

The country income distribution data for 1993 and 2000 that are extra to those used in Chotikapanich et al (2011) and the data for 2005 are sourced from the most recent UNU-WIDER World Income Inequality Database (Version 2c). The UNU-WIDER database is the most extensive and up to date set of data, incorporating information and updates from the Deininger and Squire World Bank dataset, the Luxembourg Income Study, Transmonee and other sources. Data from UNU-WIDER are available in the form of income shares, g_i, and population shares, c_i, for a number of income classes. In some cases expenditure shares rather income shares are available. Our preference was to use per capita income. If this was not available, we then use per capita expenditure. Also, ideally the income distribution data used should correspond to the years considered. However, for the case that the data are not available for the exact years we consider a two year band on either side of the benchmark year. Generally, the distribution data available are decile or quintile level data for each individual country. Surprisingly, distribution data for 2005 at the level required for estimation is currently least available for developed European countries, with quintile level data available only until 2002.[2] As a result, the 2005 data from the UNU-WIDER database will be supplemented by income data from regional/national statistical agencies.

[2] Since 2002 the European Union Social, Income and Living Conditions (EU-SILC) survey has been completed annually, but only the Gini coefficient is publicly available for this period. Correspondence with UNU-WIDER throughout the year indicated that a further update to this database was imminent and would address this issue, however this update never eventuated.

In terms of estimation we need to have the data in the form of the class mean incomes expressed in common currency units ($\overline{y}_i$). The calculations used to obtain $\overline{y}_i$ can be described as follows. Let $\overline{y}$ denote country level real per capita (mean) income in international dollars - details are given in the next subsection. For the UNU-WIDER data used, we have information on population shares c_i and income shares g_i; the required class means are given by $\overline{y}_i = g_i \overline{y}/c_i$.

3.2 Data on real per capita mean income and PPPs

There are two main issues related to the choice of a real per capita income variable $\overline{y}$. The first is the need to take into account the differences in price levels across countries, and the differential movements of prices over time in different countries. The second is whether to make use of per capita income/expenditure estimates constructed from household survey data, or per capita income data drawn from national accounts. Consider the second issue first. Milanovic (2002) compares and contrast estimates from these two sources. We have opted for the use of country real per capita (mean) income drawn from national income sources so that our study is consistent with the results in Chotikapanich et al (2011).

Differences in price levels across countries and over time are resolved by using country real per capita (mean) income data in PPP terms which can be obtained from a number of sources. Each source uses different methodologies and benchmark years. The choice of mean income data from these different sources is likely to have an impact on the findings of empirical studies. In the main part of global inequality, we use the latest results on gross domestic product per capita (real income per capita) in PPP terms obtained from World Bank's 2005 International Comparison Program (ICP). The 2005 ICP had an extensive coverage of countries with 146 participating countries and included China and India for the first time since 1985, resulting in a dramatic improvement in the availability of PPP data covering almost one-third of the world population. In addition, to facilitate our investigation on the influence of the choice of PPP data on estimates of inequality we apply additional three sets of PPP that have been used in literature. They are (i) the PPP's sourced from the 2007 World Development Indicators (WDI), (ii) the PPP data in current and constant 1996 prices sourced from Penn World Table version 6.2, and (iii) the PPP data in current and constant 2005 prices sourced from Penn World Table version 6.3.

The WDI PPP's sourced from the 2007 World Development Indicators involves 2005 data that has been extrapolated from the previous 1996 ICP benchmark. Comparison between the

ICP and WDI estimates for inequality will illustrate the impact that the more recent and accurate price data has had on global estimates of inequality that make use of the same methodology.

The ICP and Penn World Table make use of differing methodologies when compiling PPP data. The 2005 ICP round compiles index numbers using a method due to Elteto-Koves-Szulc (EKS). [3] The Penn World Tables on the other hand make use of the Geary-Khamis (GK) method. There is considerable debate over the most effective calculation of PPP's. See for example, Ackland et al (2004) and Dowrick and Almal (2005).

The 6.2 and 6.3 versions of the Penn World Tables (PWT) provide PPP data for over 150 countries and spanning a 50-year period. The version 6.2 has a base year of 1996 while that of version 6.3 is 2005. While PWT 6.3 uses the same base year as the ICP data, it does not make use of the information collected by the ICP in 2005.[4] We use both the current and constant prices from these two versions of PWT. For the constant price we use the real GDP per capita constructed using a chain-based index. For both versions, it is denoted by RGDPCH and expressed in either *constant 1996* or *constant 2005 international dollars*. The RGDPCH has been adjusted for differences in prices across countries and over time. For the current price we use the Real Gross Domestic Product per Capita denoted by CGDP.

While both the ICP and WDI data are calculated using the EKS method, the PWT data is calculated using the GK method, allowing a comparison between estimates of inequality using different index number methodologies. The 2005 ICP was also used as the source of population size of each country needed for finding regional/global distributions for 2005, while population data for 1993 and 2000 were sourced from Chotikapanich, et al. (2011).

3.3 Country coverage

There are 94, 92 and 82 countries included in this paper for 1993, 2000 and 2005, respectively. These countries have income distribution data at a minimum of quintile level and PPP data from the 2005 ICP round. They cover all geographic regions and levels of economic development and are listed in Table 1. For 1993 and 2000, the countries included in this paper are the same as in Chotikapanich et al (2011) with the extra three and one

[3] PPP data is calculated at a regional level and then aggregated. It should be noted that the African region price data was compiled using the Ikle method which is a variation of the GK method that minimises bias but provides additivity. A detailed outline of the methodology used by the ICP to calculate PPP's can be found in World Bank (2008a), with a critical review of this provided by Deaton and Heston (2008).

[4] The latest ICP information is scheduled to be incorporated into the forthcoming PWT 7.0. PWT 6.3 is designed to link previous versions of PWT to the ICP data, and is ideally suited for the purpose of this thesis.

countries for 1993 and 2000, respectively. In grouping countries into different regions we followed the classification used by Chotikapanich (2011) and Milanovic (2002) thus making our results at the regional level comparable to those reported.

When studying the income distribution at the world level, a more important indicator of the coverage is the percentage of the world population included, rather than the number of countries. The population coverage of the sample is shown in Table 2. We cover 90, 88 and 85 percents of the world population in 1993, 2000 and 2005, respectively. The coverage for Africa is the lowest accounting between 60 – 67 percents for these years. Although it would be ideal to have 100 percent population coverage, the coverage achieved in this paper is comparable with studies in the literature.[5]

4. Empirical results

Country-specific income distributions were estimated using the method described in Section 2 for all countries that we have the data for 2005 and for those extra countries for 1993 and 2000. Goodness-of-fit was assessed by comparing the observed income shares with the expected income shares derived from the estimated distributions for some selected countries. It was found that the actual (observed) and estimated (expected) income shares are remarkably similar for these countries in both years. The detailed results for both estimated country-specific distributions and the goodness of fit results can be obtained from the authors upon request. Once the country-specific income distributions were estimated we combined them using the method described in Section 2 to obtain regional and global income distributions.

The results and discussion presented within this section aim to answer a number of questions. We first look at what has happened to the distribution of world income over the study period and what implications this has had for the level and trend of global inequality. Given the large populations of China and India and the significant impact they have on the world distribution of income, changes to the income distribution in these two countries will be looked at more closely. The world distribution in the absence of China and India will also be analysed to see whether the trend in global inequality still holds. We will also examine the sensitivity of the results to the choice of PPP's from different sources and from the use of real income data in constant or current prices.

[5] Milanovic (2002a) has a common sample that covers 84% of the world's population, while Sala-i-Martin (2002a, 2002b) covers 88% of the world's population. Dowrick and Akmal (2005) do not state their population coverage, but include 60 countries for 1980 and 53 countries for 1993.

4.1 Global and regional income distributions, 2005

In this section we compare income distributions and inequality for 2005 for the world and for five regions: Western Europe, North America and Oceania (WENAO), Latin America and Caribbean (LAC), Eastern Europe (EE), Asia, and Africa. Figure 1 displays plots for regional and global density function for 2005. All regional distributions appear to be unimodal. The regions can be ordered according to the location of their density functions, from the poorest to richest, as Africa, Asia, LAC, EE and WENAO. Africa and Asia have highly skewed distributions reflecting a high concentration of poverty. Relative to other distributions, that of WENAO is almost flat. The global income distribution is located approximately between the distribution of Asia and LAC. Information on regional and global inequality and the decomposition of this inequality are provided in Table 3. Inequality is measured by Gini and Theil index. Irrespective of the measure used, the region with the greatest inequality is Africa. A large part of this inequality is attributable to inequality between countries.

After Africa, LAC is the region with the next highest inequality. In terms of decomposition of inequality, Theil index suggests inequality is largely attributable to within-country inequality. The relative standing of inequality for Asia and WENAO depends on whether it is measured using the Gini or Theil index. For both regions, both measures suggest the most of the inequality comes from inequality within-country.

The global inequality for 2005 is 0.6702 if measured by Gini and 0.8772 by Theil. The decomposition of Theil index suggests that inequality between countries is the major contributor to the total inequality.

4.2 Global and regional inequality: levels and trends

In this section we will examine the global and regional inequality for 1993, 2000 and 2005. We will first look at the broad picture of the change in countries mean income over time. The distribution of countries based on mean income is presented in Figure 2 and as expected illustrates a general rightward shift which is reflective of increasing mean incomes.[6] The dense grouping of low income countries has generally become more dispersed over time, particularly evident by the increasing number of countries with mean incomes between $10,000 and $15,000. However, there also appears to be a grouping of countries with mean incomes less than $2 500 that are not experiencing growth in incomes.

[6] It should be noted that although the scale ends at $45 000, there are a number of countries outside the range in 2005, notably Luxembourg and the United States.

The distribution of mean incomes in Figure 2 does not take into consideration the population of each country, treating each country with equal weight. Figure 3 plots the global income density function over 1993, 2000 and 2005, which is the population weighted average of the density functions of each individual country covered in the study. Consistent with the previous figure, the distributions have consistently moved to the right reflecting the increase in world mean income over time. The peaks of the distributions (which reflect modal incomes) however are still less than $1,500, indicating that there is a significant proportion of the world's population that receive much less than the mean world income. Closer examination of the 2000 density function also shows a slight 'kink' in the left tail, which may represent the development of a second modal income at the very low end of the distribution. This would indicate that for 2000 there is a significant population receiving very low incomes of a few hundred dollars.

Table 4 provides the most recent global income inequality estimates for 1993, 2000 and 2005 estimated using ICP PPP data in constant 2005 prices. Both the Gini coefficient and Theil indicate a continual decline in global income inequality over this time period. The Gini coefficient has declined from 0.7000 in 1993 to 0.6904 in 2000 and then further to 0.6702 in 2005. The decline in Theil index appears even more significant, given the greater sensitivity of this measure to changes in income with inequality falling from 1.0532 in 1993 to 0.9864 in 2000 and then to 0.8772 in 2005.[7]

A decomposition of inequality into contributions from the differences in incomes within and between countries is useful in understanding the factors driving the overall downward trend in global inequality. This decomposition indicates that the driving force behind the decline in overall global inequality has been the decline in inequality between countries, both in absolute and relative terms. This between country component of global inequality is actually concept 2 inequality and is a measure of weighted international inequality, as it does not take into consider any variations in income within countries. In 1993, between country inequality measured 0.7659, contributing 73 percent of total global inequality; while in 2005 this had reduced to 0.5687, comprising 65 percent of total inequality. The decline in between country inequality has been coupled with a slight increase in within country inequality both in absolute and relative terms, rising slightly from 0.2873 (27 percent) in 1993 to 0.3084 (35

[7] While it may seem surprising to see a measure of inequality greater than 1, Theil is not bounded at 1 like the Gini coefficient. Given that the number of countries is K, Milanovic (2005a) notes that the upper bound for Theil is ln K, although technically if K approaches infinity there would be no upper bound.

percent) in 2005. As will be investigated further in this section, the trends in both these components are likely to be attributed to China and India. Both these populous countries have seen growth in mean income which is likely to be driving down between country inequality; and have experienced an increasing disparity of income within their borders between 1993 and 2005.

Inequality can also be examined visually through the analysis of Lorenz curves. The Lorenz curve for the global income distribution is presented in Figure 4 where the horizontal axis plots $F(y)$ (which is the population weighted sum of $F_k(y)$ of each country defined in (11)), against the vertical axis plots $\eta(y)$ (which is the weighted sum of $\eta_k(y)$ where the weight is the product of its population share and also by its mean income, defined in (13)). Given that the global distribution of income is a mixture of individual country distributions, we do not have parameters for the distribution and thus cannot use the conditions outlined earlier to determine Lorenz dominance, and must rely on a visual assessment. Figure 4 shows that the Lorenz curves for each year intersect, resulting in an inconclusive Lorenz ordering, with these criteria unable to class income distributions in any year as unambiguously less unequal than the others. This implies that despite the decline in the summary measures of inequality, it cannot be claimed that global income inequality has unambiguously declined over the three years. However, if we look at where the Lorenz curves intersect, we can approximate that the bottom 80 percent of the world's population have increased their cumulative share of the world's income from 24 percent in 1993 to around 28 percent in 2005.

Our estimates of global inequality using the latest ICP data are significantly larger than almost all other studies for 1993 and 2000. The only exception is for 1993, where the Gini coefficient estimated by Dowrick and Akmal (2005) is 0.711 using Afriat PPP's, which is reasonably close to the estimate here of 0.702. This is to be expected as the ICP 2005 data from the World Bank makes use of the EKS methodology which yields PPP's similar to that of the Afriat method. However both of these are considerably larger than any of the other estimates. The closest Gini estimate for 2000 of 0.692 estimated by this study is 0.684 by Dikhanov (2005) which makes use of the previous ICP benchmark PPP's, although the actual PPP's used are for the year 1999 rather than 2000. The distributions are estimated using a "quasi-exact polynomial interpolation". The inequality estimates for 2005 provided in Table

4 indicates that the downward trend in global inequality, also evident in a number of studies, most notably the work by Sala-i-Martin (2006?), appears to have continued.

The only work other than this research that makes use of the latest ICP PPP data is Milanovic (2009), who re-estimates his global inequality estimates for the years 1988, 1993, 1998 and 2002.[8] Consistent with the estimates in Table 4, Milanovic (2009) finds that the revised inequality figures using the 2005 benchmark are considerably higher than the previous 1993 benchmark. Given the different sample years of the studies, the only year that is directly comparable is 1993 with Milanovic's estimate of both the Gini coefficient and Theil index being slightly less than the estimates of Table 4 but also considerably larger than most studies. Milanovic (2009) estimates the Gini coefficient to be 0.699 (compared with 0.700) and Theil to be 0.937 (compared with 1.053). Given that Milanovic assumes income homogeneity within income classes, this would provide some downward bias on his estimates so the estimates of the two studies are relatively close. The key difference however between the estimates provided here and those by Milanovic is the trend in global inequality. From 1993 to 2002, Milanovic (2009) finds that inequality consistently increases, rising from 0.937 to 1.001 when measured by the Theil index, which is reflective of his previous findings. When using the Gini coefficient however, Milanovic found inequality to actually decline slightly between 1993 and 1998, but that this decline was more than compensated for by the rise in inequality to 0.708 in 2002.

What is the influence of China and India?

The large populations of China and India means that changes to the income distributions of these countries has a large influence in shaping the distribution of world income and as such, it is worth looking in more detail at these distributions which are presented in Figures 5. From this Figure, both China and India have seen their respective distributions consistently move towards the right and accompanied by a fattening of the tails, although the modal income is still quite low, particularly for India.

The visual analysis of Figure 6 suggests that the 2000 Lorenz curve for China dominates the 1993 and 2005 Lorenz curves, indicating that inequality in China declined during the 1990s, but has then increased from 2000 to 2005. Both Gini and Theil's measures indicate that this is

[8] Ram (2009) also makes use of the latest ICP PPP figures, but calculates international 'concept 2' inequality. Using this data, Ram calculates Theil's L for international inequality in 2005 to be 0.64, which is considerably higher than the estimate using PPP's from WDI, which is calculated to be 0.49.

the case, with China's Gini coefficient and Theil's index in 2005 measured at 0.4699 and 0.3921 respectively, compared with 0.4518 and 0.3535 in 1993. Similar to China, the level of inequality within India is greater in 2005 than in 1993; however the trend in inequality has been the inverse of China, with inequality within India rising during the 1990s from 0.3160 to 0.3606 before remaining consistent or falling slightly between 2000 and 2005 to 0.3570.

Given the significant impact of China and India on the global distribution of income, it is informative to investigate the change in global inequality when they are excluded from the global distribution of income. These are outlined below in Table 5, alongside the estimates for the world as a whole. As expected, the mean world income rises in all three years when these countries are excluded individually and together. The level of global inequality in 1993 is relatively similar whether China is included or not with Theil estimates of 1.0532 and 1.0210, respectively. Without the growth of China however, global inequality would have risen slightly between 1993 and 2000, before climbing to 1.1514 in 2005. Given that global inequality without China is increasing between 2000 and 2005, this indicates that income growth in China has been driving the decline in global income inequality. Both within and between inequality increase overtime between 1993 and 2005 in the absence of China indicating that China plays a very strong role as driving force of declining international inequality.

The level and trend in the global inequality without India have conflicting evidence depending on whether Gini or Theil is being considered. Usng Gini and with the absence of India, global inequality seems stable between 1993 and 2005 and the esitmated Gini are very close to the ones obtained when India is included.

However, the most interesting result however to come out of Table 5 is the final column, which reports global inequality without both China and India. In the absence of these two countries, global inequality has actually increased over time, which has been mainly driven by an increase in between country inequality rising from 0.6232 in 1993 to 1.0967 in 2004 as measured by Theil. Thus it appears that all of the reductions in global inequality for the world as a whole can be attributed to the growth of China and India.

4.3 Real Income Measures and Inequality

Previous studies on global inequality make use of PPP data from different sources, different benchmarks and are extrapolated to different years. Our estimates previously presented are based on ICP data in constant 2005 prices. The ones commonly used in previous studies are

based on PPPs from Penn World Table from various versions. It is informative to compare and analyse the sensitivity of the inequality estimated using these different PPPs. Also useful is a comparison between inequality estimates based on constant prices and current prices. The use of constant prices enables a more accurate comparison of changes to income over time as it removes the impact of changes in the price level over each year. Current prices on the other hand are useful for providing an accurate representation of inequality for that particular year, as it makes use of prices from the same year that the income data is sourced.

To obtain inequality estimates using different PPP data we note that the use of different PPP data does not change the distribution of income within a country; rather differing PPP data changes the mean income of each country. To illustrate simply, PPP data doesn't change the relative size of cake received by each person, it changes the size of the whole cake. Given that the parameters of the beta-2 distribution p and q determine the shape of the distribution within each country, these are unaffected by the change in PPP data; it is the scale parameter b that changes with different PPP data. Using the values of p and q estimated from the ICP PPP data, the parameter b is recalculated for each country for all three years using the different PPP data. Thus for each country four more distributions are estimated for each year which are then aggregated to form four world income distributions for each year.

Table 6 presents the global inequality estimated using (i) the ICP data in 2005 constant prices, (ii) the PWT6.3 data in constant 2005 prices, (iii) the PWT6.2 data in 1996 constant prices, (iv) the PWT data in current prices, and (v) the WDI data in 2005 constant prices. Comparing the inequality estimates using these different PPP data provides a startling picture. We will now compare these extra estimates with the previous results from ICP PPP data.

ICP data in 2005 prices VS *PWT data in constant 2005 and current prices*

Comparing the estimates from the ICP data with the PWT data in constant 2005 prices illustrates the difference that using a recent benchmark has with data extrapolated from an earlier benchmark. Also captured in this comparison is the impact of the different index number methodologies used by the respective sources of data. The EKS approach taken by the ICP is a more accurate representation of the true level of inequality, particularly as suggested in Dowrick and Akmal (2005) that the use of PPP data from the Penn World Tables is likely to underestimate inequality as a result of the substitution bias inherent in the GK method of constructing purchasing power. From Table 6, the use of ICP data illustrates

levels of global inequality that are significantly larger than those using PWT data in both 2005 constant prices and PWT data in current prices. This leads to the conclusion that previous estimates of global inequality, particularly those for years in the late 1990s and early 21st century are likely to have significantly underestimated the level of global inequality. The differences in levels are quite significant. In 1993 for example, Theil's index is 1.0532 when estimated using the ICP data but only 0.8247 when estimated using PWT in constant prices, and slightly lower at 0.8241 when the current price version of the PWT is used. This is also the case for 2000 and 2005, although the absolute and relative difference between the estimates using different PPP's has decreased. [9]

The differences between global inequality using ICP data and PWT in constant 2005 prices are clearly illustrated in the Lorenz curves provided in Figures 7 to 9. The figures show that for each year, the Lorenz curve based on data from the Penn World Tables appears to Lorenz dominate the ICP curve. For these years, global inequality is unambiguously lower when measured using PWT data than the ICP data in constant prices.

A temporal comparison of the density functions for ICP and PWT in constant prices is illustrated in Figure 10. For each year, the ICP function is more skewed and with higher peaks relative to PWT, reflecting lower modal incomes and a more uneven distribution of income.

ICP data in 2005 prices VS *PWT data in constant 1996 prices*

The inequality measures for 1993 and 2000 in the final column of Table 6 replicate the work of Chotikapanich, et al. (2011) which uses the income data based on PWT 1996 prices. Comparison between the results using the ICP data and those replicate the work of Chotikapanich et al (2011) gives the impact of the different index number methodologies used by the respective sources of data and the different benchmark years. Same as for the case of PWT data in 2005 constant and current prices, the use of ICP data illustrates levels of global inequality that are significantly larger than those using PWT 1996 prices. This also leads to the conclusion that the results shown by Chotikapanich (2011) are likely to underestimated the level of global inequality. The differences in levels are quite significant. In 1993 for example, Theil index is 1.0532 when estimated using the ICP data but only 0.8166 when estimated using PWT in 1996 prices

[9] As the constant 2005 prices and current prices for 2005 are the same, the inequality estimates are also the same.

The third section of the last column presents the 2005 inequality measure using the 2005 WDI data. Given that the within individual country income distributions are the same regardless of PPP measure since the use of difference PPP data does not change the distribution of income within country, the differences in the indices for global inequality is explained entirely by the differences in income between countries.

The importance of using a consistent set of PPP data when calculating global inequality over time is outlined in the methodology of the latest ICP report, which states that "it may be misleading to use Gini coefficients or other dispersion measures from previous benchmarks and compare them with 2005 to measure trends in income inequality across countries" (World Bank, 2008a, p. 190). This is clearly highlighted by the above results, for if we had simply taken the results for 1993 and 2000 from Chotikapanich, et al. (2011) using PWT data in constant 1996 prices and then used the 2005 results from ICP data, we would have concluded that the Theil index would have risen from 0.8166 in 1993 to 0.8772 in 2005.

While the levels of global inequality vary greatly between the different choices of PPP's, the downward trend in global inequality is maintained as long as a consistent set of PPP data is used. Given that the choice of PPP data only changes the total amount of income to be distributed within a country, not the actual distribution of this income, inequality at the country-specific level remains unchanged.

5. Conclusion

This paper aims at updating the estimates of inequality at both a national, international and global level. The populist view that globalisation has increased inequality does not hold when inequality is measured at the global level. Between 1993 and 2005, inequality has consistently declined as measured both by the Gini coefficient and Theil index. This result was found to be robust when tested using PPP data from different sources extrapolated from previous benchmarks in both constant and current prices. This decline in global inequality was the result of declines in inequality between countries. Thus, claims that globalisation is increasing inequality at an international level also lack support. The estimates do suggest that there is an upward trend in inequality within countries overall, as measured by the contribution to global inequality by within country inequality, which does add support for protestors against globalisation as it may be worsening within country inequality. However within country inequality was found to rise and fall for the same number of countries.

Significant revisions to the PPP data in the latest 2005 ICP round indicate that mean income levels for a number of populous countries are significantly lower than the estimates extrapolated forward from previous benchmarks. This obviously has implications for the world distribution of income and global income inequality, which has been outlined in this paper to be at levels much greater than previously estimated. When analysing inequality at the global level, many choices need to be made, and as indicated by the sensitivity of the inequality results, they can have a large impact on the findings. The main difference between the latest ICP estimates of inequality to previous estimates is due to the source of PPP data, with global inequality much similar to previous results when estimated using data from the Penn World Tables.

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Table 1: Country Coverage and Overlaps for 1993, 2000, 2005

Countries included in 1993, 2000, 2005
Africa (12 countries) Burkina Faso, Egypt, Ethiopia, Gambia, Ghana, Kenya, Madagascar, Morocco, Nigeria, Senegal, Uganda, Zambia *Asia* (13 countries) Bangladesh, China, India, Indonesia, Iran, Jordan, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam, Yemen *Eastern Europe* (11 countries) Albania, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Romania, Russia, Slovak Republic, Slovenia, Ukraine *Latin America and the Caribbean* (17 countries) Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Ecuador, El Salvador, Honduras, Jamaica, Mexico, Nicaragua, Panama, Peru, Uruguay, Venezuela *Western Europe, North America and Oceania* (11 countries) Australia, Austria, Cyprus, Finland, Germany, Greece, Ireland, Sweden, Turkey, United Kingdom, United States
Countries included only in 1993, 2000
Africa (5 countries) Algeria, Mauritunia, South Africa, Tunisia, Zimbabwe *Asia* (5 countries) Hong Kong, Japan, South Korea, Laos, Taiwan Eastern Europe (6 countries) Armenia, Belarus, Kazakhstan, Krygyz Republic, Moldova, Uzbekistan *Latin America and the Caribbean* (1 country) Guyana *Western Europe, North America and Oceania* (11 countries) Belgium, Canada, Denmark, France, Israel, Italy, Luxembourg, Netherlands, New Zealand, Norway, Portugal
Countries included only in 1993 and 2005
Africa (2 countries) Central African Republic, Niger
Countries included in 2005 only
Africa (9 countries) Benin, Chad, Democratic Republic of Congo, Republic of Congo, Gabon, Malawi, Mali, Sierra Leone, Togo *Asia* (1 country) Malaysia *Eastern Europe* (3 countries) Czech Republic, Croatia, Poland *Latin America and the Caribbean* (2 countries) Guatemala, Paraguay *Western Europe, North America and Oceania* (1 countries) Spain

Table 2: Population Coverage

	World Population (in millions)			Population included in the Study					
	1993	*2000*	*2005*	*1993*	*%*	*2000*	*%*	*2005*	*%*
Africa	672	813	896	437	65.0	489	60.1	485	67.1
Asia	3,206	3,628	3,652	3021	94.2	3,308	91.2	3,210	91.5
Eastern Europe	411	365	391	360	87.6	360	98.6	290	74.4
Latin America and Caribbean	462	521	533	425	92.0	486	93.3	520	97.7
WENAO	809	852	845	762	94.2	805	97.0	624	73.4
World	5,538	6,179	6,512	5005	90.0	5,043	88.5	5,129	85.1

Source: Penn World Table 6.3, Chotikapanich et al (2011) and the World Bank (2008)

Table 3: 2005 Income Inequality

	POP	% of POP	Mean	Gini	Theil	within	between
Global	5372573	100.00	7515.59	0.6702	0.8772	0.3084	0.5687
					100%	35%	65%
Asia	3340247	62.17	3320.17	0.4706	0.3747	0.2891	0.0856
					100%	77%	23%
WENAO	619819.1	11.54	33006.07	0.4546	0.4072	0.3096	0.0976
					100%	76%	24%
Africa	600887.3	11.18	1831.14	0.5632	0.6096	0.2772	0.3323
					100%	45%	55%
EE	290801.3	5.41	10932.92	0.3897	0.2578	0.2072	0.0507
					100%	80%	20%
LAC	520817.5	9.69	8737.14	0.5443	0.5656	0.5234	0.0422
					100%	93%	7%

Table 4: Global Inequality

	1993	2000	2005
Gini	0.7000	0.6904	0.6702
Theil's L	1.0532	0.9864	0.8772
Within	0.2873 (27.28%)	0.3006 (30.47%)	0.3084 (35.16%)
Between	0.7659 (72.72%)	0.6858 (69.53%)	0.5687 (64.83%)

Table 5: Global Inequality With and Without China and India[1]

	World	Without China	Without India	Without China & India
1993				
Population	5 005 021 380	3 814 450 720	4 120 078 500	2 929 507 850
Mean	7099.67	8966.22	8463.13	11 290.76
Gini	0.7000	0.6714	0.6793	0.6239
Theil	1.0532	1.0210	1.0515	0.9218
Within (%)	0.2873 (27.28%)	0.2667 (26.12%)	0.3144 (29.90%)	0.2986 (32.40%)
Between (%)	0.7659 (72.72%)	0.7543 (73.88%)	0.7371 70.10%)	0.6232 (67.60%)
2000				
Population	5 447 105 900	4 178 252 540	4 442 981 670	3 174 128 310
Mean	8235.24	9963.28	9742.22	12 571.64
Gini	0.6904	0.6875	0.6746	0.6500
Theil	0.9864	1.0498	0.9754	0.9914
Within (%)	0.3006 (30.47%)	0.3079 (29.33%)	0.3207 (32.88%)	0.3384 (34.13%)
Between (%)	0.6858 (69.53%)	0.7419 (70.67%)	0.6547 (67.12%)	0.6531 (65.88%)
2005				
Population	5 372 572 510	4 066 258 690	4 279 009 080	2 972 695 270
Mean	7522.08	8629.46	8901.60	11 022.57
Gini	0.6701	0.6905	0.6643	0.6731
Theil	0.8772	1.1514	1.3269	1.3995
Within (%)	0.3085 (35.17%)	0.3268 (28.38%)	0.2628 (19.81%)	0.3028 (21.64%)
Between (%)	0.5687 (64.83%)	0.8246 (71.62%)	1.0641 (80.19%)	1.0967 (78.36%)

Source: World Bank (2008a) and author's calculations

[1] Given that Theil's L is primarily used for decomposition, the results of the Gini decomposition are not presented here. They are available from the author upon request.

Table 6: Global Inequality, Various PPP's

1993	***ICP (2005 Prices)***	***PWT (2005 Prices)***	***PWT (Current Prices)***	***PWT (1996 Prices)***
Mean	7099.67	7 558.17	6055.77	6510.47
Gini	0.7000	0.6255	0.6464	0.6433
Theil's L	1.0532	0.8247	0.8241	0.8166
Within (%)	0.2873 (27.28%)	0.2875 (34.86%)	0.2875 (34.89%)	0.2872 (35.17%)
Between (%)	0.7659 (72.72%)	0.5372 (65.14%)	0.5366 (65.11%)	0.5294 (64.83%)
2000	***ICP (2005 Prices)***	***PWT (2005 Prices)***	***PWT (Current Prices)***	***PWT (1996 prices)***
Mean	8235.24	8888.56	7910.14	7800.81
Gini	0.6904	0.6416	0.6348	0.6297
Theil's L	0.9864	0.8047	0.7818	0.7779
Within (%)	0.3006 (30.47%)	0.3021 (37.54%)	0.3021 (38.64%)	0.3021 (38.84%)
Between (%)	0.6858 (69.53%)	0.5025 (62.46%)	0.4797 (61.36%)	0.4757 (61.16%)
2005	***ICP (2005 prices)***	***PWT (2005 Prices)***	***PWT (Current Prices)***	***WDI (2005 prices)***
Mean	7515.59	8743.10	8743.10	8862.49
Gini	0.6702	0.6264	0.6264	0.6232
Theil's L	0.8772	0.7457	0.7457	0.7242
Within (%)	0.3085 (35.17%)	0.3084 (41.36%)	0.3084 (41.36%)	0.3001 (41.22%)
Between (%)	0.5687 (64.83%)	0.4373 (58.64%)	0.4373 (58.64%)	0.4241 (58.56%)

Source: World Bank (2007, 2008a), PWT6.2, PWT6.3 and author's calculations

Figure 1: 2005 regional and global income distributions

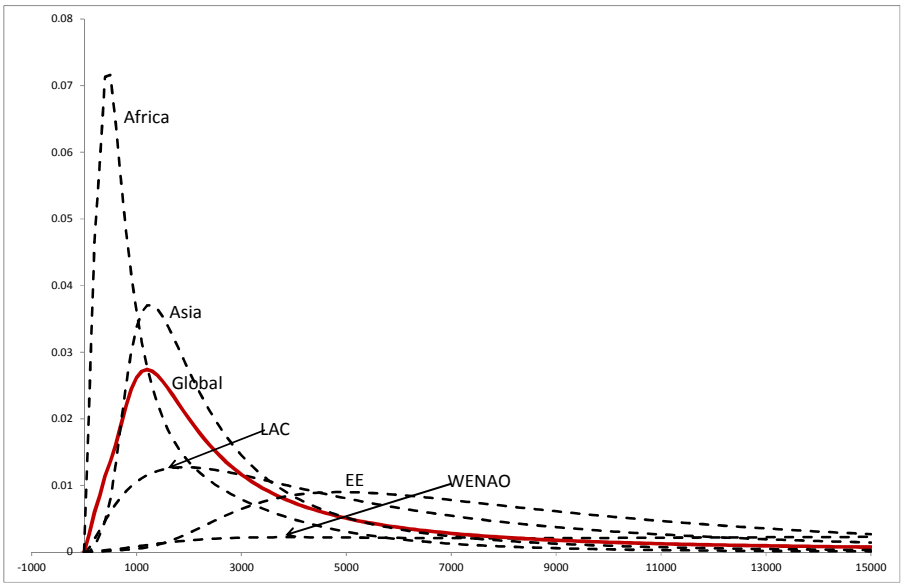
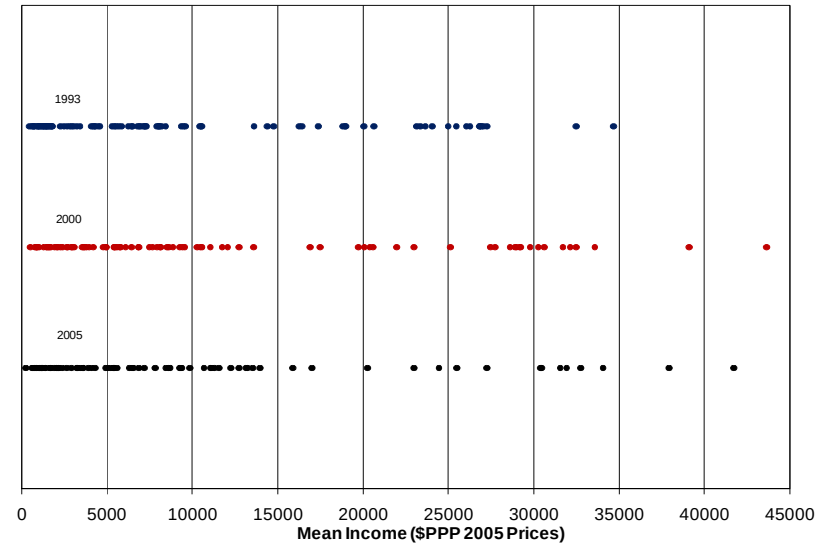


Figure 2: Distribution of Mean Income



Source: World Bank (2008a)

Figure 3: Global Density Function over Time (using ICP PPP data in constant 2005 prices)

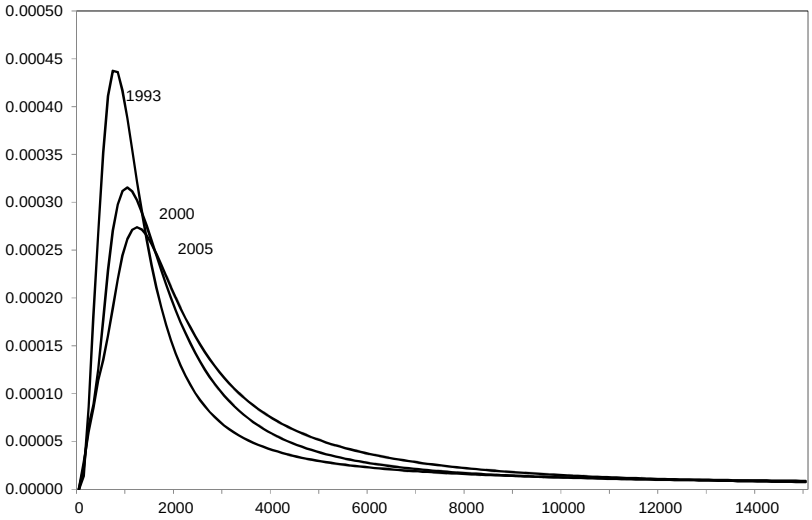


Figure 4: World Lorenz Curve over Time

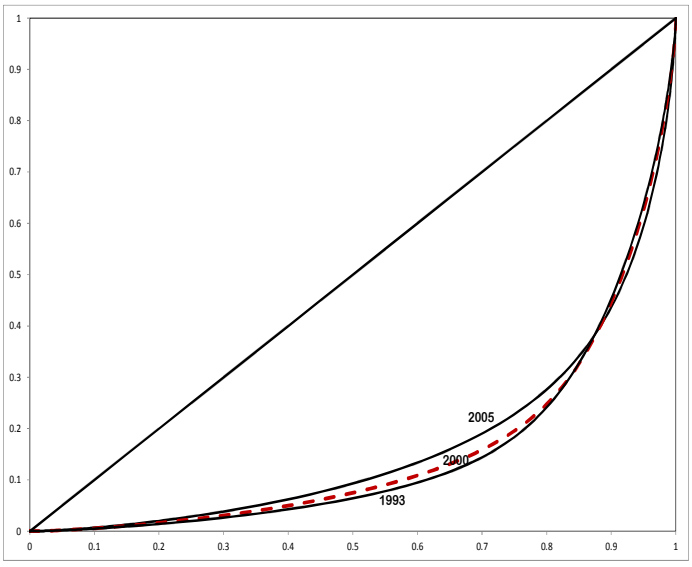
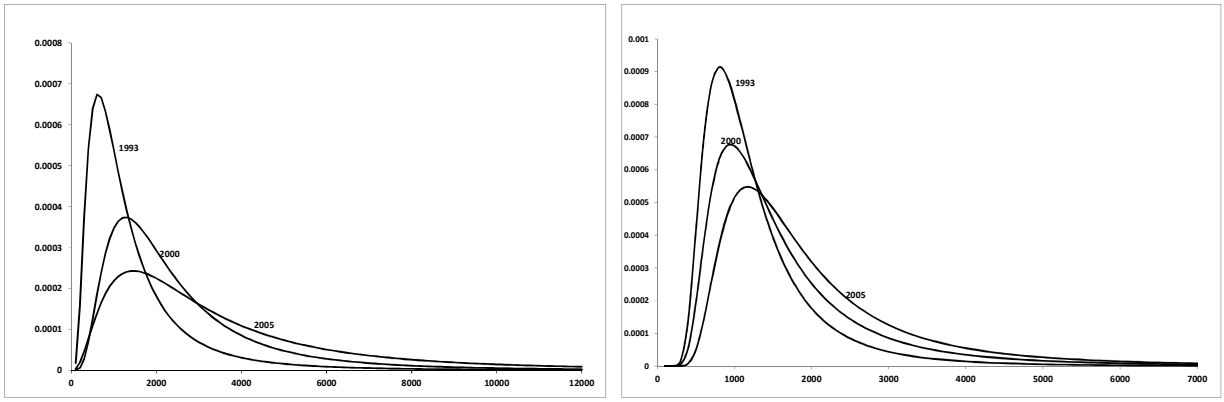
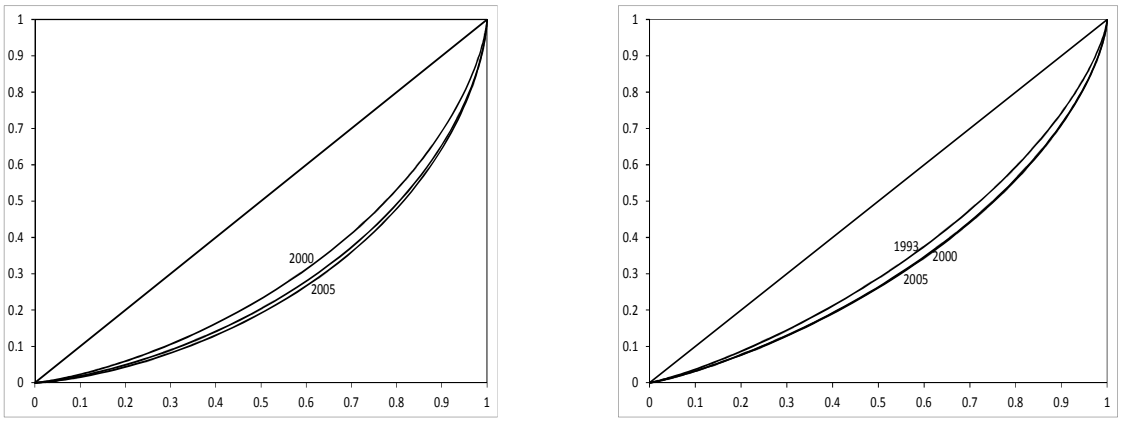


Figure 5: Density Functions over Time, China and India



China **India**

Figure 6: Lorenz Curves over Time, China and India



China **India**

Figure 7: World Lorenz Curve, 1993

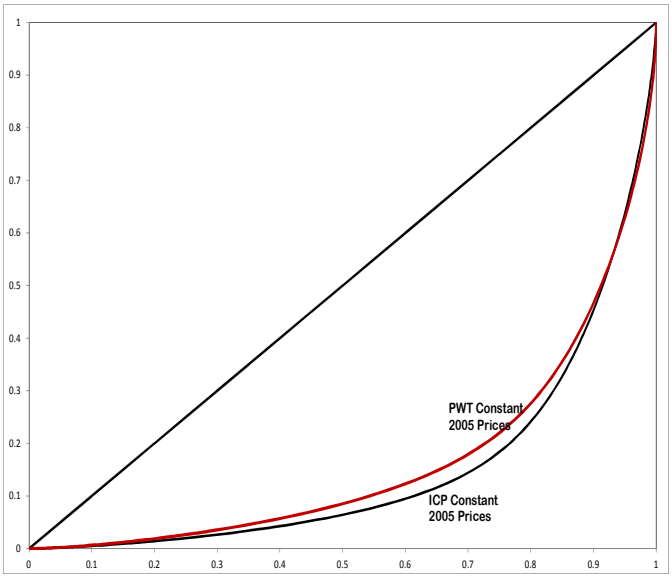


Figure 8: World Lorenz Curve, 2000

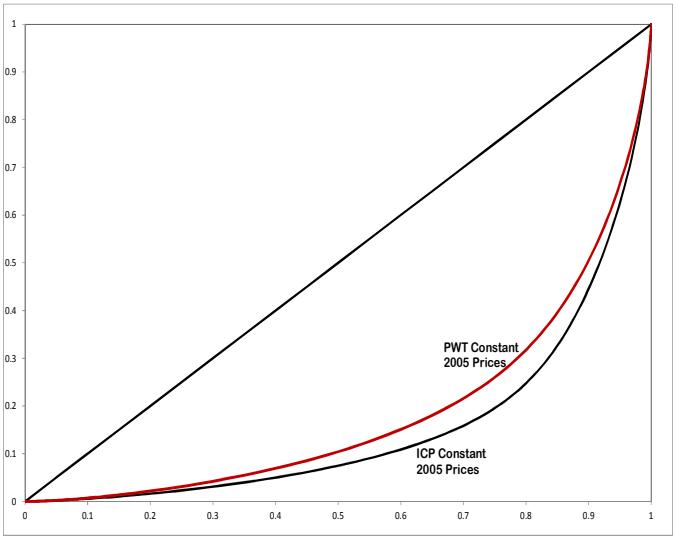
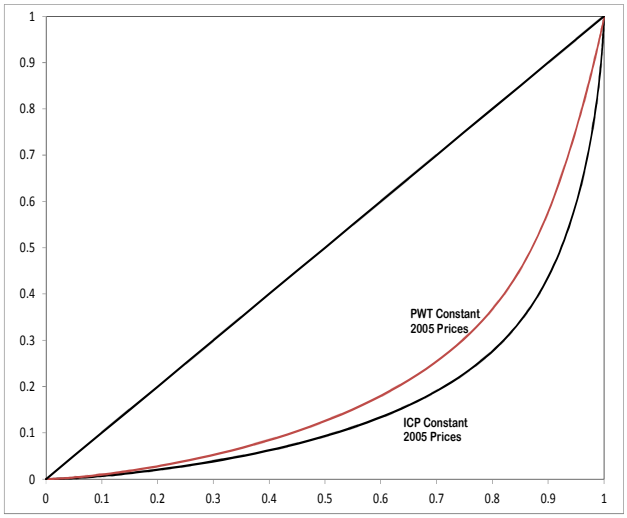


Figure 9: World Lorenz Curve, 2005



Source: World Bank (2008a), PWT 6.3, and author's calculations

Figure 10: World Density Functions over Time, ICP and PWT in 2005 Constant Prices