

# The World Distribution of Income: Falling Poverty and... Convergence, Period

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## Abstract

We estimate the world distribution of income by integrating individual income distributions for 139 countries between 1970 and 2000. Country distributions are constructed by combining two widely-used data sets: the PPP-Adjusted National Accounts data of the Penn World Tables is used to anchor the mean and Deininger and Squire (1996) and World Bank microeconomic surveys are used to pin down the dispersion.

The WDI is used to estimate poverty rates and headcounts. The CDF for 1990 stochastically dominates that of 1970, which means that poverty rates declined for all conceivable poverty lines. The 2000 CDF also stochastically dominates the 1970 distribution for all relevant levels of income. The two distributions for levels below \$262 cross only because Congo/Zaire is included in the analysis, even though no good National Accounts data is available for this country for the late 1990s.

Poverty rates are reported for four poverty lines. For all lines, poverty rates in 2000 were between one-third and one-half of what they were in 1970. There were between 250 and 500 million less poor people in 2000 than in 1970. The number of people that live on less than one-dollar-a-day in 2000 was about 195 million, an order of magnitude less than the 1.2 billion widely publicized by institutions like the World Bank and the United Nations. We analyze poverty across different regions and countries. Asia is a great success, especially after 1980. Latin America reduced poverty substantially in the 1970s but progress stopped in the 1980s and 1990s. The worst performer was Africa, where poverty rates increased dramatically since 1970.

We estimate nine indexes of income inequality implied by our world distribution of income. All of them show substantial reductions in global income inequality during the 1980s and 1990s.

Finally, we argue that when in 2000, the United Nations established the Millenium Goal of halving the 1990 poverty rate, the world had already gone between 60% and 70% of the way towards achieving it.

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## 1. Introduction

The evolution of the World Distribution of Income (WDI) matters to those who care about poverty and those who care about global income inequality.

A mural recently installed in the lobby of the World Bank reads “Dreaming of a World Free of Poverty”. Freeing the world from poverty is perhaps the most important economic goals for humanity today. In fact, the most widely cited of the United Nations’ Millennium Goals is to reduce the 1990 poverty rate to one half by the year 2015. While poverty is certainly a goal worth pursuing, it will not be easy to know whether it is being accomplished or how much progress (if any) we are achieving.

One problem is the very definition of poverty. Even without going into the distinction of relative vs. absolute poverty, there is a lot of confusion about what poverty is. For a long time, analysts identified poverty with the lack of physical means for survival. Thus, some attempted to define poverty in terms of a minimum required caloric intake<sup>1</sup>. Other analysts define poverty in monetary terms: poor people are those whose income (or consumption) is less than a specified amount. Some attempts have been made to reconcile the two definitions by putting a monetary value on the minimum caloric intake. In fact, this is how the first widely used monetary poverty line may have been born (See Bhalla (2002).) Even when analysts agree that poverty should be defined monetarily, they do not agree on whether we should measure the number of people whose *consumption* or *income* lies level below a specified poverty line. Ravallion et al. (2001), Chen and Ravallion (2001), Bhalla (2002), and The World Bank (2003), for example, use consumption poverty while the United Nations Development Goals (2000) and Pritchett (2003) use income poverty.

Another source of disagreement is the exact position of the poverty line. For example, the poverty line used by the United Nations when they first proposed the Millenium Goals was “one-dollar-a-day”. The World Bank uses both one-dollar-a-day and two-dollar-a-day lines. Bhalla (2002) settles in the middle and prefers 1.5 dollars per day. Pritchett (2003) is more extreme and argues that the poverty line should be put at 15 dollars per day.

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<sup>1</sup> The Food and Agriculture Organization (FAO) of the United Nations provides estimates of malnourishment. They construct a distribution of caloric intake by combining microeconomic surveys on expenditure and income and country-wide per capita caloric availability. The per capita calories available are estimated by adding local food production and food imports and

An additional problem concerns the “baseline year”. Many analysts talk about the number of people who “live with less than one-dollar-a-day” and they quote, for example, World Bank poverty estimates. In 1990, the World Bank defined the extreme poverty line to be 1.02 dollars-a-day in 1985 prices. In 2000, the definition changed to 1.08 dollars-a-day in 1993 prices. Although this mysterious change in the poverty threshold has never been explained by the World Bank, what’s clear is that 1.02 dollars a day in 1985 prices do not correspond to 1.08 dollars in 1993 prices. Similarly, in the year 2000 the United Nations’ Millenium Goals refer to the poor as those whose income is “less than one-dollar-a-day” without being specific about the baseline year to which this “one dollar” is valued. One might assume that the dollar they refer to is valued in 2000 prices but then they use the World Bank estimates of poverty which, as just mentioned, are now defined in 1993 prices. These distinctions may seem trivial at first, but they are not: one-dollar-a-day in 2000 corresponds to \$340 a year<sup>2</sup> whereas one-dollar-a-day in 1985 corresponds to \$495 a year. The difference between the number of people who live with less than \$340 and less than \$495 is in the hundreds of millions. Thus, the lack of precision as to what baseline year a particular definition applies has huge implications on the exact estimates of poverty rates and headcounts and their evolution over time.

The fundamental problem is that all of these definitions are both reasonable and arbitrary. Contrary to popular belief, poverty lines are not objectively estimated from some minimum amount of money (or calories, or food) needed for people to survive.<sup>3</sup> Thus, the amount of income (or consumption) that separates the poor from the non-poor and, therefore, the estimated poverty rates and headcounts, are arbitrary. Once one sets the poverty line, however, one can estimate how many citizens live with less than that amount of money year after year. Thus, we can say something about the evolution of poverty over time, for a given (arbitrary) line.

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subtracting exports. Malnourished people are those who have a caloric intake below a minimum required amount.

<sup>2</sup> This calculation uses 1996 prices, the baseline used throughout the paper.

<sup>3</sup> Strictly speaking, if the poverty line were a survival threshold, then poverty rates would always be zero since anybody below it would have died.

One reason for estimating the entire WDI is that we can analyze the evolution of poverty for each and all poverty lines. After all, the cumulative distribution function (CDF) provides a direct estimate of poverty rates for any and all levels of income.<sup>4</sup>

A second reason for computing the WDI is be able to analyze the evolution of *world income inequality*. Recent economic and political debates have discussed the evolution of global inequalities. Critics of the process of global integration say that markets and globalization generate a disturbing rise in income differences between the rich and the poor. The evidence provided to support these negative trends tends to be patchy. For example, the 2001 United Nations Development Report argues that global income inequality has risen based on the following logic.

Claim 1: “Income inequalities within countries have increased.”

Claim 2: “Income inequalities across countries have increased.”

Conclusion: “Global income inequalities have also increased.”

To document claim 1, analysts collect the Gini coefficients for a number of countries. They notice that the Gini “has increased in 45 countries and fell in 16”.<sup>5</sup> To document the second claim, analysts go to the convergence/divergence literature and show that the Gini coefficient of per capita GDP across countries has been unambiguously increasing over the last 30 years.<sup>6</sup> These increasing differences in per capita income across countries is a well known phenomenon called “absolute divergence” by empirical growth economists. Lant Pritchett (1997) famously labeled it as “divergence big time”.

Although it is true that within-country inequalities are increasing on average, and it is also true that income per capita across countries has been diverging, the conclusion that global income inequality has risen does not follow logically from these premises. The reason is that Claim 1 refers to the income of “individuals” and Claim 2 refers to per capita incomes

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<sup>4</sup> Having an estimate of the complete WDI allows us to calculate, not only the number of poor citizens in the world, but their income levels as well. Sen (1976) argued that we should be interested in the number of extreme poor, but also in the “degree of their poverty”. In fact, this is the reason why Sen proposed the Sen-Index that measures how far below the poverty threshold (that is, below \$1/day) the poor are, a measure also called “the poverty gap”. Of course if we had an estimate of the WDI, we would be able to analyze various important aspects of the distribution of income of the poor.

<sup>5</sup> United Nations, UNDP (2001), p.17. See also UNDP (2003).

<sup>6</sup> This is also true for other measures of per capita income dispersion. See for example, Barro and Sala-i-Martin (1992, 2003).

of “countries”. By adding up two different concepts of inequality to somehow analyze the evolution of world income inequality, the UNDP falls into the fallacy of apples and oranges.

The argument would be correct if the concept of inequality implicit in Claim 2 was not “the level of income inequality across countries” but, instead, the “inequality across individuals that would exist in the world if all citizens in each country had the same level of income, but different countries had different levels of per capita income”. Notice that the difference is that the correct statement would recognize that there are four Chinese citizens for every American so that the income per capita of China gets four times the weight. In other words, instead of using a measure of inequality in which each country’s income per capita is one data point, the correct measure would weight by the size of the country.<sup>7</sup> The problem for the UNDP is that, population-weighted measures of income inequality show a downward trend over the last twenty years<sup>8</sup>. The question, then, is whether the decline in across-country individual inequality (correctly weighted by population) more than offsets the population-weighted average increase in within-country individual inequality. In order to obtain the answer, we need to find an estimate of how many citizens have each level of income. In other words, we need an estimate of the WDI.

And this is the main goal of this paper: we construct an estimate of the WDI for each year from 1970 to 2000. We do so by first estimating a distribution of income for each of 139 countries accounting for 93% percent of the world’s population in 2000. Individual country distributions are constructed using two widely used data sets. First, we use PPP-adjusted GDP per capita data from the Penn World Tables 6.1 (Heston, Summers and Aten (2002)) to anchor the mean of each country’s distribution. Second, the within-country dispersion is estimated using the income and expenditure micro surveys World Bank’s World

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<sup>7</sup> Even in this case, the conclusion would not be entirely true if the measure of inequality is the Gini coefficient (the concept used by UNDP (2001)). As shown by Bourguignon (1979) and Shorrocks (1980), the Gini coefficient does not satisfy the additivity or decomposability property so the “within-country Gini” and the “across-country Gini” do not add up to a global Gini. Bourguignon (1979) and Shorrocks (1980) show that the only indexes that satisfy the “decomposability property” (and other desirable axioms such as “scale independence” and the “Pigou-Dalton Transfer Principle”) are those called “Generalized Entropy Indexes”. Two of the widely used indexes in the inequality literature are the Theil Index and the Mean Logarithmic Deviation. We discuss these decompositions in Section 4 below.

<sup>8</sup> This phenomenon was first documented by Schultz (1998). Theil (1979, 1996), Berry, Bourguignon and Morrison (1983), Theil and Seale (1994), Firebaugh (1999), and Melchior, Telle, and Wiig (2000) also analyze population-weighted income inequality.

Development Indicators which expand Deininger and Squire (1996). Since microeconomic surveys are not available annually for every country, we need to make some approximation (discussed in Section 2) to assign a level of income to each quantile for each country and year. We then use a non-parametric approach to estimate a smooth income distribution for each country/year. Finally, these individual distributions are integrated to compute the WDI.

The related literature includes Bourguignon and Morrison (2002) who attempt to estimate the WDI going back to 1820. Like Sala-i-Martin (2002), Bourguignon and Morrison (2002) estimate the WDI directly by assuming that each quintile in each country is made of individuals with identical incomes. Another drawback of Bourguignon and Morrison (2002) is that their analysis comprises only 33 countries or groups of countries and ends in 1993.

Another related paper is Bhalla (2002)<sup>9</sup>. Although the methodology and the data used by Bhalla differ from that of this paper, his main conclusions in terms of the evolution poverty and global income inequality are quite similar. Bhalla (2001) uses a parametric approach called the “Simple Accounting Procedure” (SAP) to approximate the Lorenz Curve for each individual country.<sup>10</sup> As we will discuss in the next section, we use a non-parametric approach to approximate the density function.<sup>11</sup> Another difference from Bhalla (2002) is that he uses World Bank PPP data rather than the Penn World Tables data to pin down the mean of the distribution. For most countries, the choice of data set does not matter much. It does, however, for the largest country in the world: the growth rates of PPP-adjusted per capita GDP reported by the World Bank are much larger than those of the PWT.<sup>12</sup> This might be the

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<sup>9</sup> Bhalla wrote his book as the first drafts of this paper were written.

<sup>10</sup> The SAP is based on Kakwami (1980)’s method of approximating the Lorenz curve using limited data. The formula used is  $\log[p-L(p)] = \alpha + \alpha \log(p) + \beta \log(1-p)$ , where  $p$  represents the bottom  $p$  percent of the population and  $L(p)$  is the corresponding share of income. Estimates are made using quintile data and then projected for any number of centiles.

<sup>11</sup> Sala-i-Martin (2004) uses a parametric approach to estimate individual country distributions. He assumes a log-normal distribution and uses the national accounts to anchor the mean and surveys to pin down the variance. The main results of this paper are very similar to those in Sala-i-Martin (2004) (see Section 3 below).

<sup>12</sup> Economists have recently pointed out that Chinese statistical reporting during the last few years has been less than accurate (see for example, Ren (1997), Maddison (1998), Meng and Wang (2000), and Rawski (2001)). The complaints pertain mainly to the period starting in 1996 and especially after 1998 (see Rawski (2001)). This coincides with the very end of and after our sample period, so it does not affect our estimates. However, we should remember that we do not use the official statistics of Net Material Product supplied by Chinese officials. We use the numbers estimated by Heston, Summers and Aten (2002), who attempt to deal with some of the anomalies following Maddison (1998) (see the China Appendix in Heston,

main reason why the poverty rates reported by Bhalla fall faster than the ones we report in Section 3. This also explains why Bhalla's income inequality falls faster than ours (more on this in Section 4.) Another paper in this literature is Sala-i-Martin (2002a) who estimates a WDI by directly estimating a kernel density function using five income shares per country. The method used in Sala-i-Martin (2002a) does not allow for the estimation of individual country distributions since it directly estimates the global density function. A drawback of Sala-i-Martin (2002a) is that he does not allow for within-country dispersion for countries that do not have survey data, and assumes that dispersion is constant for countries with only one survey. We, on the other hand, allow for changes in within-country dispersion by assigning the survey data of "neighboring" countries. Another difference between this paper and Sala-i-Martin (2002a) is that we include the USSR and, after 1990, the republics of the Former Soviet Union and the analysis covers two additional years to 2000. Despite these methodological differences and coverage, the estimated evolution of poverty and income inequality reported by Sala-i-Martin (2002a) largely coincide with the results reported below.

The extensive literature examining individual income inequalities at the global level also includes Schultz (1997), Dikhanov and Ward (2001), Chotikapanish, Valenzuela and Rao (1997), Dowrick and Akmal (2001), Milanovic (2000, 2002). A related set of papers are those in the "convergence literature". The list includes Barro (1991), Barro and Sala-i-Martin (1992), Quah (1996), Jones (1997), Pritchett (1997), and Kremer, Onatski and Stock (2001) (see Barro and Sala-i-Martin for a survey of this empirical literature). The key difference between the convergence literature and this paper is that they focus on countries, not citizens, as the unit of analysis.<sup>13</sup>

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Summers, and Aten (2002)). For example, the growth rate of Chinese GDP per capita in our data set is 5% per year, more than two percentage points less than the official estimates (the growth rate for the period 1978-2000 is 6.2% in our data set as opposed to the 8.0% reported by the Chinese Statistical Office). The World Bank reports an annual growth rate of 7.6% over the same period.

<sup>13</sup> Recently, a number of papers debate whether it is better to analyze country or individual-level data (see Ravallion 2004). This is a bogus debate: different economic questions require the analysis of different data. If one wants to know what country-wide policies or institutions tend to promote economic growth (and if one assumes that they are independent across countries) then one has to use national data. If, on the other hand, one wants to know the number of poor citizens of the world or how unequal their incomes are, then one needs to use individual-level data. Thus, no approach is clearly superior.



The rest of the paper is organized as follows. Section 2 describes the methodology to construct individual country distributions and the WDI. Section 3 uses the CDF to report poverty rates for all possible poverty lines as well as poverty rates and headcounts for a number of widely-used poverty lines. We also analyze poverty in all continents and countries of the developing world. The main lesson is that, although global poverty has declined dramatically over the last twenty years, it has not done so uniformly across the globe. In particular, it has experienced substantial decline in East and South Asia, it has remained fairly stable in the Arab World and Latin America, it has increased slightly in the Former Soviet Union (especially in the central Asian republics) and it has increased substantially in Sub-Saharan Africa. Section 4 reports eight inequality measures derived from the estimated WDI. All measures point in the same direction: not only has world income inequality not increased as dramatically as many feared, but it has, instead, fallen since its peak in the late 1970s. Section 5 concludes.

## **2. Methodology**

### ***(i) Using National Accounts Data to Anchor the Mean of the Distribution and Survey Data to pin down its Dispersion***

The main goal of this paper is to estimate the world distribution of individual incomes for every year between 1970 and 2000. We do this in two steps. First we estimate a yearly income distribution for each of 139 countries. Then we integrate these country distributions to estimate the WDI.

To construct individual country distributions, we take advantage of two widely used sources of data. We use the PPP-adjusted GDP data from the Penn World Tables (6.1, Heston, Summers and Aten (2002)) to anchor the mean of individual country distributions.

The decision to anchor survey distributions with national account means is not without controversy. Early work by the World Bank on poverty estimation combined microeconomic surveys with national accounts data (Ahluwalia, Carter, Chenery (1979)). However, the World Bank decided to abandon this tradition in the mid-1990s and decided to anchor their data to the survey mean. In fact, they recommended that individual countries estimating poverty rates do the same thing so that countries like India, that had long anchored the survey distributions to the national account means decided to use both distributions and

means from surveys. As argued by Deaton (2001), “no very convincing reason was ever given for the change”.<sup>14</sup>

The problem with the mean survey income is that it does not always coincide with the national accounts per capita income. Moreover, for some countries the two tend to diverge over time so the survey mean tends to capture a declining fraction of the national accounts mean. This is not surprising, given the differences in methods of collection, recall periods, survey methodologies and popular attitudes towards surveys in different countries.

Although there is a heated debate over whether one should use survey or national account anchors when estimating poverty rates, we use national account means in this paper for a variety of reasons.<sup>15</sup> First, the properties of the survey means are not well understood. Survey methodologies, recall periods, and cultural attitudes towards not telling the truth to surveyors are different across countries and this may introduce a lot of noise in the means of the income distributions. On the other hand, the methodologies used to construct national accounts are, by and large, homogenous across countries. If all citizens in a particular country tend to underreport a constant fraction of their income or consumption and if the national accounts get the correct aggregate number, then scaling up the income shares by aggregate national account data is the correct thing to do. Of course one could argue that if one does not trust the survey mean, one should not trust the “variance” of the surveys either (and we do use the variance of the surveys to estimate individual country distributions). The problem is that, while we do have an alternative and a way to check and correct the mean (because, if there were no measurement errors, it should coincide with the national accounts mean), we do not have a way to check the dispersion. Moreover, the national accounts are less subject to underreporting than surveys that are based on actual spending and earnings.

Second, we do not have available survey data for every year for every country. In fact, of the 139 countries included in this paper, 29 have only one survey between 1970 and 2000, and 28 additional countries have no surveys at all. Using the survey means to anchor the average of the income distribution of these countries would require the forecasting of these survey means for the missing country/year cells. A superior strategy is to use available national accounts data. As we will argue later, getting the country mean of the distribution is more important than getting the dispersion right.

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<sup>14</sup> Deaton (2001), page 135.

Third, anchoring the distribution data to national account averages implies that the means of our distributions correspond to numbers widely accepted by researchers. For example, all the empirical research on the determinants of economic growth uses national account GDP per capita data as the subject of its analysis. Thus our results and empirical estimates are directly comparable to those of the related cross-country literature.

Fourth, although there are some theoretical reasons for using survey means (see Ravallion (2000) for a defense of the survey means when it comes to estimating consumption poverty rates), it turns out that these means deliver some “strange” results. For example, the mean income derived from the surveys used by Milanovic (2001) suggests that, in 1993, Hong Kong’s income was 5% larger than that of the United States (the national accounts suggest that the US’ was 25% larger). They also suggest that Korea’s income was 2% larger than Sweden’s (the national accounts suggest that Sweden is 49% richer), that Nicaragua was 77% richer than Thailand (in reality, Thailand is 83% richer than Nicaragua), that Ghana was 112% richer than India (in reality, India was about as rich as Ghana), that Kenya was 81% richer than Senegal (in reality, Senegal was 20% richer than Kenya). The list of “suspicious” results goes on and on.<sup>16</sup> A second set of strange-looking results comes from the analysis of world income inequality when microeconomic surveys are used to pin down both the mean and the dispersion of country distributions. Milanovic (2000, 2002), for example, estimates an implausibly large jump in the Gini coefficient from 0.62 in 1988 to 0.66 in 1993, followed by an equally implausibly large decline to 0.64 over the following five years. As we will see in Section 5, the Gini coefficient for the incomes of all the citizens in the world should be a very slow-moving object.<sup>17</sup> Rather than demonstrating that inequality increased spectacularly over a short period of five years, and then declined almost as spectacularly over the following five, the unusual swings in the index reported by Milanovic suggest that using the survey means to pin down individual country distributions is problematic.

And finally, most of the controversy over whether to use national account or survey means centers on the problem of estimating poverty. The central problem is that the rich tend to underreport income more than the poor do. If this is the case, “shifting” the whole

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<sup>15</sup> See Deaton (2003).

<sup>16</sup> See Bhalla (2002) for these results as well as a more extensive list of strange results.

<sup>17</sup> Our estimates reported in Section 5 confirm that the Gini coefficient does not move very fast. We also report the estimates of five other studies and they all confirm that the large swings reported by Milanovic are “unusual”.

distribution by the national accounts mean tends to lead to underestimation of the number of poor. As argued by Bhalla (2002), the best way to deal with this problem is not to use the strangely-behaved survey means but to shift the poverty line to the right. Bhalla estimates that a correction of about 15% of the one-dollar-a-day line is needed.<sup>18</sup> Thus, in the empirical section we will report a one-dollar-a-day line augmented by 15%.

### ***(ii) Surveys: Dealing with Missing Data***

The second data set used to construct the WDI are the microeconomic survey data from Deininger and Squire (1996) (DS), extended with the World Bank's World Development Indicators (WB) to estimate the dispersion of each country's distribution.<sup>19</sup> One problem with these surveys is that they were not conducted for every year and for every country.<sup>20</sup> To confront this problem, some researchers opt for restricting their analysis to countries for which surveys are available in two particular years. Of course the number of countries with survey data for precisely those two years is very small so researchers approximate the true shares with the survey data of the closest available year. This implies the loss of many countries for which some information is available. For example, Milanovic (2000) is forced to deal with 91 countries for a very short five-year interval that goes from 1988 to 1993. Restricting the analysis to small time periods is problematic because statistical short-term reversals are bound to occur in long-term trends, just like recessions occur in the middle of long-term growth processes. As we will see in Section 5, these short-term reversals do occur indeed. We solve this problem by "forecasting" the income share for five quintiles for countries where a number of surveys are available.

A look at the two data sets (the PWT and the DS-WB) reveals that there are four groups of countries:

Group A.- Those for which GDP per capita is available and income or expenditure surveys are reported for various years.

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<sup>18</sup> Bhalla (2002) argues for a 15% correction using expenditure data. We apply the same correction to our income data. The reader that does not feel comfortable with this adjustment should see the \$570 line as a \$1.5/day poverty line.

<sup>19</sup> These survey data have been criticized by Atkinson and Brandolini (2001).

<sup>20</sup> Only the United States has surveys every year.

Group B.- Those for which GDP per capita is available and only one survey is reported between 1970 and 2000.

Group C.- Those for which GDP per capita is available and microeconomic surveys are not reported.

Group D.- Those for which no GDP per capita is available.

### **Income Shares for Countries in Group A**

There are 82 countries with more than one survey over the thirty-year period from 1970 to 2000.<sup>21</sup> Overall the countries of this group had a total of 5.089 billion citizens in the year 2000 (over 84% of the world's population). For these countries, we plot the income shares of each of five quintiles over time and we observe that they tend to follow very smooth trends (see Sala-i-Martin (2002a and b)). In other words, although the income shares estimated by Deininger and Squire and the World Bank are not constant, they do not seem to experience large movements in short periods of time.<sup>22</sup> Using this information, we regress income shares on time to get a linear trend for each country. This was done using two methods. First, the regressions were estimated independently for each of the five quintiles without worrying about adding-up constraints. A second method estimated the regressions for the top two and the bottom two quintiles, leaving the income share of the middle quintile as the residual. Both methods gave identical results.<sup>23</sup> For the years in which no shares are available, the "projected" shares from these regressions are used.

### **Income Shares for Countries in Group B**

For 29 countries (with a total population of 329 million inhabitants in 2000 or 5% of the world's population), we have only one microeconomic survey. Since we cannot really

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<sup>21</sup> See Appendix 1 for the names of the countries in this category. 14 of the 82 countries are former republics of the former Soviet Union. Since all these republics were part of the same country before 1990, the number of countries in Group A is 69.

<sup>22</sup> Obviously, these trends can only be temporary since income shares are bounded between 0 and 1.

<sup>23</sup> It can be persuasively argued that some of these countries (for example India or China) experienced large increases in inequality after large reforms took place in the 1980s. Sala-i-Martin (2002a and b) allows for two "slopes" for both India and China (one for pre- and one for post-liberalization) and shows that the estimated WDI does not change substantially. In particular, his measures of global income inequality (measured by the Gini coefficient, the Theil index, various Atkinson indexes, or the mean logarithmic deviation) are not very different from those estimated with the same trend for both periods.

measure the “evolution” of within-country income inequality for these countries, we could exclude them from the analysis.<sup>24</sup> We choose not to exclude them for two reasons. First, we want get as close as possible to the world distribution of income. Restricting our analysis to the countries in group A would mean that the incomes of 16% of the world’s citizens are ignored. Second, and more importantly, restricting our analysis to the set of countries in group A would entail an important sample selection bias. The reason is that the countries with no survey data tend to be poor and tend to have “diverged”. Their exclusion from our analysis, therefore, tends to bias the results towards finding an excessive compactness of the distribution. Since, as it turns out, we will find that the income inequality has fallen over time, we do not wish to introduce a bias that favors one of the main conclusions of the paper.

Following Berry, Bourguignon and Morrison (1983), Sala-i-Martin (2002 a and b) assume that the income shares for these countries remain constant at the levels estimated in the only survey (that is, we could assume that inequality within these countries remains constant over time). This, of course, ignores any movements in the within-country distributions, although it captures the contribution of these countries to the across-country distribution since the “average” income (which we will derive from national accounts data for which we do have yearly information) is still included in the analysis.

In this paper, we use the “level” shares from the single survey for each of these countries (and remember that countries in Group B are those countries with one survey between 1970 and 2000) and we “assign” average slopes of the countries from Group A that belong to the same World Bank region to estimate the income shares for the years in which there are no survey data. The regions are: East Asia and Pacific, Europe and Central Asia, Latin American and Caribbean, Middle East and North Africa, South Asia, Sub-Saharan Africa, High-Income Non-OECD and High-Income OECD<sup>2526</sup>.

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<sup>24</sup> This is the choice made, for example, by Dowrick and Akmal (2001) or Milanovic (2001).

<sup>25</sup> Bourguignon and Morrison (2002) also assign the within country distributions of “similar” countries where “similar” is sometimes defined as “regional proximity” and sometimes as “common historical roots”. Bhalla (2002) also uses the survey data of neighbouring regions.

<sup>26</sup> Alternatively, we could have “forecasted” measures of dispersion for the countries of Group A by using observed characteristics that are thought to be determinants of the within-country income distribution (such as macroeconomic, regional, religious, institutional or policy variables). The problem with this approach is that the determinants of income inequality within a country are not well understood, so that the variables to be incorporated into the analysis would be subject to debate. We leave this avenue for future research.

## **Income Shares for Countries in Group C**

There are 28 countries with no survey data but with PPP-Adjusted GDP data. The 2000 population in these countries totaled 242 million people (4% of the world population). Again, these countries could be excluded from the analysis but this could potentially bias our estimates of the distribution towards finding too much compactness. Instead, we follow the procedure used for countries in group B and assign the average income shares of the region to each of the countries in this group.

Countries in Group D (that is, countries with no survey data and no GDP data) are excluded from the analysis.

The 139 countries included comprise 93% percent of the world's population in 2000.

## **A Note on the Soviet Union and Former Soviet Union Republics**

The Soviet Union collapsed in the middle of our sample period. We incorporate it into our analysis as a single country with a single per capita GDP before 1989 and as 14 different republics after 1990. In other words, before 1989, we use the survey data available for the Soviet Union and the ppp-adjusted GDP per capita data from the PWT. Starting in 1990, we treat each of the FSU republics as independent units, each with its own survey shares (from the WB) and level of per capita income (from the PWT).<sup>27</sup>

## **A Note on Democratic Republic of Congo / former Zaire**

The PWT do not report GDP data for the Democratic Republic of Congo (former Zaire) for the latter part of the 1990s, because national accounts data were not produced by the Congolese government after the civil war started. Despite this, we do not exclude this problematic country because it is one of the poorest in the world, and with more than 50 million people, one of the largest. In order to include Congo/Zaire, we “forecasted” GDP per capita for the final three years of the sample using a simple moving average of the growth rates of the previous years. Since these previous years were disastrous<sup>28</sup>, the growth rates

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<sup>27</sup> The analysis post 1990 excludes the republic of Moldova because PWT are not available for that country.

<sup>28</sup> After the 1994 massacres of Rwanda-Burundi, a massive flow of refugees fled to Zaire which destabilized the country (GDP fell by more than 20% in 1994). A rebellion to replace President Mobutu Sese Seko was led by Laurent Desiré Kabila. Mobutu was toppled in May 1997 and Kabila assumed the presidency. His regime was subsequently challenged by Rwanda and Uganda-backed rebellion in August 1998. Troops from Zimbabwe, Angola,

used for this “forecast” were large negative numbers. The result was that Congo/Zaire’s per capita income fell from more than \$1000 in 1970 to about \$230 in 2000, which means that the overwhelming majority of the Congolese population lived below or around the poverty line. Were we to exclude Congo/Zaire from the analysis, we would underestimate poverty rates. This is why we choose to keep Congo/Zaire in the data set. We shall keep in mind, however, that the national accounts data for this country (and therefore, the mean of its income distribution) has essentially been made up and the negative growth rate probably over-estimated.<sup>29</sup> As a result, in Section 3 we will report poverty estimates both with and without Congo/Zaire.

### ***(iii) A Non-Parametric Approach to Estimate Country Distributions***

Once an income share is assigned to each quintile of each country for each year, we approximate each country’s income distribution using a kernel density function.<sup>30</sup> Although some assumptions have to be made on how to estimate the kernel density function, this procedure does not restrict the country distribution to have a specific functional form.<sup>31</sup> One

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Namibia, Chad, and Sudan intervened to support the Kinshasa regime. Kabila was assassinated on January 16<sup>th</sup> 2001 and his son, Joseph Kabila became the current President.

<sup>29</sup> According to the World Bank, Congolese PPP-adjusted GDP per capita fell by 66% (our data display a much sharper decline of 87.6%). The decline for the period 1997-2000 is 4.3% (we assume a fall of 17%). Given that our assumed growth rates are more negative, the growth of poverty in Congo/Zaire is likely to be overestimated.

<sup>30</sup> Sala-i-Martin (2004) uses an alternative approach. Following the microeconomic literature on income distribution for developed countries (see, for example, Cowell (1995) and Mulligan (2002)), he assumes that each country’s distribution is log-normal. He then uses the survey data to estimate the variance and the GDP per capita to estimate the mean. A similar approach was followed by Quah (2002) to estimate poverty rates in China and India. The problem with this approach is that we do not really know the functional form of the distribution for each country and there is no reason to believe that it is log-normal everywhere. In fact, it has been argued that, for the United States, the upper tail of the distribution is not well captured by a log-normal since this distribution tends to underestimate the number of obscenely rich people. Thus, some analysts proxy the U.S. distribution with a log-normal function for most of the levels of income and a Pareto function (which has a thicker upper tail) for larger levels of income. See Mulligan (2002) for a discussion and for some estimates of the bias of assuming a log-normal function for all levels of income. In Section 3 we compare our WDI with Sala-i-Martin (2004).

<sup>31</sup> We use gaussian kernel weights but we experimented with other weights. For example, using the Epanechnikov function delivers exactly the same results, as long as the bandwidth is held constant across estimation methods.



key parameter that needs to be specified or assumed is the bandwidth of the kernel. The convention in the literature suggests a bandwidth of  $w=0.9*sd*(n^{-1/5})$ , where  $sd$  is the standard deviation of (log) income and  $n$  is the number of observations.<sup>32</sup> We evaluate the density function at 100 different points so that each country's distribution is decomposed into 100 centiles. Once the kernel density function is estimated, we normalize it so that the area is equal to the total population of the country and we anchor it so that its mean corresponds to PPP-adjusted GDP per capita from the PWT.

Figure 1 displays the results for some of the largest countries for 1970, 1980, 1990 and 2000. Panel 1a shows the evolution of the Chinese distribution of income. To get a sense of the level of income and poverty for each country, the figure also plots a vertical line which roughly corresponds to the World Bank's extreme poverty line: one-dollar-a-day in 1985 prices.<sup>33</sup>

We notice that the Chinese distribution for 1970 is hump-shaped with a mode at around \$750 a year. About one-third of the function lies to the left of the \$1/day poverty line, which means that about one-third of the Chinese citizens in 1970 lived in absolute poverty. We see that the whole density function "shifts" to the right over time which, of course, reflects the fact that Chinese incomes have grown. The incomes of the richest Chinese increased substantially (the upper tail of the distribution shifts rightwards significantly). Although the incomes of the poor Chinese have also experienced positive improvements, the growth of the lower end of the distribution is definitely smaller, which implies that income inequality within China has increased. By 2000, the distribution has a mode at \$2,400 and it appears that a local maximum starts to arise at around \$6,600. The fraction of the distribution below the one-dollar line is now very small.

Figure 1b reproduces the income distributions for India, the second most populated country in the world. The positive growth rates of India over this period have also shifted the distribution to the right, especially during the eighties and nineties. We can also see that the total area below the poverty line (which is the total number of poor citizens) has declined although the overall area has increased dramatically (that is, Indian population has increased a lot over the last thirty years). This, of course, has reduced dramatically the fraction of poor.

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<sup>32</sup> We also tried the optimal Silverman (1986) bandwidth and got virtually identical results in terms of poverty and income inequality.

<sup>33</sup> In Section 3 we define this poverty line more precisely.

Inequalities in India do not appear to have increased or decreased substantially over the sample period.

Figure 1c shows the incomes for the United States, the third largest country in the world in terms of population today. Again, we see that the positive aggregate growth rate has shifted the whole distribution to the right, lifting the incomes of virtually all Americans. We notice that the fraction of the distribution below the poverty lines is zero for all years. Two interesting points about the U.S. must be noted. Firstly, even the lower tail of the distribution shifts to the right (so income of the poorest Americans increased over time). And secondly, the upper tail of the distribution seems to shift further, which suggests that inequalities within the United States have increased over the last three decades. This, however, is not because the poor are worse off, but because the incomes of the rich have grown faster.

Figure 1d displays a very interesting case: Indonesia. In 1970, the mode of the distribution almost coincided with the \$1/day poverty line. About one-third of the distribution lay to the left of the one-dollar line. Over time, the distribution shifted to the right substantially, and the fraction lying to the left of the poverty line declined dramatically. This is true, despite the dramatic decline in GDP that Indonesia suffered after the East Asian financial crises. To see this point more dramatically, we also plot the 1997 distribution. We see that, indeed, the distribution shifted back to the left between 1997 and 2000 due to the great depression. We also see that, although poverty increased after the 1997 financial crises, the overall picture for Indonesia still exhibits remarkable success in eliminating poverty over the last three decades. One reason is, of course, aggregate growth. Another reason is that inequality in Indonesia has fallen. Thus, Indonesia is an example of a growing economy with shrinking inequality, an example that shows that growth and increasing income inequality do not usually go together.<sup>34</sup>

The distribution for Brazil, displayed in Figure 1e, does not appear to be “normal” in the sense of being “hump-shaped”. The reason is that the variance of the Brazilian distribution is much larger than the variance we used to compute the bandwidth. Hence, the appearance of “non-normality” of this density function simply reflects that Brazil has a very unequal income distribution. Figure 1e (borrowed from Sala-i-Martin (2004)) displays the income distribution for Brazil when log-normality is imposed (the mean of the distribution

still corresponds to income per capita from the National Accounts and the variance is estimated from the surveys). The rightmost part of the distribution shifts a lot more than its lower end. Of course this means that inequality in Brazil increases over time. We also see that, for the lower end, most of the shift occurs in the 1970s. After 1980, there seems to be little progress in reducing poverty. These lessons are true whether we use the non-parametric or the log-normal distribution.

Figure 1f displays what is perhaps the most interesting case: Nigeria. As for most African nations, Nigerian GDP per capita has grown at zero or even negative rates over the last thirty years. Thus, the mean of the distribution has shifted to the left. At the same time, income inequality has exploded in Nigeria over the same period. The dramatic implication of these two phenomena is that the fraction of people living with less than \$1/day increased from 14.5% in 1970, to 20.2% in 1980, to 37.8% in 1990, to 50.3% in 2000.<sup>35</sup> The interesting part is that the increase in income inequality in Nigeria is so large that the upper tail of the distribution has actually shifted to the right! In other words, although the average citizen was worse off in 2000 than in 1970, the richest Nigerians were much better off. This may have important policy implications because, although the income of the majority of the citizens is falling rapidly, those of the economic and political elites are likely to be growing, a situation that does not provide the right incentives to pursue necessary reforms. Unfortunately, although this phenomenon is unique among the largest countries reported in Figure 1, it is not uncommon in Africa.

Figure 1g displays the distribution of income of the USSR for 1970, 1980 and 1989, and the joint distribution of the Former Soviet Union Republics for 1990 and 2000. The distributions for 1970, 1980 and 1990 look pretty well-behaved and continuously shifting to the right. This reflects the fact that reported Soviet GDP per capita was continuously growing and reported income inequalities did not increase all that much. The distribution for 1990 shows a noticeable increase in overall income inequality (the distribution spreads visibly). In fact, we find that the leftmost end of the distribution shifts to the left. However, the distribution is centered so far to the right of the poverty line that only a tiny fraction of the

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<sup>34</sup> The empirical literature tends to find little correlation between growth and income inequality (see Barro (1999)).

<sup>35</sup> In Section 3 we describe these data in more detail. The poverty line used here is the \$1/day in 1985 prices adjusted by 15% to correct for underreporting of the rich, which corresponds to a \$570 annual income in 1996 prices.

population seems to have fallen into poverty. The distribution for 2000 has both shifted to the left (reflecting the well-documented decline in overall GDP per capita in the largest former soviet republics, especially Russia and Ukraine), and a discernable increase in the dispersion (which reflects the well-known increase in within country income inequality). The two phenomena contribute to the increase in the fraction of the population below the poverty line. But again, since the starting point is so far away from the \$1-a-day line, the overall increase in poverty is small.

#### ***(iv) Integrating to construct the World Distribution of Income***

Once a distribution of income has been estimated for each country and each year, we can integrate them all to construct the World Distribution of Income. Figure 2 reports the estimates of the density function for each country as well as WDI. Figure 2a reports the results corresponding to 1970. The “tallest” individual distribution corresponds to China followed by India, the Soviet Union and the United States. These individual distributions correspond exactly to the ones reported in Figure 1. The world distribution of income is the aggregate of all the individual country density functions. We notice that the mode in 1970 occurs at \$850. The distribution seems to have a little local maximum at \$9,600, which mainly captures the larger levels of income of the United States and Europe. An interesting aspect of Figure 2a is that a substantial part of individual income inequalities across the world come from differences in per capita incomes across countries rather than differences within countries. In other words, the distance between country distributions (say the difference between the mean of the USA and China) seems to be much larger than the differences between rich and poor Americans or rich and poor Chinese. In Section 4 we decompose various measures of world income inequality into within and across-country components and confirm this visual impression.

The WDI for 2000 is reported in Figure 2b. A quick comparison of Figures 2a and 2b reveals the following features: First, the WDI has shifted to the right. This, of course, reflects the fact that per capita GDP in 2000 is much larger to that of 1970. In other words, the world is a much richer place in 2000. Second, it is not visually obvious whether the WDI is more dispersed in 1970 than in 2000. That is, we cannot say visually whether world income inequality has changed over time (we will report various measures of income inequality of

this WDI in Section 4). Third, if we analyze the reasons for the change in shape of the WDI, we observe that a major change occurs in China, whose distribution both shifts dramatically to the right dramatically (China is getting richer) and its dispersion increases (China is becoming more unequal). Note that, by the year 2000, the top fifth of the Chinese distribution lies around \$10,000. This is the (per capita) level of income of countries like Mexico, Latvia, Poland or Russia, and slightly below Greece. Fourth, the bad news is that, if we look closely at the lower left corner of Figure 2b, we see that Nigeria seems to show up from nowhere. Actually, Nigeria has been in our analysis all along, but it was “buried” below China and India (and to lesser extent, Indonesia) in the previous picture. While the three Asian nations grew (and their distributions shifted to the right), the largest African country became poorer and more unequal over time. Thus, in 2000, it stands as the only large country with a substantial portion of its population living to the left of the poverty lines. Finally, a comparison between Figures 2a and 2b seem to indicate that the USSR disappears. Of course, the former Soviet empire collapsed in 1989, but remember that we include the former Soviet republics (FSU) in our analysis as an aggregated entity as shown in Figure 1j. The reason the FSU seems to have vanished from the picture is that the increase in inequality experienced during the 1990s has spread the distribution so much that the height is barely noticeable in 2000.

To see the evolution of the WDI over time, Figure 3A plots it for 1970, 1980, 1990 and 2000 in the same figure. It is now transparent that the distribution shifts rightward so that the incomes of the majority of the world’s citizens increased over time. It is also clear that the fraction of the overall area that lies to the left of the poverty line has declined (which indicates a reduction in poverty rates) and that the absolute area to the left of the poverty line has also reduced (which indicates an overall reduction in the number of poor citizens in the world). Again, the figure is not clear as to whether world income inequality increases over time as the “dispersion” does not obviously increase (or decrease). This probably suggests that world income inequality does not move much over this period and that specific measures of income inequality will have to be used if we want to discuss the evolution of inequality over the last three decades.

Figure 3B compares the WDI of this paper with the one that arises if, following Sala-i-Martin (2004), each country’s distribution is assumed to be log-normal. We note that the two global distributions are very close to each other. This suggests that the exact way in

which within-country disparities are estimated does not have a large effect on the global distribution.

### **3. Analysis of the WDI (1): Poverty**

#### ***(i) All Poverty Lines: The Cumulative Distribution Function***

The number of poor people in the world can be readily estimated by integrating the estimated WDI from minus infinity to a given level of income (known as the poverty line). Poverty rates can be then computed by dividing the total number of poor by the overall population. The problem is that, as mentioned in the introduction, poverty is not a quantitatively well-defined concept and, as a result, all poverty lines are necessarily arbitrary. We can use our estimates of the WDI to analyze the evolution of poverty rates and headcounts using all conceivable poverty lines at the same time. To do this visually, we construct the Cumulative Distribution Function (CDF) of the WDI normalized to one. Since the poverty rate is the fraction of the global population whose income is less than a given poverty line, the image of the CDF for a particular level of income yields exactly the poverty rate corresponding to that particular level of income. The reader, then, can pick and choose his favorite poverty line and see if its image on the CDF falls over time. If it does, he will conclude that poverty rates for that particular poverty line fell over time. Figure 4 displays the CDFs corresponding to 1970, 1980, 1990 and 2000. Figure 4 also displays three vertical lines, one corresponding to \$570 a year (which, as we argue in the next subsection, is the World Bank's original one-dollar-a-day line adjusted for underreporting of the rich). If we look at the image of this level for each of the four years, we see that poverty rates fell from 20% in 1970, to 16% in 1980, to 10% in 1990 to 7% in 2000. Two other lines are also displayed in Figure 4: the \$2,000 a year and \$5,000 a year. According to these two poverty lines, poverty fell also. In fact, an important feature of Figure 4 is that the 1980 CDF stochastically dominates that of 1970 and that the 1990 curve dominates 1980. That is, poverty rates unambiguously fell between 1970 and 1990 for ALL conceivable poverty lines. The 2000 CDF, dominates the three other curves for all levels of income above 393 dollars. It crosses the 1970 line at \$262 (73 cents a day in 1996 prices). The reason these two curves cross is the Democratic Republic of Congo (former Zaire). As was discussed in Section 2, the lack of National Accounts data for this war-torn country forced us to essentially make up the mean of its income distribution. Our moving-average guess for GDP per capita in 2000 was

\$230. Since these are precisely the levels of income at which the two CDFs cross in 2000, it is natural to ask how the 2000 CDF would look like were we to exclude Congo/Zaire from our analysis. The answer is that if Congo/Zaire is excluded from the sample, then the 2000 CDF dominates the 1990 curve so we can say that poverty has declined for all potential poverty lines.

Figure 4 also shows that the downward “shifts” of the CDF (and therefore, the decline in poverty rates) are especially pronounced in the region between \$450 and \$5,000 a year. The decline was particularly dramatic over the last two decades.

### ***(ii) Some Poverty Rates and Headcounts***

In order to quantify some poverty rates and headcounts with more precision, we now use four different thresholds. The most widely publicized poverty line is the one-dollar-a-day line. Many analysts quote poverty estimates using this line without specifying the prices to which this one dollar per day apply. If we use 2000 prices, the corresponding poverty line in our data set (which is based on 1996 prices) would be \$340. According to our WDI, only 3.45% of the world’s citizens lived with less than that amount of money in the year 2000. In other words, less than 195 million citizens earned less than one dollar a day. This is an order of magnitude smaller than the widely publicized 1.2 billion poor that international institutions like the World Bank or the United Nations constantly report. The reason is that poverty analysts in those institutions do not really use the \$1/day in 2000 prices.<sup>36</sup>

The World Bank’s original poverty line was expressed in 1985 prices.<sup>37</sup> Given that our baseline year is 1996, the corresponding annual income in our analysis is \$495. Thus, this is the first poverty line used in Table 1 and in Figure 5.

The survey data used to construct our WDI is said to include systematic errors. In particular, it is believed that the rich tend to underreport their income relatively more than the poor. If this is the case, then re-anchoring the survey mean to the national accounts mean (as we do in this paper) biases poverty estimates downwards (although it is not clear whether there are biases in the trend). Bhalla (2002) argues that this bias is best corrected not by using

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<sup>36</sup> The \$365 line (\$1/day in 1996 prices) yields a poverty rate of 3.77% and a headcount of 214 million people.

<sup>37</sup> The WB poverty line was defined for consumption levels but analysts and the popular press always refer to this as the “one-dollar-a-day” line when they talk about income poverty.

survey means (as done by the World Bank), but by adjusting the poverty line by roughly 15%. If we increase the \$495 poverty line by 15% we get an annual income of \$570. Since this roughly corresponds to \$1.5/day in 1996 prices, we refer to this as the \$1.5/day line in Table 1 and Figure 5.

We finally report two additional poverty lines, as arbitrary as any other: an annual income of \$730 (roughly two-dollars-a-day in 1996 prices) and \$1,140 per year (which is twice \$570; since \$570 was labeled \$1.5/day line, we call this the three dollar line).<sup>38</sup>

Table 1 reports the poverty rates using the above four poverty lines for every five-years starting in 1970. Figure 5 reports the yearly rates and counts for each of the poverty lines. Using the original World Bank definition (\$495 annual income) the poverty rate declined from 15.4% of the world's population to 5.7%. That is, between 1970 and 2000, the fraction of citizens whose income lies below the original poverty line fell by a factor of almost 3! This is especially impressive given that, during the same period, world population increased by almost 50% (from 3.5 to 5.5 billion citizens). The implication is that the total number of poor citizens went from 534 to 322 million, a decline of 50%. If we exclude Congo/Zaire from the analysis (and again, perhaps we should, given that the data for this country for the late 1990s is non-existent), global poverty fell from 15.3% in 1970 to 4.9% in 2000. The number of poor citizens fell from 527 to 276 million; poverty headcounts were cut by almost one-half!

Using the original line adjusted for underreporting of the rich (that is, using the \$570/year or \$1.5/day line) we see a similar picture. First, the poverty rates fell from 20% to 7%, a decline of a factor close to 3. The poverty headcounts declined by about 300 million citizens (from 700 million people to a little less than 400 million). In other words, the total number of poor citizens declined by about 56% during a period in which world population increased by 50%. If Congo/Zaire is excluded, poverty rates fell from 20% to 6.3% and counts from 692 to 351 million. Again, poverty counts were cut by almost one-half.

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For example, one of the United Nations' Millenium Goals is to "halve the number of people whose income is less than one dollar a day by 2015".

<sup>38</sup> Strictly speaking, three dollars a day would correspond to \$1,095 a year. Instead, we report poverty figures for \$1140 a year because this is exactly double of \$570. Since \$570 a year is the \$1/day poverty line as defined by the World Bank once it is adjusted by 15% to correct for underreporting of the rich, the \$1,140 dollars a year line corresponds to twice the original



It is interesting to note that the total number of people whose income is less than one-dollar-a-day is nowhere close to the widely-cited number of 1.2 billion. Depending on whether we adjust for underreporting or not, the exact figure is between 321 and 398 million people, less than one-third of what was previously believed.

Using the two-dollars a day definition (\$730 a year), the poverty rate was close to 30% in 1970 and a little below 11% in the year 2000. Again, the poverty rate declined by a factor close to 3. The number of citizens whose income was less than 2 dollars a day was just above one billion people in 1970 and about 600 million in 2000, a decline of 400 million citizens or 54%. The numbers when we exclude Congo/Zaire are the following: rates fall from 29.5% to 9.8% and counts from 1.017 billion to 550 million.

Finally, using the three-dollar-a-day definition (\$1,140 dollars a year), the poverty rate was 47% in 1970 and 21% in 2000, again a healthy decline over the last 30 years. Overall poverty headcounts declined by more than 400 million people, from 1.6 billion in 1970 to 1.2 billion in 2000. It is worth noting that, even though poverty rates fell in each and every decade, during the 1970s they did not fall fast enough to offset population growth. Thus, poverty counts increased between 1970 and 1980. In fact, the total number of poor citizens in the world peaked in 1978 at 1.71 billion. Relative to this peak value, \$2/day poverty headcounts have declined by way over half a billion people. Without Congo/Zaire, the rates fell from 45.4% to 20.4% and headcounts from 1.6 to 1.1 billion.

### ***(iii) Regional Poverty***

The next question is whether the decline in global poverty documented in the previous subsection was homogeneously distributed across the land. Table 2 reports poverty rates for East Asia, South Asia, Africa, Latin America, Eastern Europe and Former Soviet Union, and Middle East and North Africa (MENA). Table 3 breaks down the rates and headcounts by country. To economize on space, Tables 2 and 3 only report poverty rates and headcounts using the \$570 a year line.

### **East Asia and the Pacific**

With over 1.7 billion citizens in 2000, East Asia is the most populated region in the world and, in 2000, it accounted for 30% of the world's population. Poverty Rates in East

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WB poverty line. The differences between the \$1,095 and \$1,140 lines are quite small so, in order to economize on space, we do not report the results for both.

Asia were close to one-third in 1970. By the year 2000, poverty rates had declined to a little less than 2.4%. Poverty rates in East Asia, thus, were cut by a factor of 10! The poverty headcount was reduced by over 300 million citizens, from 350 million in 1970 to 41 million in 2000. Poverty headcounts fell by 70 million citizens in the 1970s, and by 127 and 114 million people in the 1980s and 1990s respectively. This tremendous achievement, together with the great disaster in Africa which we discuss below, meant that while 54% of the world's poor lived in East Asia in 1970, by the year 2000 only 9.4% of the poor lived there.

Table 3A breaks down the results of East Asia by country. Although China is an important part of this success story (a decline of the poverty rate from 32% in 1970 to 3.1% in 2000 which accounts for 251 million people abandoning poverty), it is not by any means the whole story. Indonesia saw its poverty rate decline from 35% in 1970 to 0.1% in 2000 (a reduction in the headcount of about 41 million). Thailand, with a poverty rate over 23% in 1970, had practically eliminated poverty by 2000 (a reduction of more than 8 million people). In fact, all the countries in this region experienced reduction in poverty rates. The only country that lived through an increase in poverty headcounts was Papua New Guinea.

## **South Asia**

South Asia is the second most populous region in the world, with 1.3 billion people in 2000 (24% of the world's population). The evolution of poverty in South Asia is similar to that in East Asia: the rates fell from 30% in 1970 to 2.5% in 2000. The poverty headcount fell by 178 million people, from 211 million poor in 1970 to 33 million in 2000. This success was achieved primarily over the last two decades. The poverty rate declined by only 3.6% during the 1970s. This decline was not enough to offset the increase in population so that the overall number of poor actually increased by 25 million during the 1970s. Things changed dramatically during the 1980s and 1990s. The poverty rate fell from 26.7% in 1980, to 10.3% in 1990 to 2.5% in 2000. The total number of poor declined by 122 million during the 1980s and by an additional 80 million during the 1990s. The implication of this success was that, while in 1970, about 32.8% of the world's poor lived in South Asia, by the end of the century only 7.6% lived in that region.

Table 3B decomposes these data by country. We see that the behavior of the region is dominated by India, which accounts for 75% of the population of the region. Thus, most of the decline in poverty headcounts (145 million), can be attributed to the success of the post-

1980 Indian economy (between 1970 and 1980, the total number of poor Indians actually increased by 15 million). This is not to say that the other countries in the region did not improve. With the exception of Nepal, all the other countries also experienced a positive evolution of overall poverty. During this 30 year period, poverty rates fell from 35.2% to 6.6% in Bangladesh (headcounts declined by 15 million people), from 19% to 0.5% in Sri Lanka (a headcount decline of 2 million citizens), and from 38% to 5% in Pakistan (a reduction of about 17 million poor). Nepal experienced a slow reduction in poverty rates. Due to population growth, this slow reduction in rates translated to an increase in the overall number of poor Nepalese citizens.

### **Sub-Saharan Africa**

The great Asian success contrasts dramatically with the African tragedy. With a total population of just over 608 million citizens, Sub-Saharan Africa is the third most populated region in our data set. A total of 41 countries are analyzed in this paper. Most of them had such dismal growth performances that poverty has increased all over the continent. Overall, poverty rates in 1970 were similar to those in South and East Asia: 35%. By the year 2000, poverty rates in Africa had reached close to 50% while those in Asia had declined to less than 3%. The three decades have been almost equally dismal: poverty rates increased from 35.1% to 37.2% in the 70s, to 43.7% in 1990 to 48.8% in 2000. The overall number of poor increased from 93 million in 1970 to almost 300 million in 2000. That is, the total number of poor in Africa increased by more than 200 million citizens (an increase of 36 million during the 1970s, 75 during the 1980s and 92 during the 1990s).

This dismal performance, together with the great success of the other two poor regions of the world (East and South Asia) means that the majority of the world's poor now live in Africa. Indeed, Africa accounted for only 14.5% of the world's poor in 1970. Today, despite the fact that Africa accounts for only 10% of the world's population, it accounts for 67.8% of the world's poor. Poverty, which used to be an essentially Asian phenomenon, has become an essentially African phenomenon.

The breakdown of the evolution of African poverty by country (Table 3C) reveals some interesting facts. One of the largest increases in poverty rates occurred in Nigeria (from 14.5% in 1970 to over 50% in 2000). This is regrettable because Nigeria is the largest country in the continent so this reflects the deteriorating condition of a large number of citizens.

Overall, 56 million additional Nigerians fell into poverty, and this raised the total tally to an alarming 64 million citizens. Another large disaster occurred in the Democratic Republic of Congo (former Zaire, also a very populous country with over 50 million people). The disastrous dictatorship of Mobuto Sese Seko and the war that followed its deposition led to an increase in poverty rate from an already high 40% in 1970 to an incredible 92%. A total of 39 million Congolese citizens joined the poverty ranks. Today, a whopping 47 out of 51 million live below the poverty line.<sup>39</sup> The third largest increase in poverty counts took place in Ethiopia, a country destroyed by the state socialist juntas of the Derg Party that ruled between 1975 and 1991 and its 1990s war with Eritrea: the total headcount in Ethiopia increased by over 23 million people, and the poverty rate remained constant over the last thirty years at a level close to 67%.

Although the disastrous performance is fairly uniform across the continent, there are a couple of success stories in Africa. The most famous is, obviously, Botswana. Poverty rates in this southern African country fell from 60% in 1970 to 0.5% in 2000. The problem is that Botswana is such a small country that this unambiguous success ended up lifting only 383,000 people out of poverty. The only other African countries with a net decline in the poverty headcounts were the Republic of Congo and the tiny islands of Mauritius, Cape Verde and the Seychelles.

## **Latin America**

With close to 500 million citizens (about 9% of the world's population), Latin America has had a mixed performance over the last three decades. Poverty rates in Latin America were cut by more than one-half between 1970 (poverty rate of 10.3%) and 2000 (4.2%). This would be an optimistic picture were it not for the fact that all of the gains occurred during the first decade. Little progress has been achieved after that. Indeed, the poverty rate in Latin America in 1980 was 3% and 4.1% in 1990. Poverty headcounts declined by 17 million during the 1970s and increased by 10 million over the following twenty years. This mixed performance has meant that, although Latin America started from a superior position relative to both East and South Asia (where poverty rates were well above 30% in 1970), we see that poverty rates were larger in Latin America than in both Asian

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<sup>39</sup> Although there is no doubt that the economic situation of the Democratic Republic of Congo is disastrous, we should not put too much weight on the exact figures, given the way

regions by 2000. The fraction of the world's poor that live in Latin America declined from 4.3% in 1970 to 1.7% in 1980. It then increased to 3.7% in 1990 and to 4.8% by the year 2000.

The breakdown by country is displayed in Table 3D. If we look at the column corresponding to 2000, we see that poverty rates in Latin America vary greatly by country. We note that they range from 41% in Nicaragua to almost zero in Chile, Mexico, Uruguay and Trinidad and Tobago. Honduras and Bolivia have rates in the 30s (mainly because of a rapidly deteriorating GDP per capita after 1980), Haiti has a rate of 23.9%, Paraguay, Grenada, Guatemala, Dominica, St. Vincent and the Grenadines, St. Lucia, and Belize have rates in the teens, and the rest of the countries have single digit poverty rates. The overall trend is one of improvement during the 1970s, great deterioration in the 1980s and mixed results in the 1990s.

Fortunately, the largest countries in the region tended to perform reasonably well over the sample period. With 170 million citizens, Brazil is the largest country in the region. Its poverty rate fell from 17.3% in 1970 to 1.9% in 2000, which implied that a total of 13 million citizens were lifted above the poverty line. Again, most of the gains accrued during the 1970s. However, some (although smaller) gains were also achieved during the 1990s. Mexico (97 million inhabitants) is the second largest country. Its poverty rate was 8.5% in 1970, it went down to 0.7% in 1980, down to 0.3% in 1990 and a bit less than that in 2000. Overall, Mexico lifted close to 4 million citizens out of poverty over the last 30 years. In contrast to Brazil and Mexico, the third largest country in Latin America, Colombia, has not performed well. Its poverty rate has increased from 6.5% in 1970 to 8.1% in 2000. Two million Colombian citizens became poor over this period.

### **Middle East and North Africa**

Our sample of Middle Eastern and North African (MENA) countries has 220 million citizens (7.7% of world's sampled population in 2000). Poverty rates in MENA countries have declined over the last three decades. Although the starting point was better than that of East Asia, South Asia and Sub-Saharan Africa, MENA has nevertheless managed to reduce those rates even further. The rate was as high as 10% in 1970. After the influx of oil money that poured into the region after the 1970s oil shocks, poverty rates declined to about 3.6% by

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GDP data were constructed (see Section 2).

1980. Despite the not so stellar macroeconomic performance over the following 20 years, the region managed to reduce its poverty rate to 1.6% in 1990 and 0.6% in 2000. Only 1.3 million citizens of the original 11 million remained poor by 2000. The number of poor declined by 6 million in the 70s (almost 3 million in the 80s and almost 1 additional million in the 1990s). The MENA region accounted for 1.7% of the world's poor in 1970 and only 0.3% in 2000. Contrary to what happened in East and South Asia, poverty rates in MENA countries were reduced not through aggregate per capita growth but through reduction in within country income inequalities.

The most populated country in the region is Egypt. Egypt's poverty rate declined from almost 24% in 1970 to close to zero in 2000. About 7 million citizens climbed above the poverty line over the three decades: 4 million in the 1970s, 3.5 million in the 1980s and about 150 thousand in the 1990s. Iran is the second largest country in the region. Its poverty rate was always very small and did not change much over time. A big success story is that of Jordan. With a poverty rate well over 20% in 1970, Jordan managed to reduce poverty to about 0.1% of the population in three decades. At the other end of the spectrum, Mauritania witnessed an increase in poverty rates from 19.6% in 1970 to close to 32% in 2000.

### **Eastern Europe and the Former Soviet Union**

Our final region is Eastern Europe and Central Asia, which includes the USSR and, after 1990, the former Soviet Republics. About 436 million people inhabited this region in 2000. A lot has been written about the deterioration of living conditions in this region after the fall of communism. The truth, however, is that although it is true that poverty has increased since 1990, the level of income in this region was so high to begin with that poverty rates were a lot smaller than in any of the regions analyzed up until now. The rate, which was at the already low level of 1.3% in 1970, had declined to 0.4% by 1980. It did not change at all during the 1980s. And then, it more than doubled during the decade that followed the fall of communism. The increase in poverty was the result of both a decline in per capita income and an increase in inequality within countries. But the starting level was so small in magnitude that, despite its doubling, the rate remained at 0.1% in 2000. In terms of absolute numbers, the Eastern Block managed to almost eradicate poverty between 1970 and 1985, when the overall number of poor citizens was 369 thousand. The poverty headcount

multiplied by 5 over the following 5 years to 1.9 million, and then doubled again to 4.4 million in 2000.

Table 3F analyzes the individual countries in the region. In 2000, the number of citizens of the FSU was 282 million. Of those, 1.5% (about 4.4 million) were poor. In 1990, right after the collapse of communism, the poverty rate was about 0.6%. It increased to 1.5% by 1995 and stayed at that level over the following five years. The overall number of poor was 1.8 million in 1990 and 4.4 million in 2000. The distribution of poverty across republics was fairly uneven. Armenia started in the worst position (18.4% poverty rate) in 1990, but managed to half the rate by 1995 and cut it to 1% by 2000. Tajikistan started with the second worst position (17.9% poverty rate) and moved in the opposite direction as the rate climbed to 28.2 over the decade. Other bad performers include Azerbaijan (0.4% in 1990, 8.9% poverty rate in 2000), Kyrgyzstan (0.2% in 1990, 7.2% in 2000), and Uzbekistan (0.3% in 1990, 6.1% in 2000) . We see that most of the poverty of the FSU was concentrated in the Central Asian republics. The small Baltic states Estonia, Latvia and Lithuania had negligible poverty rates all along. Despite their dismal performance, Belarus, Georgia and Ukraine did not see their poverty rates increase substantially.

Outside the Soviet Union, the largest country in the region in 2000 was Turkey with 66 million citizens. Turkish poverty rates declined from 12.8% in 1970 to close to zero in 2000. Most the gains occurred in the 1970s, but there were some positive movements also during the 1980s and 1990s. Turkey managed to lift 4.5 million citizens out of poverty in three decades.

Of the remaining countries in the region, Romania,, Czechoslovakia (Slovakia and the Czech Republic), Poland and Hungary, only Romania managed to have an income level so low that a noticeable proportion of the population lived with less than one dollar a day.

#### **4. Analysis of the WDI (2): World Income Inequality**

We can now analyze another important aspect of the world distribution of income: income inequality. Many indexes of income inequality have been proposed in the literature. Some have desirable properties and some do not. Some can be derived from social welfare functions, and some cannot. Since the goal of this paper is not to settle the question of what index best represents worldwide income inequalities, we will simply report eight of the most

popular indexes used in the literature:<sup>40</sup> The Gini coefficient, two Atkinson indexes with coefficient 0.5 and 1,<sup>41</sup> the variance of the logarithm of income, the ratio of the average income of top 20% of the distribution to the bottom 20% and the ratio of the top to the bottom 10% of the distribution<sup>42</sup>, the Mean Logarithmic Deviation (MLD, which corresponds to the Generalized Entropy Index with coefficient 0), and finally, the Theil Index (which corresponds to the Generalized Entropy Index with coefficient 1).

### ***(i) Global Income Inequality: Convergence, Period!***

The results of estimating each of the eight indexes for each year between 1970 and 2000 are reported in Table 4 and Figures 7 and 8. Column 1 of Table 4A and Figure 7a report the evolution of the Gini coefficient. According to this index, world income inequality remained more or less flat during the 1970s. After peaking in 1979 (at 0.662), it followed a downward trend over the following two decades. In the year 2000, the world Gini coefficient was 0.637. Overall, the Gini declined by almost 4% since 1979.

An important aspect of the yearly evolution of the Gini coefficient is that its behavior is not monotonic. For example, we see a sudden decline in 1975 which is explained by the fact that rich countries suffered an important recession in that year due to the first oil shock, a recession that was not felt in some of the poorest and largest countries in the world. For example, in 1975 the growth rate in China was 3.6% and that of India was over 7%. Of course when the rich suffer and the poor gain, world income inequality is reduced. Another example of a short term reversal occurred in the late 1980s, when inequality increased for a few years before returning to its longer term downward trend. This increase in inequality can be partly explained by the large 1988 recession in China. The central point is that the fact that there are short term reversals associated with business cycles in the largest countries or groups of countries means that we should distrust empirical studies of world income inequality that cover very short time spans.

Figures 7b through 7f display the evolution of some of the other income inequality measures. The exact yearly estimates are reported in Table 4A. The main lessons from these

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<sup>40</sup> See Cowell (1995) for a description and properties of each of these inequality indexes.

<sup>41</sup> See Atkinson (1970).



estimations are the following. Firstly, all indexes show a remarkably similar pattern of worldwide inequality over time. Secondly, inequality remained more or less constant (or maybe increased) during the 1970s. Thirdly, inequality declined substantially during the 1980s and 1990s. The size of the decline depends a bit on the exact measure: the largest reduction corresponds to the top-20%-to-bottom-20% ratio, which declined by almost 30% between 1979 and 2000, followed by top-10%-to-bottom-10% ratio (a decline of 17.3%), the MLD index (which declined by 9% ), the A(0.5) index (down by 7.8%), the Theil index (which declined by almost 7%), the A(1) index (down by 5.7%), the Gini coefficient (down by 3.8%), and finally, the variance of the logarithm (down by 2.6%). Despite these small differences across measures, the overall picture is clear: inequality reduced during the last twenty years. In 1997, Lant Pritchett famously described the evolution of income per capita across countries with the expression “divergence big time”. Using a similarly spirited expression, we could say that our analysis shows that, if rather than looking at GDP per capita across countries we analyze the incomes of individual citizens, the last two decades have witnessed an unambiguous process of “*convergence, period!*”

The fourth lesson is that all figures seem to suggest that the downward trend might have stopped during the second half of the 1990s. However, since this is a very short period, we do not yet know whether this is a short-term statistical reversal (of the type observed in the late 1980s) or a change in the long-term trend. Finally, it is interesting to notice that Sala-i-Martin (2002a and b) reach exactly the same conclusions, even though those studies used a different methodology and did not include the USSR/FSU in the analysis.<sup>43</sup>

Our analysis shows that, after having stagnated during the 1970s, global income inequality started a two-decade-long process of decline. This change in trend is surprising

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<sup>42</sup> The top-20%-to-bottom-20% is the ratio of the income of the person located at the top 20<sup>th</sup> centile divided by the income of the corresponding person at the bottom 20<sup>th</sup> centile. A similar definition applies to the top-10%-to-bottom-10% ratio.

<sup>43</sup> In other words, contrary to what one might have suspected, the collapse of the Soviet Union and the subsequent explosion of income across former soviet citizens does not alter the overall picture. As conjectured in Sala-i-Martin (2002a, footnote 22), the collapse of the Soviet Union has two offsetting implications for worldwide inequality. First, the increase in within-country inequality tends to increase the overall worldwide inequality. Second, the reduction of per capita GDP of a relatively rich country tends to induce convergence of per capita income between the citizens of the FSU and those of the developing world, which tends to reduce the estimates of overall world income inequality. It turns out that the two

because, according to Bourguignon and Morrison (2002), world income inequality had continuously increased over the last century and a half. What caused this reversal? The answer is the growth rate of some of the largest yet poorest countries in the planet: China, India and the rest of Asia. The incomes of 1.2 billion Chinese and one billion Indians along with several hundred million of the poorest citizens of Asia converged rapidly towards the levels of income of the one billion citizens of the OECD. The rapid growth rates of per capita income of Asia (the most populated and one of the poorest regions of the world) meant rapid reductions in overall inequalities. This reversed a centuries-old process by which the citizens of the countries that had succeeded in implementing the industrial revolution kept growing and diverging away from the incomes of the developing world. Using population sizes of the year 2000, we could say that in 1820 the whole world was poor. Equal and poor. Slowly, the incomes of the one billion citizens of what is today the OECD kept growing and diverging away from the incomes of the five billion people of the developing world. The dramatic growth rates of China, India and the rest of Asian countries meant that the incomes of three to four billion people started converging to those of the OECD. This reduced worldwide income inequality for the first time in centuries. Of course the problem is that the 700 million inhabitants of Africa and several hundred millions of remaining poor nations are diverging. This means that when Asia completely catches up with OECD, then the incomes of about 5 billion relatively rich people will diverge away from those of Africa and world income inequality will start rising again.

### ***(ii) Inequality Decomposition***

What about within country inequality? It is true that, whereas per capita income in China exploded after the 1978 reforms, inequalities across Chinese regions and across Chinese citizens increased dramatically. It is also true that inequalities increased within many other countries (like the United States, for example). However, the fact that world individual inequalities declined indicates that the “across-country” convergence has more than offset the probable increases of within-country inequalities. To quantify the two forces, we use two indexes of inequality that can be decomposed into a “within-country” measure and an “across-country” measure. Bourguignon (1979), Shorrocks (1980) and Cowell (1995) show

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effects roughly offset so that the overall trend of world inequality turn out not to change when we incorporate the USSR/FSU to our analysis.

that the only indexes that can be “decomposed” are those in the class of the “Generalized Entropy”. Two of our indexes belong to this class: the Mean Logarithmic Deviation and the Theil Index.<sup>44</sup> Intuitively, this decomposition separates overall worldwide income inequality into two components. The “within-country” component is the amount of inequality that would exist in the world if all countries had the same income per capita (that is, the same distribution mean) but the actual within-country differences across individuals. This measure ends up being a weighted average of within-country inequalities, where the weights are proportional to the size of the country. In other words, the evolution of within-China inequality has more weight than the evolution of within-Lesotho’s.

The “across-country” component is the amount of inequality that would exist in the world if all citizens within each country had the same level of income, but there were differences in per capita incomes among countries. An important point is that this would not be the estimate of inequality of per capita income across countries (in which each country is one data point and all have the same weight regardless of size). The “across-country” inequality would correspond to a population-weighted (or aggregate income-weighted) measure of inequality in which larger countries have more weight.<sup>45</sup>

Table 4B reports the decomposition of world income inequality using our two decomposable indexes. The first three columns use the Mean Logarithmic Deviation (MLD). In 1970, the aggregate MLD was 0.861. Of this, 0.616 corresponded to “across-country” inequality and 0.246 to within-country. In other words, over 71% of income inequality across individuals in the world was accounted for by differences across countries and only 29% was accounted for by within-country differences. The numbers for the Theil Index do not look very different: 69% of the 0.812 overall inequality value for 1970 was accounted for by across-country differences and only 31% by within-country dispersion. Recall that, when we inspected Figure 2a we already suspected that most of world income inequality was accounted for by across-country differences. We now confirm this suspicion.

The second interesting lesson of Table 4B is that within-country inequality has been increasing over time, both according to the MLD and the Theil Index. The third finding is that across-country inequality has experienced the opposite trend. The combined effect of these two findings implies that the fraction of global inequality which can be accounted for

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<sup>44</sup> See Sala-i-Martin (2002a) for exact formulas for these decompositions.

<sup>45</sup> This is why the methodology followed by the UNDP (2001) is flawed.

by across-country differences has been decreasing. In fact, by the year 2000, only 61% of global MLD and only 64% of the global Theil index come from the across-country component (down from 72% and 69% in 1970 respectively).

The fourth result is that the decline in across-country inequality has been larger than the increase in within-country so that the sum has gone down. In other words, despite the fact that inequality within China, within Russia, within the United States, and within many other countries has gone up, the growth of some of the largest and poorest countries in the world (most notably China, India and the rest of Asia) has tended to reduce overall income inequality across the citizens of the world.<sup>46</sup>

### ***(iii) Income Inequality Compared***

Figure 9 compares our estimates of the global Gini with those of some previous studies. The first thing to notice in Figure 9 is that the Gini coefficient estimated by Chotikapanish, Valenzuela and Rao (1997) is almost identical to ours: they only report estimates for 1980, 1985 and 1990, but the three points coincide almost exactly to ours. An important aspect of this coincidence is that if we look at their study, one may conclude that there is no clear trend in global income inequality since it slightly declines between 1980 and 1985 and then it increases between 85 and 90. When their results are confronted with ours, we see that the increase in the second half of the 1990s is a small reversal within a long-term downward –sloping trend. As we mentioned in the introduction, these small short-term reversals are a good reason to use long-run data to analyze global inequalities. A second interesting aspect of Figure 9 is that the Gini coefficient reported in almost all studies moves very slowly. The exception is the one reported by Milanovic (2001, 2002). As discussed in the introduction, the large swings in their estimates of global inequality are probably more a reflection of the use of strangely-behaved surveys rather than national accounts income per capita to anchor the distribution means. A third result comes from the comparison with other studies: Bourguignon and Morrison (2002) show increasing inequality between 1970 and 1980, and then a stagnation during the following 12 years. Dowrick and Akmal (2003) report slightly growing inequality. Their Gini estimates are the largest of all that appear in Figure

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<sup>46</sup> However, Sala-i-Martin (2002) shows that if South and East Asia keep growing at current rates and Africa keeps falling behind, global inequalities will increase again as the incomes of Asian citizens will have fully converged to those of OECD citizens and together, they will diverge away from African incomes.

9.<sup>47</sup> Dikhanovic and Ward (2001) also estimate a slightly increasing income inequality between 1970 and 1999. Finally, Bhalla (2001) reports a large fall in the global Gini. This result may be due to his use of World Bank PPP-adjusted GDP per capita data (rather than PWT) to pin down the mean of country distributions. As mentioned above, the growth rate for China reported by the World Bank is much larger than the one reported by the PWT. The more rapid speed of convergence of the 1.2 billion Chinese citizens implied by the WB data tends to accelerate the estimated decline in global income inequality.

## 5. Summary and Conclusions

We combine micro and macro data to estimate the world distribution of income. We use microeconomic surveys to estimate the dispersion of the distribution of 139 countries for each year between 1970 and 2000 and PPP-adjusted national accounts data to pin down the mean of each of these distributions. We integrate the 139 individual distributions to construct the WDI. A number of interesting lessons arise from this analysis.

The first finding is that global poverty rates (defined as the fraction of the WDI below a certain poverty line) declined significantly during the last three decades. The CDF for 1990 stochastically dominates that of 1970. This means that poverty rates declined for all conceivable poverty lines. The 2000 CDF also dominates the 1970 distribution for all levels of income above \$262. The two distributions cross at that level only because the Democratic Republic of Congo (former Zaire) is included in the analysis despite lacking GDP data for the late 1990s. In order to include that war-torn country, we forecasted its GDP using the dismal growth rates of the previous years which may have overestimated the decline of income of the close to 50 million Congolese citizens. If Congo/Zaire is excluded from the analysis, then the 2000 CDF stochastically dominates the 1970 curve so we conclude that poverty rates fell for all conceivable poverty lines.

In order to provide specific poverty numbers, we report poverty rates and headcounts for four different poverty lines: the original World Bank's poverty line of one dollar a day in 1985 prices (which corresponds to \$495 a year in 1996 prices, the base year used in our study). Using this line, poverty rates fell from 15.4% of world's population in 1970 to 11.9% in 1980 to 7.3% in 1990 to 5.7% in 2000. Total headcounts declined from 533 million in

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<sup>47</sup> Dowrick and Akmal (2003)'s preferred measure uses Afriat methods to correct for the substitution bias introduced by PPP transformations. If they use plain PWT data without

1970 to 321 million in 2000. The second line is the 1.5 dollars-a-day-line (\$570 dollars a year), which corresponds to the original line, adjusted for 15% for underreporting of the poor (see Bhalla (2003)). The poverty rates here decline from 20.2% in 1970 to 7% in 2000 and the corresponding poverty counts fall from 700 million in 1970 to 400 million in 2000. Notice that the number of poor in 2000 is about one-third of the 1.2 billion usually cited by popular books (Stiglitz 2002), the United Nations (UNDP (2003)) or the World Bank (2003).

The third line used in the paper is a two dollars-a-day line (\$730 a year). Using this definition, poverty rates fell from 29.6% in 1970 to 10.6% in 2000 and counts fall from 1,029 million in 1970 to 600 million in 2000. Notice that this is about one-third of the widely cited 1.2 billion citizens. Finally, a three-dollar-a-day line suggests that poverty rates fell from 46.6% in 1970 to 21.1% in 2000 and counts went from 1.6 billion in 1970 to 1.2 billion in 2000.

The spectacular reduction of worldwide poverty hides the uneven performance of various regions in the world. East and South Asia account for a large fraction of the success. Africa, on the other hand, seems to have moved in the opposite direction. The dismal growth performance of the African continent has meant that poverty rates and headcounts increased substantially over the last three decades. The implication is that whereas poverty was mostly an Asian phenomenon thirty years ago (87% of the world's poor lived in East and South Asia), poverty is, today, an essentially African problem (68% of the poor live in Africa today whereas only 18% live in Asia).

The collapse of the Soviet Union meant a large decline in mean income and a substantial increase in income inequality. Although these two phenomena potentially contribute to increase poverty, the levels of income of the Eastern Europe and the FSU were so high that poverty did not change significantly. The only countries where poverty increased noticeably were those of Central Asia.

Latin America reduced poverty substantially in the 1970s but progress stopped in the 1980s and 1990s. The Arab World's poverty rates were much smaller than those seen in Africa or Asia in the 1970s. Even so, the MENA countries managed to reduce poverty even further despite their less than stellar macroeconomic performance.

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correction then they conclude that global income inequality declined between 1980 and 1993.

Many experts relate the evolution of world poverty to the process of globalization. The results of this paper may shed some light to this debate since it pinpoints the regions of the world where poverty has actually increased. One may want to ask if those are also the regions that have globalized the most.

Our estimated WDI allows us to compute various measures of inequality across individuals. We report eight measures of global income inequality. All of them deliver the same picture: after remaining constant during the 1970s, inequality declined substantially during the last two decades. The main reason is that incomes of some of the poorest and most populated countries in the World (most importantly China and India, but also many other countries in Asia) rapidly converged to the incomes of OECD citizens. The estimates range from a 2.6% reduction in the variance of log-income to a 30% decline in the top-20th-bottom-20<sup>th</sup> ratio. The Gini coefficient declined by 3.8%, the two Atkinson indexes by 5.7% and 7.8%, top-10th-bottom-10<sup>th</sup> ratio by 17.3%, the MLD by 9% and the Theil Index by 6.9%. Rather than the “divergence, period” famously described by Pritchett (1997), we find that individual incomes have followed a process of “convergence, period!”.

The decomposition of inequality between “within-country” and “across-country” reflects that within-country inequality has been increasing over the sample period. However, the decline in across-country inequality has more than offset the first effect and delivers an overall reduction in global income inequality.

An important lesson arising from our analysis is that within-country dispersion moves very slowly compared to growth of per capita GDP. In other words, the mean of the income distribution moves faster than its variance. One implication is that aggregate economic growth tends to reduce poverty, even in countries where growth tends to increase inequality. Dollar and Kraay (2000) find that a one percent increase in the average growth of a nation tends to increase the income of the lowest quintile by one percent. In other words, growth tends to reduce poverty. Our results are consistent with their finding. Another implication is that the evolution of world income inequality is also mostly driven by economic growth. If the growth rate of rich nations is larger than that of the poor countries, then global inequalities tend to increase and vice versa. The evolution of within-country inequalities plays a small (although increasing) role in the evolution of global income inequality. A corollary is that how the dispersion of income within countries is constructed matters little as long as we have the mean since the mean is what drives both poverty and income inequality.

One final thought. In 2000, the United Nations established the Millennium Goals. Its first and main goal was to “*reduce by half the proportion of people that, in 1990, lived on less than one dollar a day*”. The deadline was 2015. As discussed in the introduction, the statement does not say whether the one dollar should be valued in 2000 prices or in some other baseline. If, by this, they meant \$1/day in 2000 prices (which would correspond to \$340 per year in our 1996-based data), poverty rates in 2000 would be 3.45% and the global number of poor 195 million. This number is an order of magnitude smaller than the widely reported 1.2 billion.<sup>48</sup> The United Nations’ documents mention explicitly that the total number of poor is close to 1.2 billion, which is the number that is often cited by the World Bank. Thus, one imagines that when the UN says that the poverty line is \$1/day, they mean in 1985 prices. As mentioned earlier, if we correct for underreporting of the rich, the corresponding poverty line is \$570. Our Table 1 shows that the poverty rate for this line in 1990 was 10%. The Millennium Goal will be achieved, therefore, when poverty rates are 5%. The poverty rate in 2000 was 7%. Thus, when the Millennium Goal was established in 2000, the world was already 60% of the way towards achieving it. If we exclude Congo/Zaire from the analysis (because no good GDP data are available for that country for the late 1990s), the poverty rate was 9.6% in 1990 and 6.3% in 2000. Hence, by the time the Millennium Goal was established, the world had already gone 69% of the way towards achieving it. The world might just be in a better shape than many of our leaders believe!

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<sup>48</sup> See Stiglitz (2002) and World Bank HDI (2003).



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**TABLE 1: Poverty Rates and Headcounts for Various Poverty Lines**

<b>POVERTY RATES</b>									
<b>Poverty Line</b>	<b>Definition</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 70-2000</b>
\$495	WB Poverty Line (\$1/day)	15.4%	14.0%	11.9%	8.8%	7.3%	6.2%	5.7%	-0.097
\$570	WB Line Adjusted 15% (\$1.5/Day)	20.2%	18.5%	15.9%	12.1%	10.0%	8.0%	7.0%	-0.131
\$730	\$2/day	29.6%	27.5%	24.2%	19.3%	16.2%	12.6%	10.6%	-0.190
\$1,140	\$3/day	46.6%	44.2%	40.3%	34.7%	30.7%	25.0%	21.1%	-0.254
<b>POVERTY HEADCOUNTS (thousands)</b>									
		<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 70-2000</b>
<b>Population</b>		3,472,485	3,830,514	4,175,420	4,539,477	4,938,177	5,305,563	5,660,342	2,187,858
<b>Poverty Line</b>	<b>Definition</b>								
\$495	WB Poverty Line (\$1/day)	533,861	536,379	498,032	399,527	362,902	327,943	321,518	-212,343
\$570	WB Line Adjusted 15% (\$1.5/Day)	699,896	708,825	665,781	548,533	495,221	424,626	398,403	-301,493
\$730	\$2/day	1,028,532	1,052,761	1,008,789	874,115	798,945	671,069	600,275	-428,257
\$1,140	\$3/day	1,616,772	1,691,184	1,681,712	1,575,415	1,517,778	1,327,635	1,197,080	-419,691

**TABLE 2: POVERTY BY REGION (Original WB Poverty Line, \$1.5/Day or \$570/year)**

**POVERTY RATES**

	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
<b>World</b>	5,660,040	0.186	0.169	0.145	0.111	0.097	0.084	0.077	-0.108	-0.041	-0.049	-0.019
<b>East Asia</b>	1,704,242	0.327	0.278	0.217	0.130	0.102	0.038	0.024	-0.303	-0.110	-0.115	-0.078
<b>South Asia</b>	1,327,455	0.303	0.297	0.267	0.178	0.103	0.057	0.025	-0.277	-0.036	-0.164	-0.078
<b>Africa</b>	608,221	0.351	0.360	0.372	0.426	0.437	0.505	0.488	0.137	0.020	0.065	0.051
<b>Latin America</b>	499,716	0.103	0.056	0.030	0.036	0.041	0.038	0.042	-0.061	-0.074	0.012	0.001
<b>Eastern Europe</b>	436,373	0.013	0.005	0.004	0.001	0.004	0.010	0.010	-0.003	-0.009	0.001	0.006
<b>MENA</b>	220,026	0.107	0.092	0.036	0.016	0.012	0.007	0.006	-0.102	-0.071	-0.025	-0.006

**POVERTY HEADCOUNTS**

	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
<b>World</b>	5,660,040	645,242	649,169	606,400	505,186	476,704	445,650	437,732	-207,509	-38,842	-129,696	-38,971
<b>East Asia</b>	1,704,242	350,263	334,266	281,914	182,205	154,973	61,625	41,071	-309,192	-68,349	-126,941	-113,902
<b>South Asia</b>	1,327,455	211,364	234,070	236,366	176,536	113,661	69,582	33,438	-177,926	25,002	-122,705	-80,223
<b>Africa</b>	608,221	93,528	109,491	129,890	172,175	204,364	269,733	296,733	203,205	36,361	74,474	92,369
<b>Latin America</b>	499,716	27,897	17,014	10,195	13,836	17,406	17,379	21,012	-6,885	-17,702	7,211	3,607
<b>Eastern Europe</b>	436,373	4,590	1,991	1,418	369	1,906	4,238	4,402	-188	-3,172	488	2,496
<b>MENA</b>	220,026	11,250	10,954	4,991	2,507	2,101	1,466	1,264	-9,986	-6,259	-2,890	-837

**FRACTION OF WORLD'S POOR IN EACH REGION**

	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
<b>World</b>	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%				
<b>East Asia</b>	30.1%	54.3%	51.5%	46.5%	36.1%	32.5%	13.8%	9.4%	-44.9%	-7.8%	-14.0%	-23.1%
<b>South Asia</b>	23.5%	32.8%	36.1%	39.0%	34.9%	23.8%	15.6%	7.6%	-25.1%	6.2%	-15.1%	-16.2%
<b>Africa</b>	10.7%	14.5%	16.9%	21.4%	34.1%	42.9%	60.5%	67.8%	53.3%	6.9%	21.5%	24.9%
<b>Latin America</b>	8.8%	4.3%	2.6%	1.7%	2.7%	3.7%	3.9%	4.8%	0.5%	-2.6%	2.0%	1.1%
<b>Eastern Europe</b>	7.7%	0.7%	0.3%	0.2%	0.1%	0.4%	1.0%	1.0%	0.3%	-0.5%	0.2%	0.6%
<b>MENA</b>	3.9%	1.7%	1.7%	0.8%	0.5%	0.4%	0.3%	0.3%	-1.5%	-0.9%	-0.4%	-0.2%

**TABLE 3A: POVERTY IN EAST ASIA AND PACIFIC (Original WB Poverty Line, \$1.5/day or \$570 a year)**

Rates	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
China	1,258,821	0.355	0.318	0.265	0.159	0.131	0.048	0.031	-0.324	-0.090	-0.134	-0.100
Fiji	808	0.033	0.014	0.007	0.010	0.005	0.003	0.003	-0.030	-0.026	-0.002	-0.002
Indonesia	210,421	0.347	0.202	0.079	0.031	0.007	0.001	0.001	-0.347	-0.268	-0.072	-0.006
Korea, Rep.	47,275	0.037	0.007	0.001	0.000	0.000	0.000	0.000	-0.037	-0.036	-0.001	0.000
Malaysia	23,270	0.158	0.091	0.025	0.011	0.002	0.000	0.000	-0.158	-0.133	-0.022	-0.002
Philippines	75,580	0.193	0.135	0.073	0.100	0.061	0.047	0.020	-0.173	-0.120	-0.012	-0.042
Papua New Guinea	5,181	0.113	0.056	0.089	0.093	0.110	0.056	0.107	-0.006	-0.024	0.022	-0.003
Thailand	60,728	0.231	0.202	0.129	0.075	0.011	0.001	0.000	-0.231	-0.102	-0.118	-0.011
Taiwan	22,157	0.004	0.000	0.000	0.000	0.000	0.000	0.000	-0.004	-0.004	0.000	0.000
<b>TOTAL</b>	<b>1,704,242</b>	<b>0.327</b>	<b>0.278</b>	<b>0.217</b>	<b>0.130</b>	<b>0.102</b>	<b>0.038</b>	<b>0.024</b>	<b>-0.303</b>	<b>-0.110</b>	<b>-0.148</b>	<b>-0.115</b>

Counts	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
China	1,258,821	290,657	291,798	259,972	167,282	148,784	57,874	38,860	-251,797	-30,685	-111,187	-109,924
Fiji	808	17	8	4	7	4	2	2	-15	-13	-1	-2
Indonesia	210,421	40,826	26,779	11,735	5,119	1,258	160	132	-40,694	-29,091	-10,477	-1,126
Korea, Rep.	47,275	1,200	235	29	2	1	1	1	-1,199	-1,171	-28	0
Malaysia	23,270	1,713	1,116	338	169	44	3	1	-1,711	-1,375	-294	-43
Philippines	75,580	7,250	5,834	3,530	5,464	3,844	3,301	1,491	-5,759	-3,720	314	-2,353
Papua New Guinea	5,181	273	154	273	320	423	240	555	281	0	150	132
Thailand	60,728	8,265	8,336	6,032	3,841	615	43	28	-8,237	-2,233	-5,417	-587
Taiwan	22,157	62	7	1	1	1	1	1	-61	-61	0	0
<b>TOTAL</b>	<b>1,704,242</b>	<b>350,263</b>	<b>334,266</b>	<b>281,914</b>	<b>182,205</b>	<b>154,973</b>	<b>61,625</b>	<b>41,071</b>	<b>-309,192</b>	<b>-68,349</b>	<b>-126,941</b>	<b>-113,902</b>

**TABLE 3B: POVERTY IN SOUTH ASIA (Original WB Poverty Line, \$1.5/day or \$570 a year)**

Rates	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
Bangladesh	131,050	0.352	0.409	0.393	0.281	0.214	0.130	0.066	-0.285	0.042	-0.179	-0.148
India	1,015,923	0.289	0.281	0.252	0.168	0.089	0.044	0.013	-0.276	-0.037	-0.163	-0.075
Sri Lanka	19,359	0.195	0.165	0.131	0.058	0.033	0.009	0.005	-0.190	-0.064	-0.099	-0.028
Nepal	23,043	0.391	0.360	0.405	0.335	0.313	0.267	0.217	-0.174	0.014	-0.092	-0.096
Pakistan	138,080	0.375	0.328	0.258	0.146	0.078	0.056	0.045	-0.331	-0.118	-0.180	-0.033
<b>TOTAL</b>	<b>1,327,455</b>	<b>0.303</b>	<b>0.297</b>	<b>0.267</b>	<b>0.178</b>	<b>0.103</b>	<b>0.057</b>	<b>0.025</b>	<b>-0.277</b>	<b>-0.036</b>	<b>-0.164</b>	<b>-0.078</b>

Counts	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
Bangladesh	131,050	23,439	31,329	34,087	27,532	23,599	15,610	8,684	-14,755	10,648	-10,487	-14,915
India	1,015,923	158,312	172,591	173,143	128,725	75,229	41,295	13,516	-144,795	14,831	-97,913	-61,713
Sri Lanka	19,359	2,442	2,232	1,937	914	554	172	94	-2,348	-505	-1,383	-460
Nepal	23,043	4,429	4,606	5,877	5,520	5,877	5,688	4,992	563	1,448	0	-885
Pakistan	138,080	22,742	23,312	21,323	13,845	8,401	6,817	6,151	-16,591	-1,420	-12,921	-2,250
<b>TOTAL</b>	<b>1,327,455</b>	<b>211,364</b>	<b>234,070</b>	<b>236,366</b>	<b>176,536</b>	<b>113,661</b>	<b>69,582</b>	<b>33,438</b>	<b>-177,926</b>	<b>25,002</b>	<b>-122,705</b>	<b>-80,223</b>



TABLE 3D: POVERTY IN LATIN AMERICA AND THE CARIBBEAN (Original WB Poverty Line, \$1.5/day or \$570 a year)

Latin America and the Caribbean (Rates)	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
Antigua	68	0.071	0.061	0.029	0.011	0.008	0.016	0.009	-0.062	-0.042	-0.020	0.001
Argentina	37,032	0.000	0.000	0.000	0.001	0.011	0.003	0.006	0.006	0.000	0.011	-0.005
Barbados	267	0.120	0.041	0.023	0.031	0.014	0.020	0.014	-0.106	-0.097	-0.009	0.000
Belize	240	0.079	0.079	0.114	0.155	0.094	0.106	0.104	0.025	0.035	-0.020	0.010
Bolivia	8,329	0.008	0.000	0.001	0.016	0.094	0.219	0.324	0.316	-0.007	0.093	0.229
Brazil	170,406	0.173	0.081	0.037	0.042	0.040	0.027	0.019	-0.154	-0.135	0.002	-0.021
Chile	15,211	0.016	0.039	0.013	0.026	0.011	0.002	0.001	-0.016	-0.003	-0.002	-0.010
Colombia	42,299	0.065	0.046	0.035	0.050	0.046	0.049	0.081	0.016	-0.031	0.011	0.035
Costa Rica	3,811	0.040	0.021	0.011	0.025	0.019	0.012	0.007	-0.033	-0.029	0.008	-0.012
Dominica	73	0.442	0.358	0.366	0.195	0.171	0.150	0.159	-0.283	-0.077	-0.195	-0.012
Dominican Republic	8,373	0.179	0.108	0.078	0.066	0.063	0.033	0.005	-0.175	-0.102	-0.015	-0.058
Ecuador	12,646	0.046	0.006	0.002	0.006	0.012	0.016	0.042	-0.004	-0.044	0.010	0.029
El Salvador	6,276	0.012	0.010	0.021	0.054	0.075	0.054	0.060	0.048	0.010	0.054	-0.016
Grenada	98	0.512	0.459	0.362	0.263	0.191	0.202	0.169	-0.343	-0.150	-0.172	-0.021
Guatemala	11,385	0.116	0.075	0.045	0.098	0.123	0.142	0.166	0.050	-0.071	0.079	0.042
Guyana	743	0.041	0.038	0.033	0.101	0.141	0.086	0.036	-0.005	-0.008	0.108	-0.105
Haiti	7,983	0.571	0.585	0.463	0.533	0.588	0.394	0.239	-0.333	-0.108	0.124	-0.349
Honduras	6,417	0.007	0.012	0.017	0.061	0.169	0.298	0.392	0.385	0.010	0.152	0.223
Jamaica	2,633	0.118	0.065	0.059	0.041	0.007	0.005	0.003	-0.114	-0.059	-0.052	-0.003
Mexico	97,221	0.084	0.031	0.007	0.004	0.003	0.002	0.000	-0.084	-0.077	-0.004	-0.002
Nicaragua	5,071	0.000	0.000	0.003	0.014	0.135	0.310	0.416	0.416	0.002	0.132	0.282
Panama	2,856	0.154	0.119	0.054	0.031	0.051	0.026	0.014	-0.140	-0.100	-0.003	-0.036
Paraguay	5,496	0.121	0.108	0.061	0.098	0.103	0.126	0.186	0.065	-0.060	0.042	0.083
Peru	25,661	0.003	0.000	0.001	0.004	0.026	0.017	0.029	0.025	-0.003	0.025	0.003
St. Kitts and Nevis	41	0.661	0.434	0.220	0.155	0.103	0.045	0.025	-0.636	-0.441	-0.116	-0.078
St. Lucia	156	0.349	0.345	0.291	0.284	0.124	0.103	0.142	-0.208	-0.058	-0.167	0.017
St. Vincent and Grenadines	115	0.689	0.479	0.344	0.188	0.165	0.138	0.142	-0.547	-0.345	-0.180	-0.022
Trinidad and Tobago	1,301	0.135	0.029	0.001	0.001	0.001	0.001	0.001	-0.134	-0.134	-0.001	0.000
Uruguay	3,337	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Venezuela	24,170	0.000	0.000	0.000	0.001	0.001	0.001	0.003	0.003	0.000	0.001	0.002
<b>TOTAL</b>	<b>499,716</b>	<b>0.103</b>	<b>0.056</b>	<b>0.030</b>	<b>0.036</b>	<b>0.041</b>	<b>0.038</b>	<b>0.042</b>	<b>-0.061</b>	<b>-0.074</b>	<b>0.012</b>	<b>0.001</b>

Latin America and the Caribbean (Counts)	2000 Population	1970	1975	1980	1985	1990	1995	2000	Change 1970-2000	Change 70s	Change 80s	Change 90s
Antigua	68	5	4	2	1	1	1	1	-4	-3	-1	0
Argentina	37,032	1	2	2	38	367	103	231	229	1	364	-136
Barbados	267	29	10	6	8	4	5	4	-25	-23	-2	0
Belize	240	9	10	17	26	18	23	25	16	8	1	7
Bolivia	8,329	34	1	4	97	619	1,625	2,695	2,661	-30	615	2,076
Brazil	170,406	16,569	8,761	4,536	5,739	5,872	4,226	3,236	-13,333	-12,033	1,336	-2,836
Chile	15,211	156	404	149	314	142	23	11	-145	-7	-7	-131
Colombia	42,299	1,475	1,161	986	1,573	1,607	1,887	3,445	1,970	-490	622	1,838
Costa Rica	3,811	69	41	25	67	56	41	26	-43	-44	31	-30
Dominica	73	30	25	27	14	12	11	12	-18	-3	-14	-1
Dominican Republic	8,373	794	547	443	420	447	262	40	-753	-351	4	-407
Ecuador	12,646	274	40	18	57	128	187	531	256	-256	110	402
El Salvador	6,276	42	42	98	257	383	307	374	331	56	285	-10
Grenada	98	48	42	33	24	18	19	17	-32	-16	-15	-1
Guatemala	11,385	607	449	305	756	1,080	1,416	1,885	1,278	-302	775	805
Guyana	743	29	28	25	80	112	72	27	-2	-4	67	-85
Haiti	7,983	2,582	2,876	2,480	3,124	3,804	2,824	1,904	-678	-102	1,324	-1,900
Honduras	6,417	17	35	61	257	823	1,688	2,513	2,496	44	762	1,690
Jamaica	2,633	220	131	126	94	16	13	9	-211	-94	-110	-7
Mexico	97,221	4,089	1,774	454	259	210	149	14	-4,076	-3,635	-243	-197
Nicaragua	5,071	1	1	8	47	515	1,372	2,111	2,110	7	507	1,595
Panama	2,856	232	205	105	68	121	68	41	-191	-127	17	-81
Paraguay	5,496	284	288	189	355	433	611	1,021	736	-95	244	588
Peru	25,661	45	4	14	76	556	389	740	695	-31	542	184
St. Kitts and Nevis	41	28	19	10	7	4	2	1	-27	-18	-5	-3
St. Lucia	156	35	37	34	35	17	15	22	-12	-1	-17	5
St. Vincent and Grenadines	115	61	45	34	19	18	15	16	-45	-27	-16	-1
Trinidad and Tobago	1,301	131	29	2	1	1	1	1	-130	-130	-1	0
Uruguay	3,337	1	1	1	2	1	1	1	0	0	0	0
Venezuela	24,170	1	2	4	19	21	23	63	62	3	17	42
<b>TOTAL</b>	<b>499,716</b>	<b>27,897</b>	<b>17,014</b>	<b>10,195</b>	<b>13,836</b>	<b>17,406</b>	<b>17,379</b>	<b>21,012</b>	<b>-6,885</b>	<b>-17,702</b>	<b>7,211</b>	<b>3,607</b>



**TABLE 3E: POVERTY IN MIDDLE EAST AND NORTH AFRICA (Original WB Poverty Line, \$1.5/day or \$570 a year)**

<b>Rates</b>	<b>2000 Population</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 1970-2000</b>	<b>Change 70s</b>	<b>Change 80s</b>	<b>Change 90s</b>
Egypt, Arab Rep.	63,976	0.240	0.245	0.089	0.023	0.003	0.000	0.000	-0.240	-0.151	-0.086	-0.003
Iran, Islamic Rep.	63,664	0.001	0.001	0.006	0.004	0.011	0.002	0.001	0.000	0.006	0.004	-0.010
Jordan	4,887	0.208	0.158	0.007	0.002	0.008	0.003	0.001	-0.207	-0.201	0.001	-0.006
Morocco	28,705	0.070	0.047	0.022	0.017	0.009	0.011	0.007	-0.063	-0.048	-0.013	-0.002
Mauritania	2,643	0.196	0.215	0.204	0.278	0.337	0.353	0.318	0.121	0.007	0.134	-0.020
Syrian Arab Republic	16,189	0.199	0.061	0.034	0.034	0.035	0.012	0.010	-0.189	-0.165	0.000	-0.024
Tunisia	9,564	0.046	0.009	0.003	0.002	0.002	0.001	0.000	-0.046	-0.043	-0.001	-0.002
Algeria	30,399	0.014	0.008	0.001	0.000	0.000	0.001	0.000	-0.014	-0.013	-0.001	0.000
<b>TOTAL</b>	<b>220,026</b>	<b>0.107</b>	<b>0.092</b>	<b>0.036</b>	<b>0.016</b>	<b>0.012</b>	<b>0.007</b>	<b>0.006</b>	<b>-0.102</b>	<b>-0.194</b>	<b>-0.230</b>	<b>-0.246</b>

<b>Counts</b>	<b>2000 Population</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 1970-2000</b>	<b>Change 70s</b>	<b>Change 80s</b>	<b>Change 90s</b>
Egypt, Arab Rep.	63,976	7,926	8,897	3,646	1,084	151	20	2	-7,924	-4,280	-3,495	-149
Iran, Islamic Rep.	63,664	18	35	253	182	588	128	38	20	235	334	-550
Jordan	4,887	314	286	15	6	24	12	7	-307	-299	9	-17
Morocco	28,705	1,073	805	423	376	208	290	196	-877	-651	-215	-12
Mauritania	2,643	240	295	316	491	683	822	840	600	76	367	156
Syrian Arab Republic	16,189	1,245	453	299	349	419	164	168	-1,077	-946	120	-251
Tunisia	9,564	238	53	21	14	16	9	2	-236	-218	-5	-13
Algeria	30,399	195	131	18	5	12	21	11	-184	-177	-7	-1
<b>TOTAL</b>	<b>220,026</b>	<b>11,250</b>	<b>10,954</b>	<b>4,991</b>	<b>2,507</b>	<b>2,101</b>	<b>1,466</b>	<b>1,264</b>	<b>-9,986</b>	<b>-6,259</b>	<b>-2,890</b>	<b>-837</b>

**TABLE 3F: POVERTY EASTERN EUROPE AND CENTRAL ASIA (Original WB Poverty Line, \$1.5/day or \$570 a year)**

<b>Rates</b>	<b>2000 Population</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 1970-2000</b>	<b>Change 70s</b>	<b>Change 80s</b>	<b>Change 90s</b>
Romania	22,435	0.001	0.000	0.004	0.000	0.000	0.000	0.001	0.000	0.003	-0.004	0.001
Turkey	66,835	0.128	0.050	0.030	0.007	0.001	0.000	0.000	-0.128	-0.098	-0.029	-0.001
Czechoslovakia	15,694	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Poland	38,646	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hungary	10,024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>USSR</b>	<b>282,739</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>					<b>0.000</b>	<b>0.006</b>	
Armenia	3,803					0.184	0.084	0.010			0.184	-0.174
Azerbaijan	8,049					0.004	0.077	0.089			0.004	0.086
Belarus	10,005					0.000	0.000	0.000			0.000	0.000
Estonia	1,369					0.001	0.001	0.002			0.001	0.001
Georgia	5,024					0.000	0.001	0.007			0.000	0.007
Kazakhstan	14,869					0.000	0.000	0.000			0.000	0.000
Kyrgyzstan	4,915					0.002	0.044	0.072			0.002	0.070
Lithuania	3,695					0.000	0.000	0.000			0.000	0.000
Latvia	2,372					0.000	0.000	0.000			0.000	0.000
Russian Federation	145,555					0.000	0.000	0.000			0.000	0.000
Tajikistan	6,170					0.179	0.353	0.282			0.179	0.104
Turkmenistan	4,530					0.000	0.001	0.003			0.000	0.002
Ukraine	49,501					0.000	0.000	0.000			0.000	0.000
Uzbekistan	22,882					0.003	0.043	0.061			0.003	0.059
<b>Aggregate of FSU</b>						<b>0.006</b>	<b>0.015</b>	<b>0.015</b>	<b>0.015</b>			<b>0.001</b>
<b>TOTAL</b>	<b>436,373</b>	<b>0.013</b>	<b>0.005</b>	<b>0.004</b>	<b>0.001</b>	<b>0.004</b>	<b>0.010</b>	<b>0.010</b>				

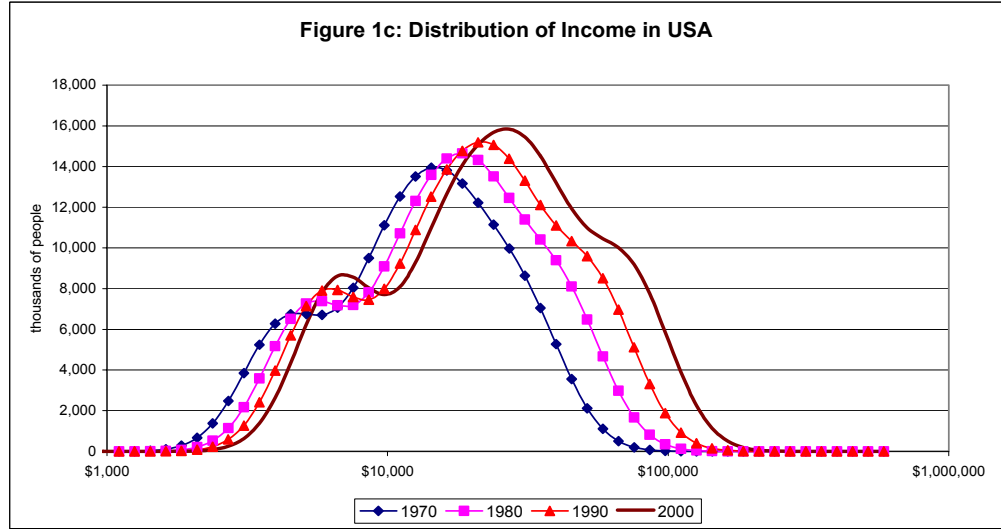
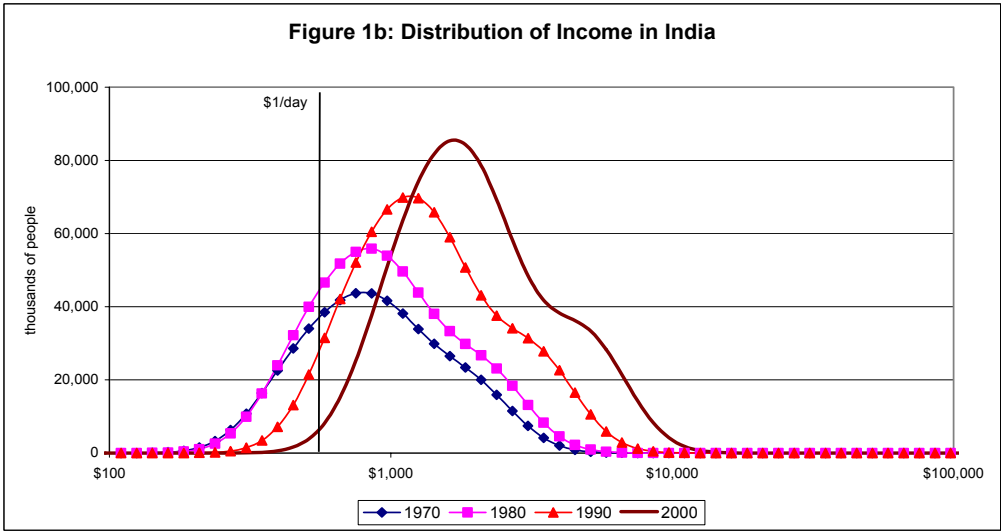
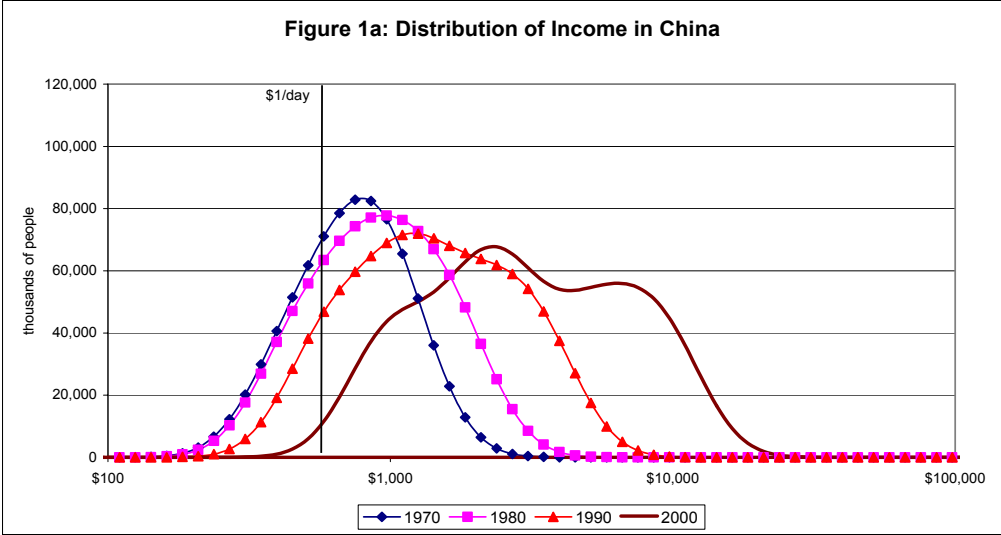
<b>Counts</b>	<b>2000 Population</b>	<b>1970</b>	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>Change 1970-2000</b>	<b>Change 70s</b>	<b>Change 80s</b>	<b>Change 90s</b>
Romania	22,435	30	2	90	1	1	3	25	-4	60	-89	24
Turkey	66,835	4,541	1,985	1,324	365	55	14	3	-4,539	-3,217	-1,269	-52
Czechoslovakia	15,694	1	1	1	1	1	1	1	0	0	0	0
Poland	38,646	1	1	1	1	1	1	1	0	0	0	0
Hungary	10,024	1	1	1	1	1	1	1	0	0	0	0
<b>USSR</b>	<b>282,739</b>	<b>17</b>	<b>2</b>	<b>1</b>	<b>1</b>				<b>-17</b>	<b>-16</b>	<b>-1</b>	<b>0</b>
Armenia	3,803					678	315,215,790,2	37			678	-641
Azerbaijan	8,049					27	594	718			27	692
Belarus	10,005					1	1	1			1	0
Estonia	1,369					1	1	2			1	1
Georgia	5,024					1	8	37			1	36
Kazakhstan	14,869					1	2	2			1	1
Kyrgyzstan	4,915					7	198	353			7	346
Lithuania	3,695					1	1	1			1	0
Latvia	2,372					1	1	1			1	0
Russian Federation	145,555					1	3	36			1	35
Tajikistan	6,170					1,065	2,098	1,741			1,065	675
Turkmenistan	4,530					1	5	12			1	11
Ukraine	49,501					1	4	25			1	24
Uzbekistan	22,882					63	988	1,406			63	1,343
<b>Aggregate of FSU</b>						<b>1,848</b>	<b>4,218</b>	<b>4,372</b>	<b>4,355</b>	<b>-16</b>	<b>1,847</b>	<b>2,524</b>
<b>TOTAL</b>	<b>436,373</b>	<b>4,590</b>	<b>1,991</b>	<b>1,418</b>	<b>369</b>	<b>1,906</b>	<b>4,238</b>	<b>4,402</b>	<b>-205</b>	<b>-3,188</b>	<b>488</b>	<b>2,496</b>

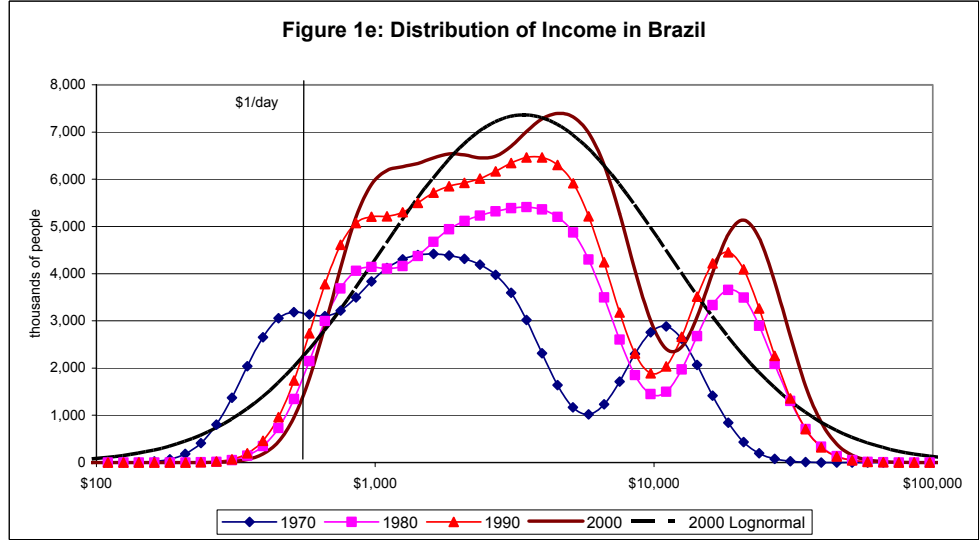
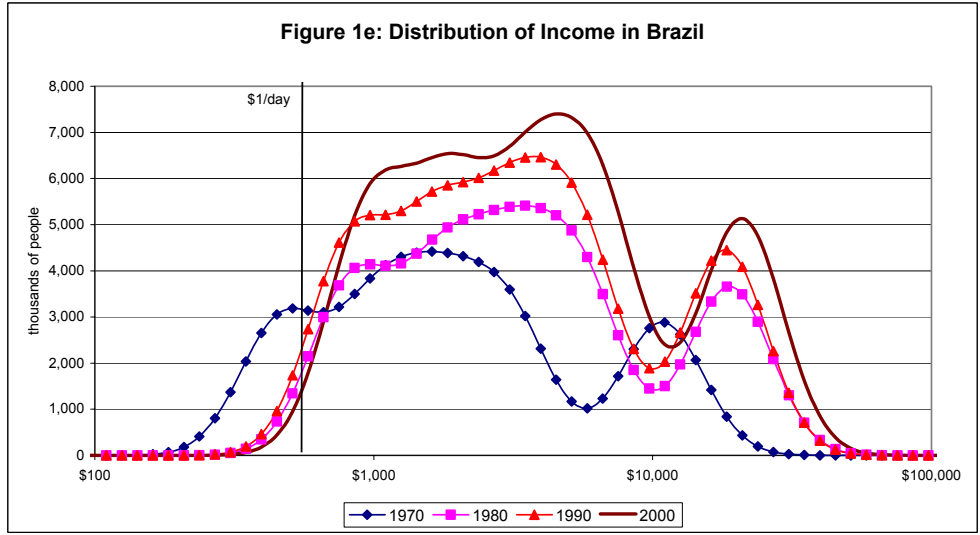
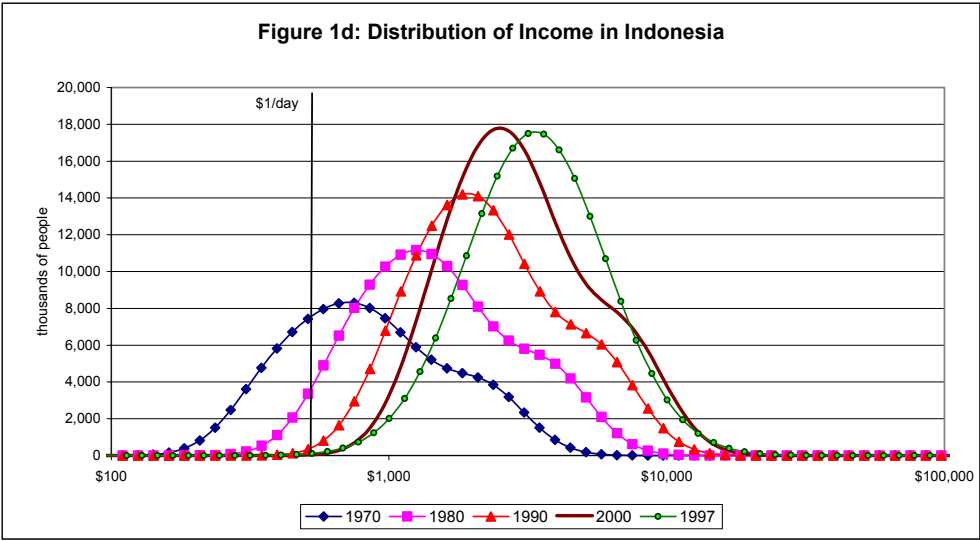
**TABLE 4A: WORLD INCOME INEQUALITY: INDIVIDUAL INDEXES**

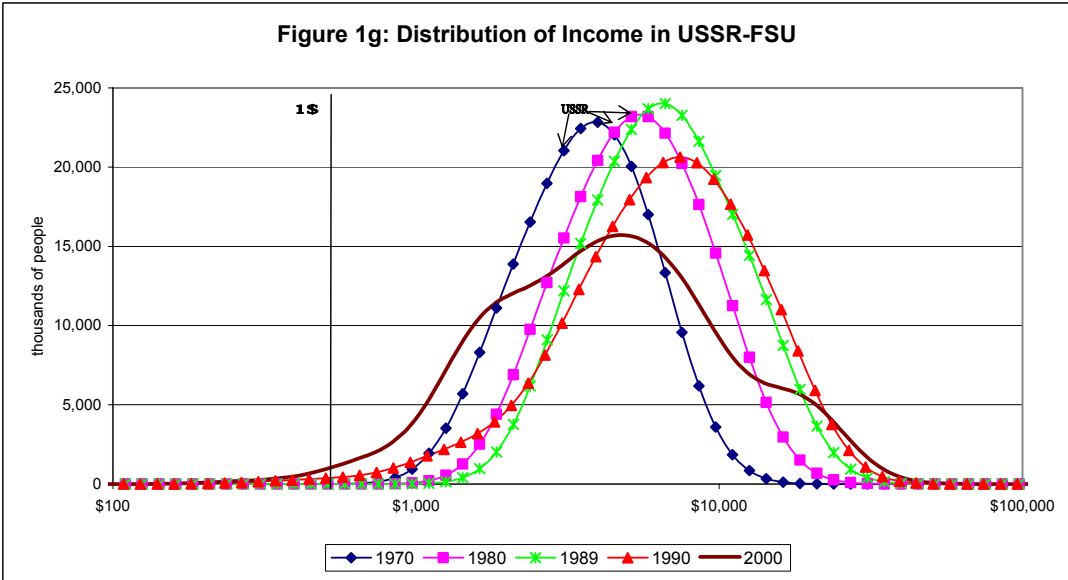
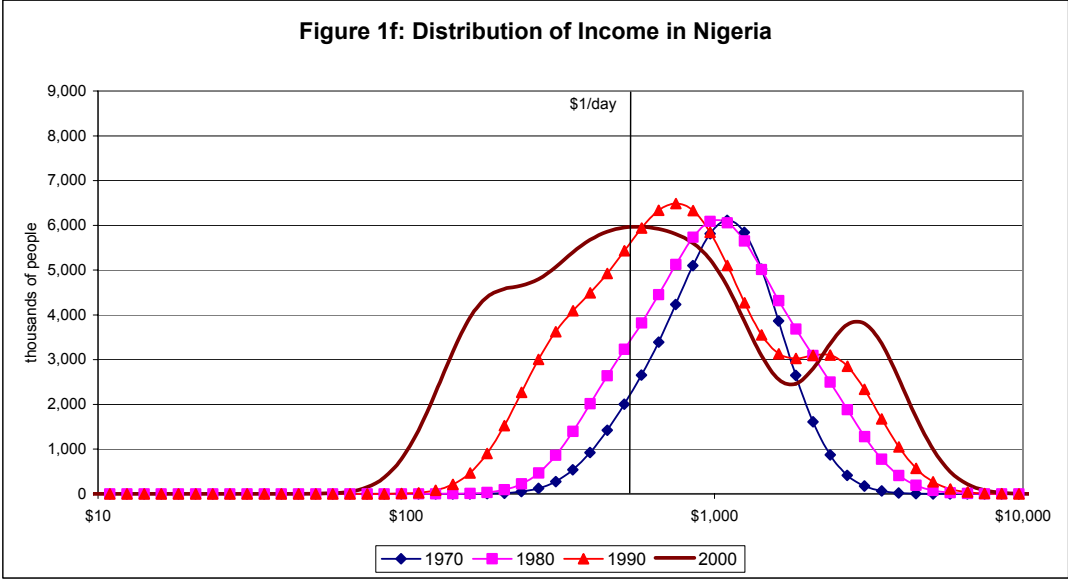
year	Gini	A(0.5)	A(1)	Variance			MLD	THEIL
				Log Income	20/20	10/10		
1970	0.653	0.351	0.577	1.581	10.319	28.215	0.861	0.812
1971	0.653	0.352	0.579	1.587	10.430	28.395	0.864	0.814
1972	0.657	0.357	0.585	1.620	10.732	29.345	0.880	0.825
1973	0.660	0.360	0.590	1.647	11.004	30.059	0.893	0.832
1974	0.660	0.360	0.590	1.651	11.031	30.223	0.892	0.830
1975	0.654	0.353	0.581	1.612	10.737	28.943	0.871	0.814
1976	0.658	0.358	0.589	1.655	11.130	30.234	0.890	0.826
1977	0.659	0.358	0.589	1.648	11.002	30.008	0.888	0.828
1978	0.661	0.361	0.592	1.669	11.152	30.592	0.898	0.835
1979	0.662	0.362	0.593	1.665	11.048	30.544	0.898	0.839
1980	0.660	0.359	0.589	1.644	10.772	29.922	0.888	0.833
1981	0.657	0.356	0.584	1.617	10.485	29.137	0.876	0.828
1982	0.651	0.348	0.574	1.578	10.132	28.018	0.852	0.807
1983	0.649	0.346	0.570	1.565	9.949	27.486	0.845	0.803
1984	0.649	0.346	0.569	1.559	9.720	27.150	0.843	0.806
1985	0.650	0.347	0.571	1.570	9.714	27.397	0.847	0.809
1986	0.647	0.344	0.567	1.552	9.459	26.933	0.837	0.803
1987	0.647	0.344	0.566	1.550	9.344	26.929	0.836	0.803
1988	0.649	0.346	0.569	1.566	9.367	27.220	0.842	0.808
1989	0.653	0.351	0.576	1.593	9.514	28.100	0.857	0.820
1990	0.652	0.350	0.575	1.593	9.503	28.137	0.855	0.818
1991	0.648	0.345	0.569	1.578	9.159	27.479	0.842	0.807
1992	0.645	0.342	0.565	1.571	8.793	26.879	0.833	0.800
1993	0.640	0.337	0.559	1.558	8.533	26.195	0.819	0.787
1994	0.640	0.337	0.559	1.568	8.322	26.039	0.819	0.789
1995	0.638	0.335	0.557	1.561	8.174	25.731	0.814	0.784
1996	0.636	0.333	0.555	1.562	8.082	25.486	0.809	0.779
1997	0.637	0.334	0.557	1.580	7.960	25.736	0.814	0.782
1998	0.638	0.335	0.558	1.585	8.048	25.560	0.816	0.785
1999	0.638	0.335	0.559	1.600	8.074	25.718	0.819	0.787
2000	0.637	0.335	0.560	1.623	8.220	25.704	0.820	0.783
<b>% Change</b>	<b>-2.4%</b>	<b>-4.9%</b>	<b>-3.1%</b>	<b>2.6%</b>	<b>-22.7%</b>	<b>-9.3%</b>	<b>-4.9%</b>	<b>-3.7%</b>
<b>% Change Since 1979</b>	<b>-3.8%</b>	<b>-7.8%</b>	<b>-5.7%</b>	<b>-2.6%</b>	<b>-29.6%</b>	<b>-17.3%</b>	<b>-9.0%</b>	<b>-6.9%</b>

**TABLE 4B: DECOMPOSITION of WORLD INCOME INEQUALITY**

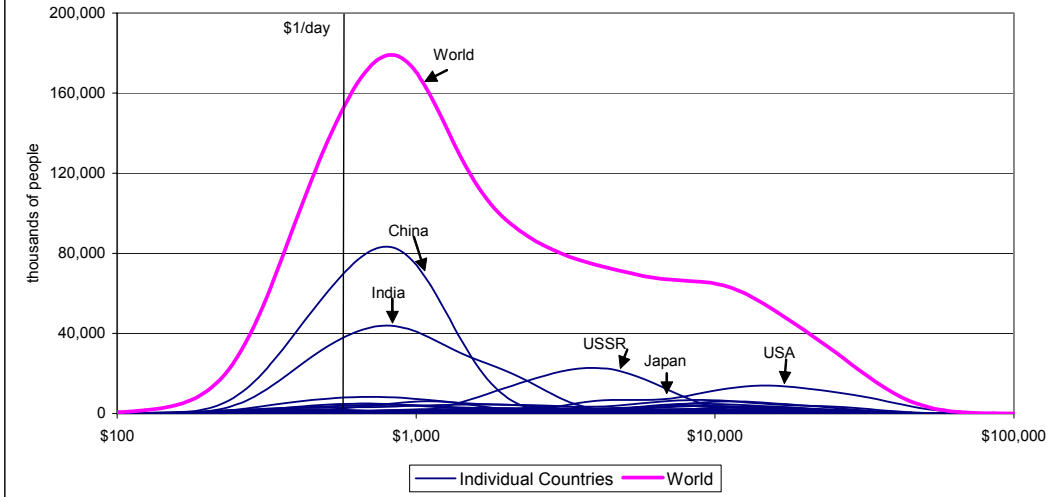
year	Mean Log Deviation					Theil Index				
	Global	Across	% Across	Within	%Within	Global	Across	% Across	Within	%Within
1970	0.861	0.616	71.5%	0.246	28.5%	0.812	0.557	68.6%	0.255	31.4%
1971	0.864	0.618	71.5%	0.246	28.5%	0.814	0.558	68.6%	0.256	31.4%
1972	0.880	0.634	72.0%	0.247	28.0%	0.825	0.568	68.9%	0.256	31.1%
1973	0.893	0.645	72.3%	0.247	27.7%	0.832	0.576	69.2%	0.257	30.8%
1974	0.892	0.644	72.2%	0.248	27.8%	0.830	0.573	69.0%	0.257	31.0%
1975	0.871	0.622	71.5%	0.248	28.5%	0.814	0.557	68.3%	0.258	31.7%
1976	0.890	0.640	71.9%	0.250	28.1%	0.826	0.567	68.6%	0.259	31.4%
1977	0.888	0.637	71.7%	0.251	28.3%	0.828	0.569	68.7%	0.259	31.3%
1978	0.898	0.645	71.8%	0.253	28.2%	0.835	0.576	68.9%	0.259	31.1%
1979	0.898	0.643	71.6%	0.255	28.4%	0.839	0.578	68.9%	0.261	31.1%
1980	0.888	0.632	71.1%	0.256	28.9%	0.833	0.571	68.6%	0.262	31.4%
1981	0.876	0.618	70.6%	0.258	29.4%	0.828	0.566	68.3%	0.262	31.7%
1982	0.852	0.592	69.5%	0.260	30.5%	0.807	0.546	67.6%	0.262	32.4%
1983	0.845	0.583	69.0%	0.262	31.0%	0.803	0.543	67.6%	0.260	32.4%
1984	0.843	0.579	68.7%	0.264	31.3%	0.806	0.546	67.7%	0.260	32.3%
1985	0.847	0.581	68.6%	0.266	31.4%	0.809	0.549	67.8%	0.261	32.2%
1986	0.837	0.569	68.0%	0.268	32.0%	0.803	0.542	67.5%	0.261	32.5%
1987	0.836	0.565	67.7%	0.270	32.3%	0.803	0.542	67.5%	0.261	32.5%
1988	0.842	0.569	67.6%	0.273	32.4%	0.808	0.548	67.8%	0.260	32.2%
1989	0.857	0.581	67.9%	0.275	32.1%	0.820	0.559	68.2%	0.261	31.8%
1990	0.855	0.577	67.5%	0.278	32.5%	0.818	0.557	68.1%	0.261	31.9%
1991	0.842	0.559	66.4%	0.283	33.6%	0.807	0.542	67.2%	0.264	32.8%
1992	0.833	0.546	65.6%	0.287	34.4%	0.800	0.533	66.6%	0.267	33.4%
1993	0.819	0.529	64.6%	0.290	35.4%	0.787	0.518	65.8%	0.269	34.2%
1994	0.819	0.525	64.1%	0.294	35.9%	0.789	0.517	65.5%	0.272	34.5%
1995	0.814	0.516	63.5%	0.297	36.5%	0.784	0.511	65.1%	0.273	34.9%
1996	0.809	0.508	62.8%	0.301	37.2%	0.779	0.504	64.7%	0.275	35.3%
1997	0.814	0.509	62.5%	0.305	37.5%	0.782	0.505	64.5%	0.277	35.5%
1998	0.816	0.506	62.0%	0.310	38.0%	0.785	0.506	64.4%	0.279	35.6%
1999	0.819	0.504	61.6%	0.315	38.4%	0.787	0.506	64.3%	0.281	35.7%
2000	0.820	0.501	61.1%	0.319	38.9%	0.783	0.499	63.8%	0.284	36.2%
<b>Change</b>	<b>-0.041</b>	<b>-0.114</b>	<b>-0.104</b>	<b>0.073</b>	<b>0.104</b>	<b>-0.030</b>	<b>-0.058</b>	<b>-0.048</b>	<b>0.029</b>	<b>0.048</b>
<b>Change Since 1979</b>	<b>-0.078</b>	<b>-0.142</b>	<b>-0.105</b>	<b>0.064</b>	<b>0.105</b>	<b>-0.056</b>	<b>-0.079</b>	<b>-0.052</b>	<b>0.023</b>	<b>0.052</b>
<b>% Change Since 1979</b>	<b>-9.04%</b>	<b>-24.92%</b>		<b>22.50%</b>		<b>-6.91%</b>	<b>-14.68%</b>		<b>8.44%</b>	



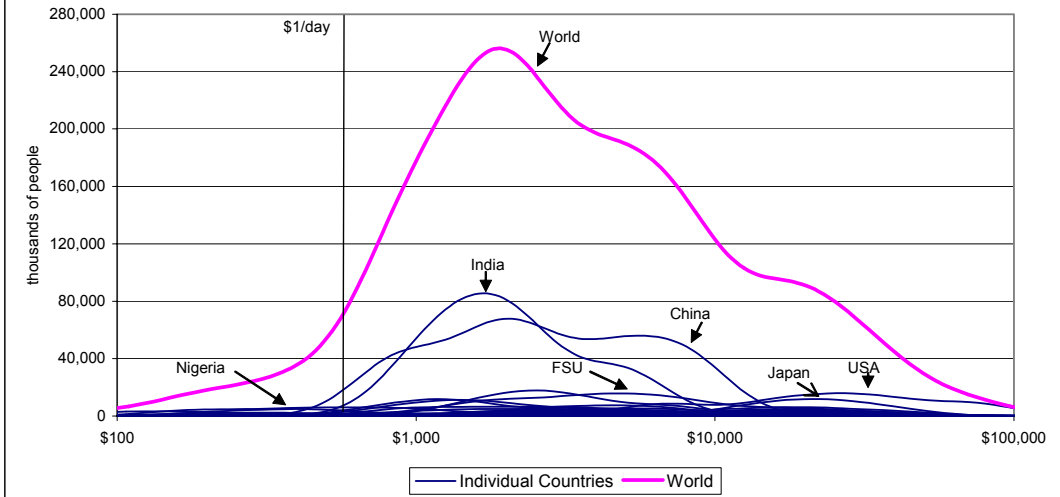




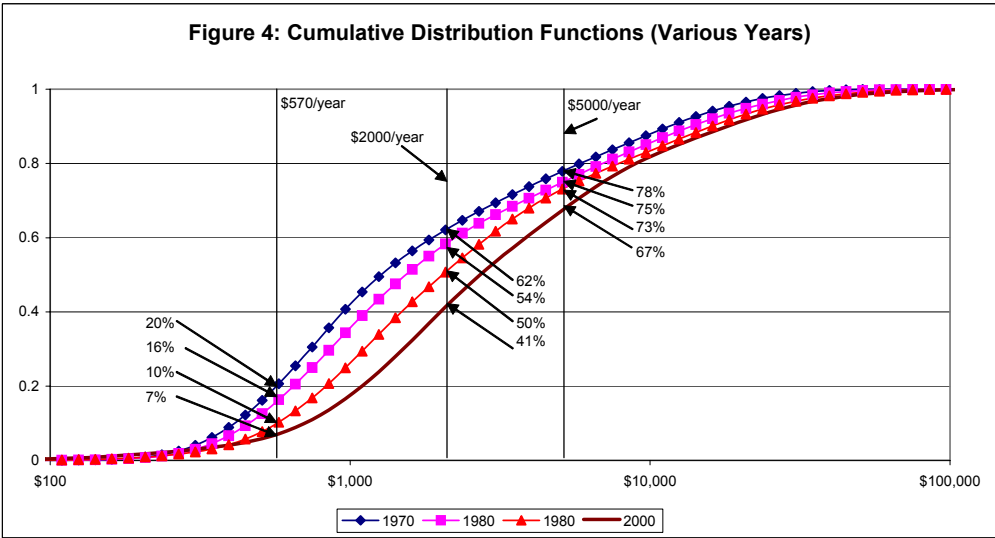
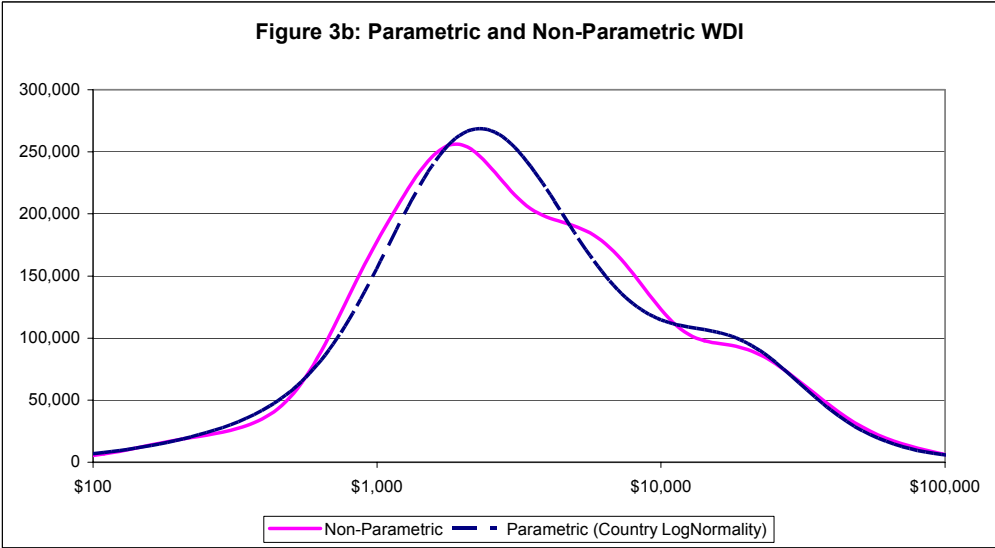
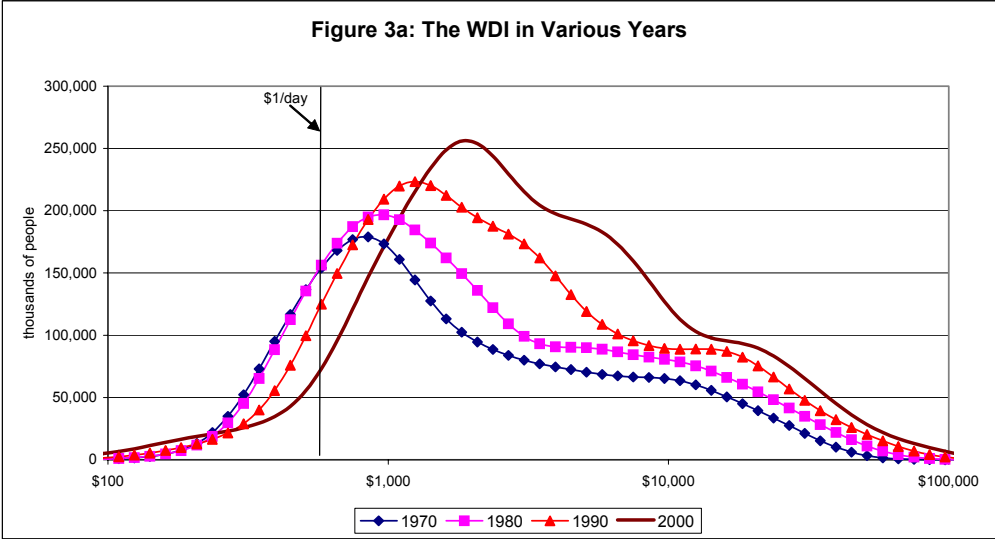
**Figure 2a: The WDI and Individual Country Distributions in 1970**

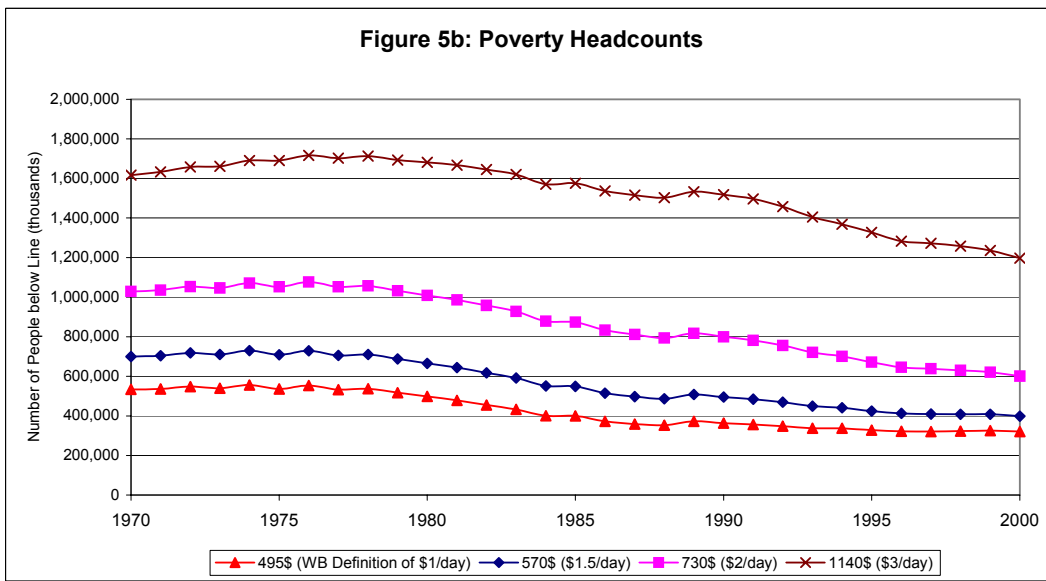
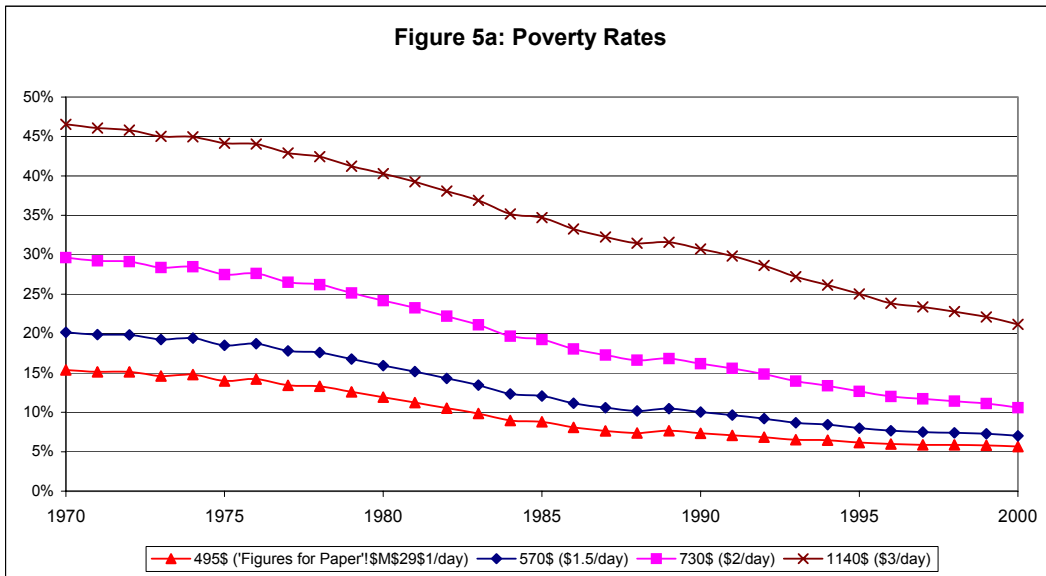


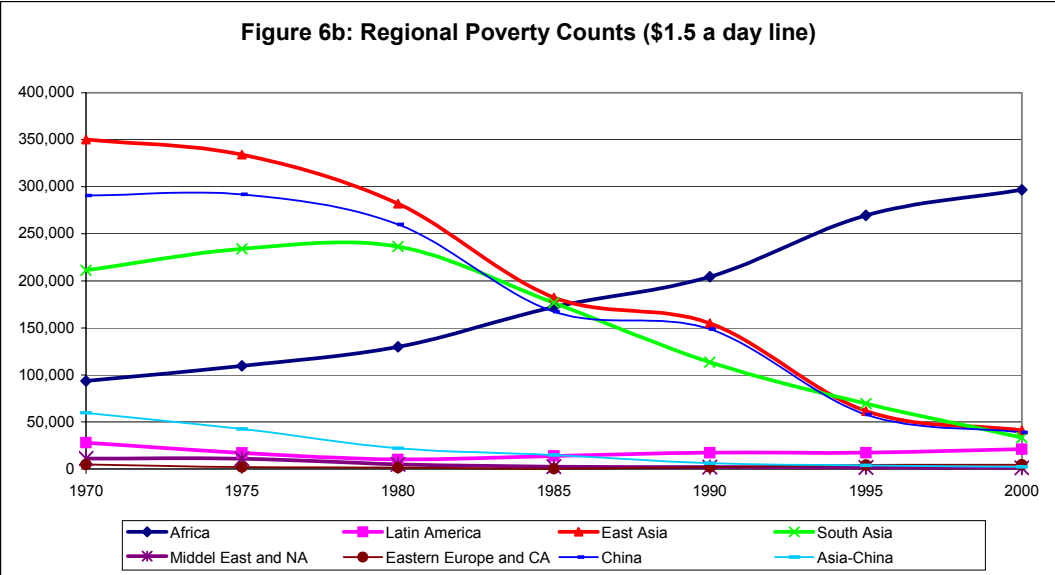
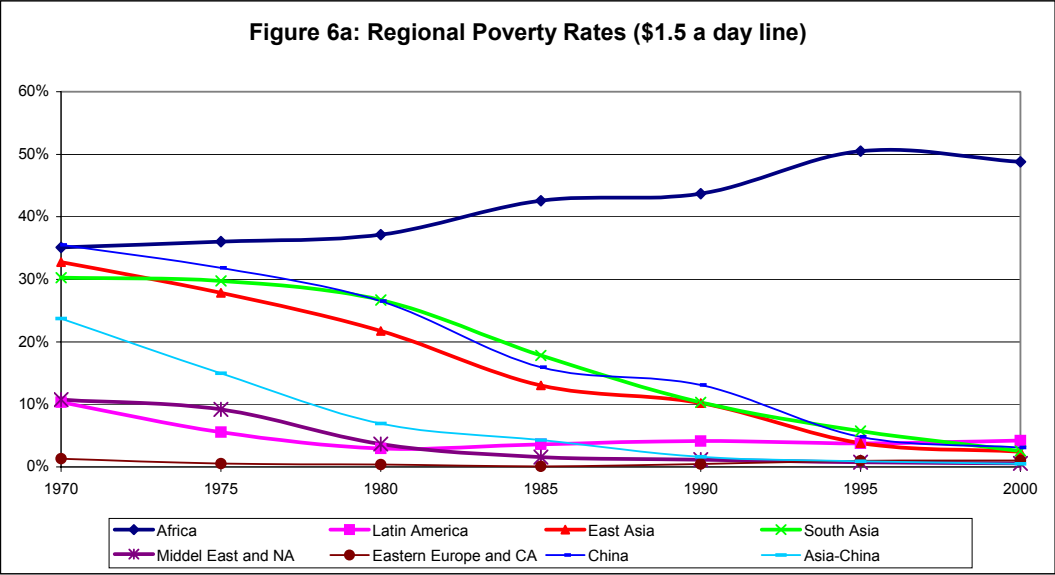
**Figure 2b: The WDI and Individual Country Distributions in 2000**

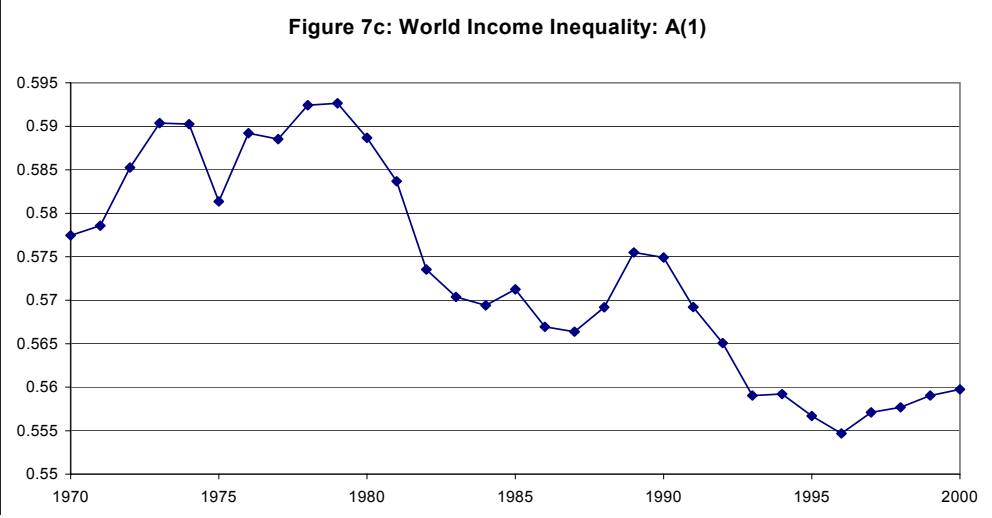
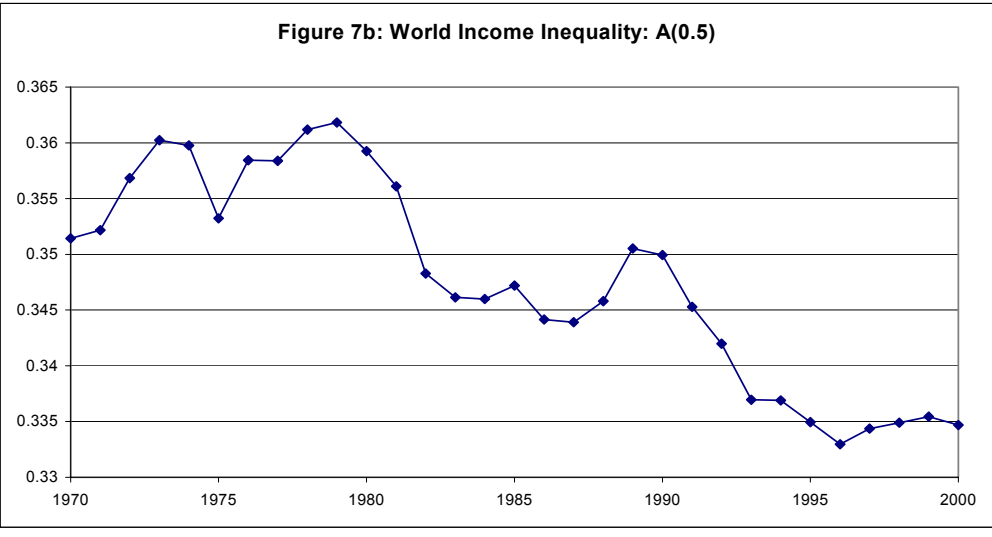












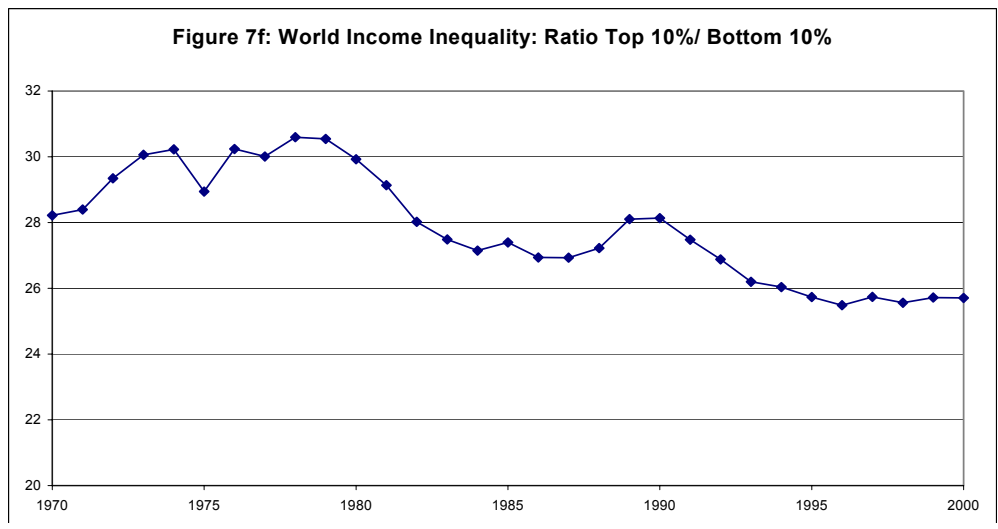
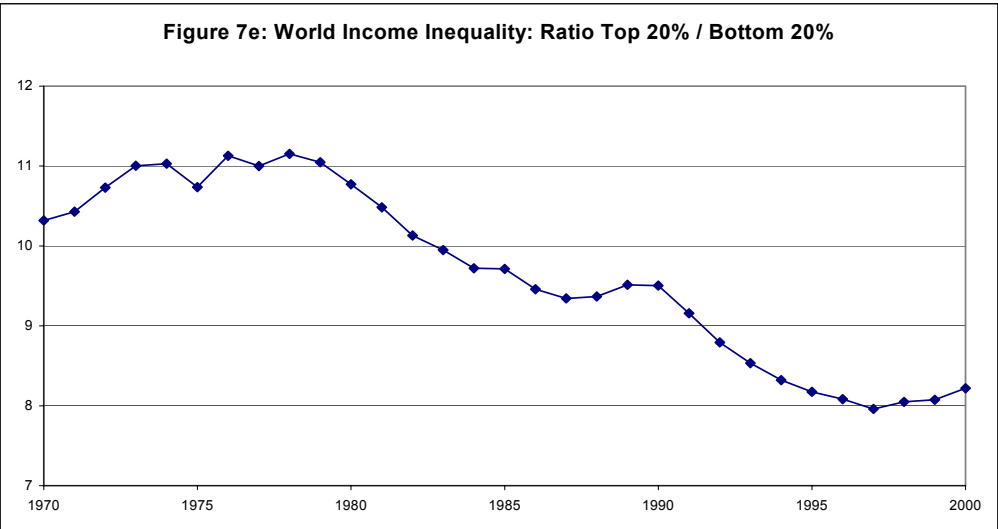
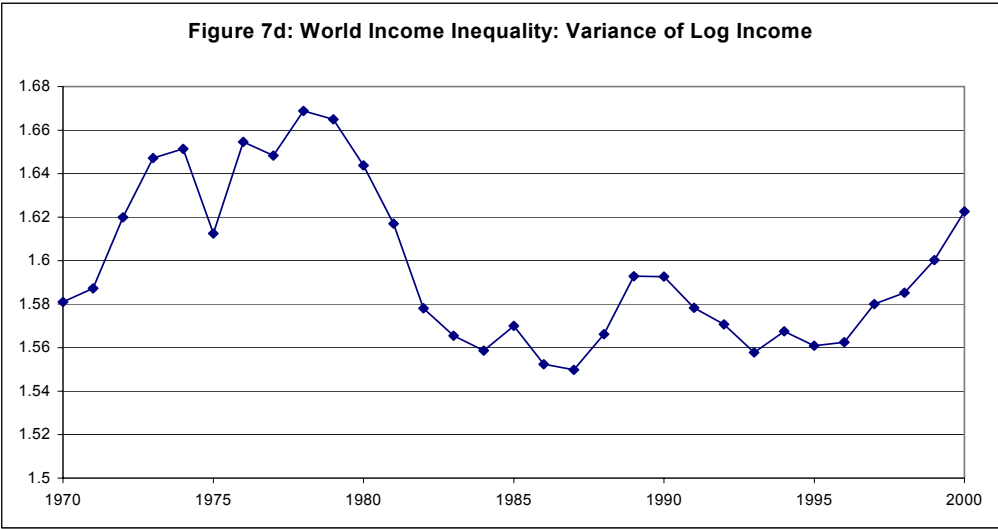


Figure 8a: Decomposition of World Income Inequality: Theil Index

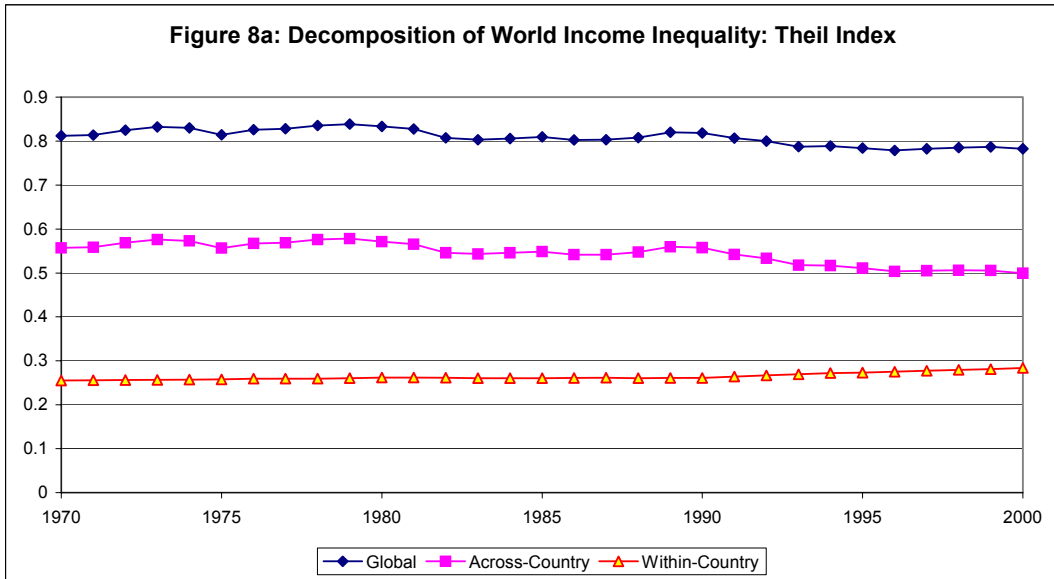


Figure 8b: Decomposition of World Income Inequality: MLD

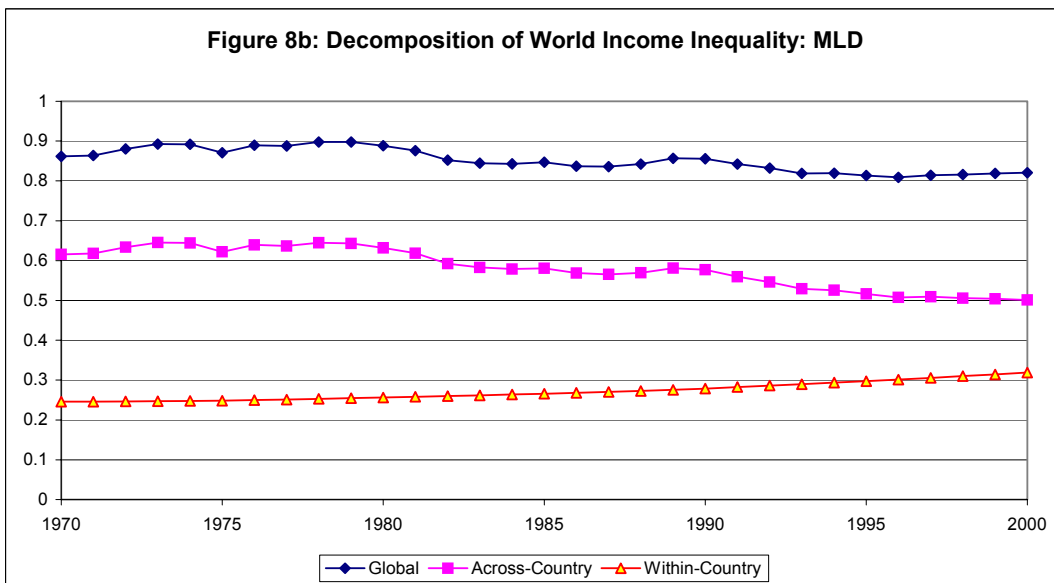
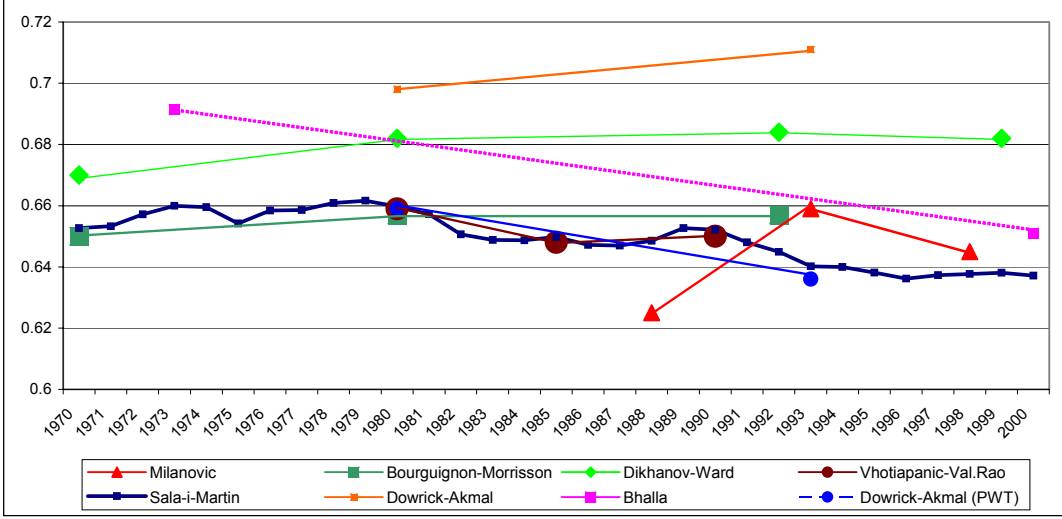


Figure 9: Gini Estimates from Other Studies Compared



APPENDIX TABLE. COUNTRIES BY GROUP

Group A	Group B	Group C
China India United States Indonesia Brazil Pakistan Japan Bangladesh Nigeria Mexico	Austria Barbados Botswana Burkina Faso Burundi Central African Republic Ecuador Ethiopia Gabon Gambia, The	Angola Argentina Benin Cameroon Cape Verde Comoros Congo, Dem. Rep. Congo, Rep. Equatorial Guinea Fiji
Germany Philippines Turkey Egypt, Arab Rep. Thailand United Kingdom France Italy Korea, Rep. Colombia	Guinea Guinea-Bissau Guyana Israel Kenya Lesotho Mali Mauritania Mozambique Niger	Iceland Iran, Islamic Rep. Malawi Namibia Seychelles Syrian Arab Republic Togo St. Vincent Sao Tome e Principe Chad
Spain Poland Canada Algeria Morocco Peru Venezuela Nepal Romania Malaysia	Papua New Guinea Paraguay Rwanda Senegal South Africa Switzerland Tanzania Uruguay Zimbabwe	Haiti St. Kitts & Nevis Sta. Lucia Cyprus Grenada Dominica Belize Antigua
Taiwan Uganda Sri Lanka Australia Ghana Netherlands Czechoslovakia Chile Madagascar Cote d'Ivoire	Soviet Union	
Guatemala Greece Belgium Hungary Portugal Zambia Tunisia Sweden Dominican Republic Bolivia Hong Kong, China	Armenia Azerbaijan Belarus Estonia Georgia Kazakhstan Kyrgyzstan Lithuania Latvia Russian Federation Tajikistan Turkmenistan Ukraine Uzbekistan	
Honduras El Salvador Denmark Finland Sierra Leone Nicaragua Jordan Norway New Zealand Ireland		
Costa Rica Singapore Panama Jamaica Trinidad and Tobago Mauritius Luxembourg		