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TRUE WORLD INCOME DISTRIBUTION, 1988 AND 1993: FIRST CALCULATION BASED ON HOUSEHOLD SURVEYS ALONE*

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The paper derives world income or expenditure distribution of individuals for 1988 and 1993. It is the first paper to calculate world distribution for individuals based entirely on household surveys from 91 countries, and adjusted for differences in purchasing power parity between countries. Measured by the Gini index, inequality increased from 63 in 1988 to 66 in 1993. The increase was driven more by differences in mean incomes between countries than by inequalities within countries. The most important contributors were rising urban-rural differences in China, and slow growth of rural incomes in South Asia compared to several large developed economies.

1. The Objective

The issues of income inequality have gained increased prominence in the last decade. There are several reasons for this. Some are empirical: increasing inequality in Western countries in 1980s, then an 'explosion' of inequality in transition economies in the 1990's. Others are 'theoretical': economic theory is able to incorporate the issues of inequality better today than a few decades ago. There is greater interest in the growth-equality relationship (Lundberg and Squire, 1999); inequality plays a central role in the endogenous growth models; there are several new approaches to what determines inequality (Li *et al.,* 1998; Benabou, 2000); inequality and political economy are linked through the median voter hypothesis. Finally, not the least important reason, is a vastly increased availability of income distribution data. Without exaggeration, one could say that the increase in the coverage of the world by

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income or expenditure surveys plays the same role in heightening the importance of income inequality today, that the work on national income aggregates played in the early 1930's in paving the way for a more thorough study of macroeconomics.[1]

Recently, the fact of rising inequality within many countries was linked with the issues of globalisation. Several writers (Richardson, 1995; Wood, 1995) have asked if rising inequality may be related to globalisation, and others (Williamson, 1999) have pointed to similar spurs in inequality at the turn of the last century – which also was a period of globalisation. But globalisation also implies that national borders are becoming less important, and that every individual may, in theory, be regarded simply as a denizen of the world. Then, the question may be asked: is *world* inequality increasing? For, even if within-country inequalities are rising, world income inequality need not increase, or may even decline, if the poor (and populous) countries grow faster than the rich (and less populous) countries. In other words, even if globalisation can be shown to lead to an increase in within-country inequalities, globalisation may lessen income differences between *individuals* in the world.

The objective of the paper is to answer this question empirically – or more exactly, since we lack the data for any prolonged (in time) study of world income inequality, at least to establish the benchmark for world inequality in two years, 1988 and 1993. We shall derive the first personal world income distribution based *directly and solely* on household survey data, and adjusted for differences in purchasing powers of individuals in different countries. The two years, 1988 and 1993, are chosen because these are the years for which the direct international price comparison data are available. Of course, such a study is made possible only thanks to a massively expanded data base on income distribution. Over the last decade, many countries in Africa conducted their first national representative household income or expenditure surveys. The economic changes in China in the late 1970s, and the end of the Cold War in the late 1980s, opened up to the researchers the hitherto unavailable sources in China and the former Soviet Union. Thus, for the first time in human history, researchers have reasonably accurate data on distribution of income or welfare (= expenditures or consumption) amongst more than 90% of world population.

Now, other than for the reasons of intellectual curiosity, why should one be concerned with world inequality? There are, I think, several reasons that could be adduced. The awareness of a problem often begins, or is at least enhanced, by its conceptualisation and quantification. We need to measure world inequality in order to be able to say whether it is, in our view, large or not; whether current policies are contributing to it, or not; and finally, whether we need to do something about it – if we deem it too large. It may be, not unreasonably, conjectured that with globalisation and greater awareness of other peoples' cultures and their level of living, the concern

[1] See the recent discussion on the same topic by Kanbur and Lustig (1999).

with poverty and inequality at the world level might begin to resemble the concern with the same issues at the national level. That is not a fanciful prognostication: one needs to remember that the empirical interest in inequality and poverty at the level of the nation-state is also relatively recent. Although the states were in existence for a very long time, the first calculations of inequality were made at the turn of the 19th century; since then inequality within nations has become a much more researched, and hotly debated topic. In addition, knowing where individuals from different countries stand in the world income distribution helps us address such current issues as the probability that the Tobin or some similar tax levied at the citizens of the rich countries would end up in the pockets of wealthy individuals from the poor countries. Is this statistically likely? If proceeds from the tax were distributed randomly across citizens of poor countries, or even in proportion to their income, we can readily calculate the probability that the tax would result in a regressive transfer at the world level.

Section 2 will review the previous studies and explain how this one differs from them. In Section 3, I explain in detail the procedure of calculation, and look at the coverage. Sections 4 and 5 present the findings, dealing respectively with regional income inequalities, and world income inequality. Section 6 looks at factors that lie behind the calculated level of world inequality, and the 1988–93 change. Section 7 compares our results with those from other studies. Section 8 concludes the paper.

2. Previous Work

Most previous studies were studies of *international* inequality in the sense that they calculated what would be inequality in the world if the world were populated by representative individuals from all countries, that is by people having mean income of their countries. The most notable examples are several studies by Theil (Theil, 1979; Theil and Seale, 1994; Theil 1996; but see also Podder, 1993) who decomposed international inequality into regional components in order to show, among other things, decomposability properties of the Theil index of inequality. For income, these studies used GDP per capita, not survey data.

The second group of studies is better in the sense that they acknowledge the fact that the world is not populated by representative individuals from each country, and try somehow to take into account income distributions within countries. However, since they do not have access to the survey data, which alone provide information on distribution, such studies use countries' Gini coefficients or other indicators of inequality in order to estimate the entire distribution from a single statistic. A good example of this type of work is a recent paper by Schultz (1998). His analysis is based on a between-country component which reflects differences in Purchasing power parity ($PPP) GDPs per capita, and a within-country component where an inequality measure (log variance) for each individual country was obtained from a regression analysis using the Deininger and Squire (1996) data base. A very similar approach was adopted by Chotikapanich *et al.* (1997). They use the

GDP per capita (in PPP terms) and the Gini coefficient for each country (also obtained from the Deininger and Squire data base), and assume that income distributions of all countries follow a log-normal pattern. They thus obtain estimates of within-country income distributions needed to derive world inequality. The approach followed by these studies is unsatisfactory for two reasons. First, distributions cannot be well predicted from a single inequality statistic, nor is it acceptable to assume that all distributions follow the same pattern. Indeed, this is a *pis-aller*, explicitly acknowledged by Chotikapanich *et al.* when they observe that 'information on the income distributions, or, at least, the population and income shares for a number of income classes [by countries]…is not available' (1997, p. 535). Second, GDP is an imperfect indicator of household disposable income or expenditures, both because it often fails to account for home consumption, which is particularly important in poor countries, and includes (eg) undistributed profits or increase in stocks, which do not directly affect current welfare of the population. Moreover, as we shall see below, there is a systematic relationship between the ratio of income or expenditures obtained from household surveys (HS) to GDP, and level of GDP per capita.

More accurate studies use survey data. For example, Berry *et al.* (1983) and Grosh and Nafziger (1986) combine survey-derived income or expenditure shares with countries' per capita GDPs (in PPP-adjusted terms). Both papers derive world (not *international*) income distribution using income shares from household budget surveys for 'developed countries and about forty less developed countries' (Berry *et al.*, p. 219) and 71 countries (Grosh and Nafziger, 1986, p. 349). Income shares are multiplied by countries' GDPs per capita in order to get mean income for each quantile.[2] In other words, household surveys are used to get income shares, but the actual incomes for different income classes are *not* obtained directly from the surveys. The difference may be important because, as mentioned before, the ratio of mean per capita survey income or expenditure to per capita GDP is not constant across countries. In addition, for countries for which they did not have income distribution data, Berry *et al.* (1983) estimate income shares 'on the basis of observed relationships between the shares of seven quantiles in countries for which comparable…data do exist and a set of explanatory variables' (p. 219). For these countries they use a regression analysis to determine income/expenditure shares.[3] Recently, Korzeniewick and Moran (1997), use the same approach although they multiply income shares (quintiles for 46 countries) by dollar per capita GDPs (*not* per capita GDPs in PPP terms). Not surprisingly, they find that between-country differences –

[2] There is an inconsistency in Grosh and Nafziger (1986) which is due to the nature of the data they use. The income (decile) shares with which they multiply countries' GDP *per capita*, are derived from distributions of *household* income across *households*. Berry *et al.* (1983) use – correctly – distribution of per capita household income across individuals.

[3] Grosh and Nafziger (1986) similarly 'allocate' some 40 countries into several groups (low income, middle income, industrialised, capital-surplus oil exporters) and apply to them income distribution of 'their' group computed from the countries whose income distributions are available. For several centrally-planned countries they use wage distributions.

which are magnified when simple dollar per capita GDPs are used – explain most of world inequality. Thus they feel justified in expanding their sample from 46 countries for which they have income-share data, to 112 countries using simple GDPs per capita and ignoring within-country distributions. In effect, they revert to a study of inter-national inequality. Firebaugh (1999), in response to Korzeniewick and Moran (1997), also presents a study of international inequality but he uses per capita GDPs in PPP terms.

Since Berry *et al.* published their article, some 15 years ago, there has been a huge increase in the availability of surveys in the countries of the former Soviet Union, and Africa in particular. There are many more surveys from other countries as well, and data standardisation (insuring that variables are defined the same way as much as possible) has progressed tremendously, thanks mostly to the efforts of Luxembourg Income Study (LIS), and the World Bank (Living Standard Measurement Survey (LSMS), Africa Poverty Monitoring, Household Expenditure and Income Data for Transition Economies, HEIDE).

More recently, Bourguignon and Morrisson (1999), have returned to the topic of world inequality in a historical perspective. They study the evolution of world inequality between 1820 and 1990. Similarly to Berry *et al.* (1983), they use quantile shares multiplied by GDPs per capita (in PPP terms) to derive world income distribution. Since, obviously, the data for such a long period of 170 years are sparsely available, they divide the world in 33 country groups whose income distributions are approximated by one or more countries belonging to the group. For example, distribution of 37 Latin American countries is assumed to be the same as that of Brazil; distribution of Indonesia the same as that of India until, of course, the data for Indonesia become available in the late 1960s etc.

Finally, we come to the papers that are methodologically almost identical to this one. These are papers by Ravallion *et al.* (1991), Chen *et al.* (1994), and Ravallion and Chen (1997). The last study, for example, is based entirely on household survey data from 67 countries with 42 countries being represented with at least two surveys. These studies have produced the widely quoted World Bank estimates of the people living in absolute poverty (at less than $PPP1 per capita per day), and their results were repeatedly used in World Bank's *World Development Reports* and *World Development Indicators*. The major difference between their and this work is in the coverage (they do not include advanced market economies)[4] and focus (they are interested in changes in world poverty; not in world inequality).

This is therefore the first study which is based solely on household survey data and where world income distribution is derived the same way as we would derive a country's income distribution from regional distributions.

[4] Two out of three papers (1991 and 1994) include only developing countries (as mentioned in the titles of the papers). The third (1997) adds transition economies.

3. Methodology, Sources, and Coverage

3.1. *Methodology: Quality of Data and how Are the Calculations Done*

For each country for which nationally representative survey data are available, we take local currency (LC) mean income or expenditure per decile (if we have access to unit record data), or for any other population shares (eg 12 or 15 population groups).[5] The objective is that the number of such data points be at least ten in order to have a sufficiently precise description of a distribution. In total, for both years, there are 216 country surveys with an average of 10.8 data points in 1988 and 11.4 data points in 1993. Most countries' data are deciles; some countries however have 16, 18, 20 or more data points. There are only 12 surveys where we have only quintiles (5 data points). Each data point is weighted by the population it represents. For example, one decile in the US survey represents 1/10th of the US population, one decile in the Nigerian survey represents 1/10th of Nigeria's population etc.

The quality of the surveys is uneven. It could hardly have been otherwise because the surveys have all been conducted independently by countries' statistical offices, even if their objectives (to assess the average standard of living or income of the population and its distribution) and national representativeness are the same. In principle, we can distinguish two types of problems.

First, the issue of survey quality. Although the claim of national representativeness is shared by all surveys, they may not all achieve it. Moreover, even the definition of what 'national representativeness' means may vary. It varies even among the developed countries where the survey techniques are generally thought to be better. For example, Israeli surveys do not include the self-employed and rural population. Urban areas are defined as those with more than 2,000 inhabitants for Jewish localities, and more than 10,000 for non-Jewish localities (Achdut, 1997, p. 152). Japan's *Family Income and Expenditure Survey* seriously underrepresents farmers and one-person households (Tachibanaki and Yagi, 1997, p. 112). These problems are magnified when we use surveys from more than 100 countries, where such sources of bias often go unreported. However, no adjustments to the surveys were made first, because information on sources of the bias survey-by-survey is unavailable, and second, even if we had information regarding omission of certain population categories, it is simply beyond the scope of knowledge of any single researcher to make meaningful corrections for such a great and varied number of surveys.

The second source of potential problems has to deal with differences in the surveys' definition of income and expenditures – the two welfare categories we use to rank people. Here, fortunately, we can take a less agnostic attitude. For example, the source of our data for most OECD countries is the Luxembourg Income Study which, using the member country surveys,

[5] A more detailed list of the surveys used, their sources, and acknowledgements to people and organisations that kindly provided them is given in Annex 1.

attempts to standardise the variable definitions (eg making sure that disposable income is defined the same way across all countries). For several transition economies and Latin American countries, I have used respectively the HEIDE database and a database created by the Inter-American Development Bank (described in Szekely and Hilgert (1999)) where variable definitions are also standardised. For the countries – about ¾ of their total number – where the quantiles were calculated from the individual level data, I have tried to define the variables in a consistent fashion: for example to have income include not only monetary income but home-consumption as well. In the remaining cases – even if unfortunately this group includes the single most important country for world income distribution, namely China – where I had access only to the pre-defined or grouped (not individual level) data I had to go by whatever the definition of income or expenditures was.

The unit of analysis is throughout the individual, which means that each decile includes 10% of *individuals* in a given country. Individuals are ranked by their household per capita income or expenditures (see Table 1).[6] When only published data were available, and if, for example, the distribution was that of households, so that each decile contained 10% of households, such data were not used. The tabulated distributions were used only if they gave percentage of individuals ranked by their household per capita income.

3.2. *Coverage*

Table 2 divides all the countries and territories[7] in the world into four groups: those included in our data base for both years (called 'common sample'), those included in 1988, but not in 1993; those included in 1993 but not in 1988; and those not included in either year. The common sample consists of 91 countries, inclusive of the data for large countries (China,

Table 1

Summaryof World Income Distribution Characteristics

Unit of observation	Individual
Welfare concept	Disposable per capita income or expenditures per capita
Ranking criterion	Welfare concept per capita
Currency units	$PPP or $

[6] There are three reasons why I am not using 'equivalent adult' instead of per capita measurement. First, equivalence scales vary as a function of relative price of public versus private goods which is not the same across countries. Thus the 'correct' equivalence scale is country-specific and the more so since we deal with countries that are vastly different in terms of real income and household composition. Second, the use of equivalence scales would make difficult a direct comparison between income (and expenditure) measures used here and GDPs per capita. The third and sufficient reason is that the use of equivalent scales is impossible without access to individual-level data for all countries. Unfortunately for about a quarter of the countries in the sample I had to rely on pre-calculated per capita tabulations.

[7] For simplicity, in the rest of the paper, both will be called 'countries'. This includes not only territories such as Puerto Rico, but also 'units' whose legal positions changed between 1988 and 1993: the republics of the former USSR, Yugoslavia, and Czechoslovakia that have become independent countries, or Hong Kong that has rejoined China.

Table 2

CountriesIncluded in the Study

Countries in *both* 1988 and 1993	Countries included *only* in 1993
Western Europe, North America and Oceania (22) Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, New Zealand, Portugal, Sweden, Switzerland, United Kingdom, United States Latin America and Caribbean (17) Argentina(urban), Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador (urban), Honduras, Jamaica, Mexico, Panama, Paraguay, Venezuela, Ecuador*, Uruguay†, Peru‡ Eastern Europe and FSU (22) Armenia, Bulgaria, Czech Republic, East Germany, Georgia, Slovak Republic, Hungary, Poland, Romania, Belarus, Estonia, Kazakhstan, Kyrgyz Rep., Latvia, Lithuania, Moldova, Russia, Turkmenistan, Ukraine, Uzbekistan, FR Yugoslavia, Slovenia Asia (17) Bangladesh(rural), Bangladesh(urban), China(rural), China(urban), Hong Kong, India(rural), India(urban), Indonesia(rural), Indonesia(urban), Japan, Jordan, Korea South, Malaysia, Pakistan Philippines, Taiwan, Thailand Africa (13) Algeria, Egypt(urban), Egypt(rural), Ghana, Ivory Coast, Lesotho, Madagascar, Morocco, Nigeria, Senegal, Tunisia, Uganda, Zambia *Total:* 91	Western Europe, North America and Oceania (1) Turkey Latin America and Caribbean (2) Guyana, Nicaragua Eastern Europe and FSU (1) Albania Asia (8) Laos, Mongolia(urban), Mongolia(rural), Nepal, Papua New Guinea, Singapore, Vietnam, Yemen Rep. Africa (16) Guinea Bissau, Burkina Faso, Djibouti, Ethiopia, Gambia, Guinea, Kenya, Mali, Mauritania, Namibia, Niger(rural), Niger(urban), RCA, South Africa, Swaziland, Tanzania *Total:* 28
Countries included *only* in 1988	**Countries *not* included in either year**
Western Europe, North America and Oceania (1) Spain Latin America and Caribbean (2) Guatemala, Trinidad & Tobago Eastern Europe and FSU (5) Azerbaijan, Bosnia, Croatia, Macedonia, Tajikistan Asia (1) Sri Lanka Africa (1) Rwanda *Total:* 10	Western Europe, North America, and Oceania (1) Iceland Latin America and Caribbean (21) Antigua and Barbuda, Argentina(rural), Aruba, Bahamas, Barbados, Belize, Bermuda, Cuba, Dominica, El Salvador(rural), French Guyana, Grenada, Guadeloupe, Haiti, Netherlands Antilles, Puerto Rico, St. Kitts and Nevis, St. Lucia, St. Vincent and Gr., Suriname, Virgin Islands Asia (18) Afghanistan, Bahrain, Bhutan, Brunei, Cambodia, Iran, Iraq, Korea North, Kuwait, Lebanon, Macao, Maldives, Myanmar, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates Africa (21) Angola, Benin, Botswana, Burundi, Cameroon, Cape Verde Is, Chad, Comoros, Congo, Gabon, Liberia, Malawi, Mauritius, Mozambique, Seychelles, Sierra Leone, Somalia, Sudan, Togo, Zaire, Zimbabwe *Total:* 61

* In 1988 only urban; in 1993 the whole country. † In 1988 the whole country; in 1993 only urban. ‡ In 1988 only Lima; in 1993 the whole country.

India, Bangladesh, and Indonesia) that have been divided into rural and urban parts. For 1988, other than the common sample, I had the data for 10 additional countries, and for 1993, for 28 additional countries. Thus the full 1993 sample was 119 countries.

The largest difference between 1988 and 1993 is a much better coverage of African countries. While in 1988, I had data for only 14 African countries, their number increased to 29 in 1993. This is mostly thanks to a number of surveys in Africa conducted or organised by the World Bank, or whose results were compiled and made more easily accessible to researchers by the Africa Region of the World Bank. Note the significant increase in the full-sample coverage of Africa shown in Table 4: the share of African population included went up from slightly under ½ to almost ¾. The share of GDP covered reached almost 90%.

Sixty-one countries are not included in either year. However, our coverage, both in terms of income or population is much greater than this number suggests, because most of the non-included countries are very small, measured either by their GDPs or population. For example, the total population of 22 non-included Latin American and Caribbean countries (see Table 2) is 42 million, and their combined GDP in 1993 was $80 billion. This is about equal to the population and GDP of Poland.

The countries are divided into five geographical regions: Africa, Asia, Eastern Europe and the former Soviet Union, Latin America and the Caribbean (LAC), and Western Europe, North America and Oceania (WENAO). The last region is the 'old OECD' region short of Japan, that is it includes the 'old' OECD countries before the recent expansion of the organisation in Eastern Europe, Mexico, and South Korea. The distribution of countries by region is shown in Table 2.

The countries included in 1988 and 1993 represent respectively about 4.4 and 5 billion people, or respectively 86 and 91% of world population. The common-sample countries cover about 84% of world population (Tables 3 and 4). The total current dollar GDP of the countries covered is about 95% of world GDP in both years. The common-sample countries account for about 93% of world GDP (Table 4).

Turning to the regions, WENAO and Eastern Europe/FSU are covered in the full sample almost in full (92 to 99% of population; not less than 95% of GDP). Asia and LAC are covered about 90%, both in terms of population and GDP. Finally, Africa's coverage, as already mentioned, has substantially increased between 1988 and 1993: from around ½ in both population and GDP to almost 90% in terms of GDP and ¾ in terms of population. The common-sample coverage is still low in Africa. It is the reflection of unavailability of household surveys until the very recent period. On the other hand, a significant jump in African coverage (for the full-sample) between 1988 and 1993 shows that in terms of household survey availability Africa is approaching the other continents.

A special consideration is due to China and India. These two countries have respectively 1.2 and 0.9 billion people, that is almost 40% of world

Table 3
World Population (in millions)

	World population		Population included in the study (full sample)		Population included in the study (common sample)	
	1988	1993	1988	1993	1988	1993
Africa	607	672	293	503	286	306
Asia	2,959	3,206	2,682	2,984	2,665	2,868
E. Europe/ FSU	425	411	422	391	399	388
LAC	427	462	373	423	363	418
WENAO	707	755	653	716	614	656
World	5,125	5,506	4,423	5,017	4,328	4,635

Table 4
How Much of the World do our Data Cover? (in %)

	Population		Current dollar GDP	
	1988	1993	1988	1993
Full sample				
Africa	48.3	74.8	52.0	89.2
Asia	90.6	93.1	91.0	91.3
E. Europe/FSU	99.3	95.2	99.4	96.3
LAC	87.4	91.6	90.2	92.5
WENAO	92.4	94.8	99.3	96.4
World	86.3	91.1	95.8	94.7
Common sample				
Africa	47.2	45.5	51.4	49.9
Asia	90.1	89.5	90.8	89.8
E. Europe/FSU	93.8	94.2	95.0	96.1
LAC	85.1	90.5	88.8	92.3
WENAO	86.8	86.9	96.5	95.6
World	84.4	84.2	93.7	93.1

population. In order to improve the analysis, their populations are shown separately for rural and urban areas (the same way that the data are generated in their Surveys). Thus, the largest single 'country' in the world is rural China with 860 million people in 1993. The same breakdown into rural and urban populations was done for three other large countries (Bangladesh, Indonesia and Pakistan)[8] for which such survey data were available.

3.3. *Problems*

Other than the issue of differential reliability (quality) of individual country surveys, the main problem is the mixing of income and expenditures. Ideally, there could be two different distributions, one based on incomes, another on expenditures. However, the number of countries which would have been

[8] Pakistan though was divided into rural and urban in 1988 only.

included in each would have been substantially lower than when both income and expenditures are combined. Moreover since countries tend to conduct either income or expenditures surveys, there would have been two unrelated distributions, none of which would represent the 'world'. One distribution would have been for that part of the world where most of the surveys are expenditure-based (Africa and Asia; see Table 5); another for the part of the world where almost all surveys are income-based (WENAO, Eastern Europe/FSU, and Latin America).[9] Since expenditure surveys are more frequent in the poorer part of the world (Africa and Asia), and since they tend to yield lower inequality and higher mean than income-based surveys,[10] the mixing of income and expenditure data probably biases Gini downward.

Another problem is the use of a single PPP exchange rate for the whole country even if we know that regional price differences may be large. This is particularly a problem in the case of the four countries for which the survey data are broken down into rural and urban parts, because presumably different PPP rates should apply to each part. For all of them but China, I use the same PPP rates however. For China, in 1993, I use the rate reported in the International comparison project (ICP) for urban areas only (since the rate itself was obtained from surveys conducted in two cities: Guandong and Shanghai), and reduce the price level in rural areas by an estimated 20% (see Yao and Zhu, 1998, p. 138).

There are also possible inconsistencies and mistakes between the PPP rates calculated for 1988 and 1993. Small errors in the estimates of large countries'

Table 5

Welfare Indicators Used in Surveys: Income or Expenditures (number of countries)

	1988		1993	
	Income	Expenditure	Income	Expenditure
Africa	3	11	2	27
Asia	9	9	8	16
Eastern Europe	27	0	19	3
LAC	18	1	16	3
WENAO	23	0	23	0
World	80	21	68	49

Note: The difference between 117 surveys for 1993 here, and 119 countries in 1993 as listed in Table 2 stems from the fact that East Germany, existing in 1988, was incorporated into the West Germany, and in 1988 Pakistan was divided into rural and urban areas while that was not the case in 1993. In 1993, we thus have 117 surveys, but 119 'countries'.

[9] There are seven countries (Armenia, Ecuador, Georgia, Jamaica, Madagascar, Thailand, and Zambia) that are 'cross-overs', that is they have income-based surveys in the 1988 data set, and expenditure-based HS in the 1993 data set. Peru is the 'cross-over' in the other direction: from expenditures to income. But, the total importance of these countries is small. Their total population in 1993 is 126 million (or 2.7% of world population), and they account for a mere 0.6% of world $PPP income.

[10] For example, Li *et al.* (1998) report that, everything else being the same, income-based Ginis are on average greater than expenditure-based Ginis by some 6.6 Gini points. Consequently, in their regressions, they increase expenditure-based Ginis by 6.6 points, and that practice has recently been adopted by other researchers (see Banerjee and Duffo, 2000).

PPPs may produce large effects on the calculated world inequality. Table 6 shows the ratio between the domestic and world price levels in 1988 and 1993 for China, India, Bangladesh, and Indonesia. The four countries' price levels ranged from 27 to 34% of the world level in 1988; in 1993, they ranged from 23 to 30%. In three countries out of four, the relative price level went down, which – bearing in mind that these are poor countries – should reduce world inequality. We note, however, the opposite trends in India's and Indonesia's relative price levels. While in 1988, the price level in India was the highest of the four countries, and some 20% higher than in Indonesia, in 1993, India's price level is the lowest of the four, and almost ¼ *less* than Indonesia's. This is a fairly large swing.

Finally, the fact that we assume that that all people within each quantile (data point) have the same income/expenditures biases the overall inequality downward. We calculate the 'minimum' or lower-bound Gini (see Kakwani, 1980, pp. 97–100). Although with only six or seven optimally selected data points, the 'minimum' Gini approximates the 'true' Gini within a few percentage points, this result is obtained within the context of income distribution for a single country (Davies and Shorrocks, 1989, pp. 100–3). The problem is more complex in our case because the span of world incomes, from the poorest income class to the richest, is much wider than in any single country, some of the data points are very large, and they are not optimally selected (that is, data points are not necessarily created at 'best' places along income distribution). Thus the minimum Gini might underestimate the true Gini by more than we would normally expect. Yet the use of minimum Gini was made necessary because in many important cases (eg China's and India's data points), we do not have information on income bounds of each income class. For example, the sixth income class of rural population in China has the mean annual income of $PPP 615 and it contains 180 million people (the largest data point in the study). Since the mean income of the income classes just below and above this one is respectively $PPP 486 and $PPP 789, we know that all the 180 million people

Table 6

RatioBetween Domestic and International Price Level in China, India, Indonesia and Bangladesh, 1988 and 1993

	Purchasing power exchange rate (LC per $)		Nominal exchange rate (annual average)		Ratio of domestic to world price level	
	1988	1993	1988	1993	1988	1993
India	4.756*	6.997*	13.917	30.493	0.342	0.229
China (urban)	1.038*	1.414*	3.72	5.762	0.279	0.245
Indonesia	453.453†	626.130*	1685.7	2087.1	0.269	0.300
Bangladesh	8.822†	9.496*	31.733	39.567	0.278	0.240

Sources: * Data from ICP tables provided by Yonas Biru (World Bank). † Data from Heston and Summers (1991).

in our group must have incomes between these two values, most likely between $PPP 500 and $PPP 700. Yet this is only one estimate of the bounds; it could as well be that the true bounds are $PPP 550 and $PPP 720, or a variety of other values. I therefore thought it more prudent to stay with a conservative estimate of the minimum Gini – that is, of inequality where it is assumed that all individuals within each data point have same income.

4. Regional Income Inequalities

4.1. *Average Regional Incomes*

Table 7 shows mean regional GDP and income per capita. In 1993, the ratio between the richest (WENAO) and the poorest (Africa) region was 30 to 1 using GDP per capita in current dollars, 11 to 1 using GDP per capita in international dollars (PPP), and 8 to 1 using the data from household surveys adjusted for the differences in purchasing power.

We know since Kravis *et al.'s* (1982) work and UN International Comparison Project that adjusting for the differences in countries' price levels reduces the gap between poor and rich countries, because price level systematically increases with GDP per capita. This reduces differences between rich and poor countries compared to what they would have been if we used market exchange rates to convert GDPs. In addition, we find here that there is – similar in its effect on the poor-to-rich nation gap – a systematic relationship between (i) the ratio of per capita income or expenditures from household surveys to GDP per capita (*RATIO*), and (ii) level of per capita GDP: as GDP per capita increases, the *RATIO* variable decreases (see Fig. 1). In other words, differences between rich and poor countries are less when measured by incomes or expenditures per capita calculated from household surveys than when measured by GDP per capita (some reasons why this may be so are given below).

If we regress for 1988 and 1993, *RATIO* against (i) GDP per capita (in $PPP terms), (ii) a dummy variable taking a value of 1 if HS data are

Table 7

GDPand Income Per Capita

	GDP per capita ($)		GDP per capita ($PPP)		Household survey income or expenditure per capita ($PPP)	
	1988	1993	1988	1993	1988	1993
Africa	619	673	1,320	1,757	1,036	1,233
Asia	1,422	2,007	1,927	2,972	1,175	1,752
E. Europe	1,889	1,194	6,355	4,522	3,634	2,646
LAC	1,967	3,027	4,829	5,923	2,702	3,483
WENAO	16,255	20,485	14,713	19,952	7,581	9,998
World	3,649	4,531	4,442	5,642	2,475	3,092

Note: All amounts are annual. Full-sample countries.

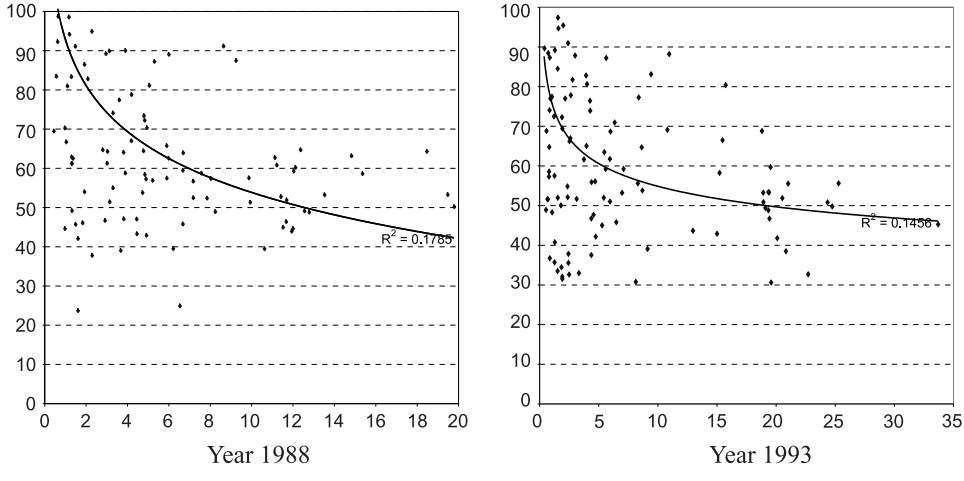

Fig. 1. *RATIO as function of $PPP GDP per capita*
Note: Vertical axis: ratio (in %) between average household survey income (or expenditure) and GDP. Horizontal axis: GDP per capita in thousand international dollars. The fitted curve is based on a simple regression between $PPP GDP per capita and RATIO

expenditures-based and 0 if income-based, and (iii) the interaction term between GDP per capita and the expenditure dummy, all the variables (but one in 1993) are significant at the 5% level (see Table 8). Every $PPP 1,000 increase in GDP per capita lowers *RATIO* by about 1 percentage point in 1993 and 2 percentage points in 1988. The expenditure dummy is also significant implying that expenditure-based surveys (more common in poor countries) yield *RATIO* values that are 30 to 40 percentage points higher than income-based surveys. However, since the interaction term is negative and

Table 8
Explaining RATIO Variable

	1988	1993
Intercept	80.84 (p = 0.000)	70.84 (p = 0.000)
GDP per capita (in $PPP)	−0.002 (p = 0.015)	−0.001 (p = 0.067)
Expenditure dummy	41.1 (p = 0.015)	29.9 (p = 0.008)
Interaction (GDP per capita and expenditure dummy)	−0.023 (p = 0.008)	−0.009 (p = 0.029)
R^2	0.17	0.16
F	6.4	7.1

Note: The dependent variable is *RATIO* (income or expenditure per capita from household surveys divided by GDP per capita expressed in percent). Significance levels between brackets.

significant, the *RATIO* variable declines faster as income goes up when household surveys are expenditure-based. The difference between expenditure- and income-based surveys in their *RATIO* values vanishes for GDP levels of about $PPP 1,800 per capita in 1988 and $PPP 3,300 in 1993.

What explains the decrease in *RATIO* as GDP per capita goes up? The cause seems to lie in the systematic accounting divergence between GDP and household surveys. Four components, imperfectly or not at all included in household survey data, tend to rise with GDP per capita. They are (i) undisbursed corporate profits, (ii) income from property, (iii) personal taxes, and (iv) government transfers in kind. Undisbursed corporate profits (and build-up of inventories) are a component of GDP, but not of household income. Their share in GDP is, of course, higher in richer countries, where the enterprise sector is larger and 'formalised'. Income from capital (property) is also greater in relative terms in richer countries, simply because income-rich countries are also capital-rich. Capital income is also the most underreported type of income in household surveys, with underreporting estimated at up to 40% in some European OECD countries.[11] Finally, disposable income as covered by surveys is defined as factor income (wages, property income, self-employment income etc.) *plus* government cash transfers *minus* personal income taxes. In richer countries, taxes withdrawn at source (and thus not included in household surveys) as well as personal income taxes are a larger share of GDP than in poorer countries. While one part of transfers financed by taxes (cash transfers) is included in HS's, the other part – often very sizeable – government education and health expenditures is not. Moreover, if there is a current surplus in the financing of cash transfers (so that contributions and fees exceed the outlays), disposable income in a country where such contributions are deducted at source will be underestimated compared to a country where there is only private insurance. In the latter case, all contributions and fees will be part of disposable income (see Lindbeck, 1990, pp. 6–7). Most poor countries belong to this category; most developed countries belong to the former (social security contributions deducted at source).

These are the reasons why the difference between the rich and poor countries will be less if we use their HS disposable income or expenditures than if we use their GDPs. It is reflected in the fact that while in Africa household surveys account for over 70% of GDP, in WENAO countries, the ratio is 50–51%. Asia, Eastern Europe/FSU, and Latin America and the Caribbean are in between with the ratio of around 60% (Table 9). Therefore, one important source of smaller world income inequality than that calculated using GDP per capita will lie in the systematic difference – varying with income level – between the survey-collected incomes or expenditures, and GDP.

[11] For example, Concialdi (1997, p. 261) writes that the best available French household surveys conducted by the *Institut National de Statistique et Etudes Economiques* underestimates capital incomes by about 40%.

Table 9

RatioBetween Household Income/Expenditure from Surveys and GDP

	1988	1993
Africa	78.5	70.2
Asia	61.0	58.9
E. Europe/FSU	57.2	58.5
LAC	55.9	58.8
W. Europe	51.5	50.1
World	54.5	53.4

Note: Weighted average.

4.2. *Regional Ginis*

Table 10 shows regional Gini coefficients for the common-sample countries. A regional Gini shows inequality in a given region (say, Asia) where each individual is treated equally – simply as an inhabitant of a given region. In other words, the aggregation of country distributions at the regional level proceeds in the same way as the aggregation of country distributions to generate world income distribution. (This is important to underline to show that the regional inequality is *not* simply *inter-national* inequality within the region.)

Note, first, that the most unequal regions are Asia and LAC with Ginis between 55 and almost 62 (Table 10). They are followed by Africa where Gini has increased sharply from 43 in 1988 to 49 in 1993. Eastern Europe/FSU, and WENAO have traded places. In 1988, the former socialist bloc was the most equal region with a Gini of 26. However, the transition which has led to massive increases of inequality within individual countries (Milanovic, 1998) has also led to an 'explosion' of inequality in the region as a whole. Its Gini in 1993 was more than 20 points higher than before the transition. It has surpassed the West European and North American region whose inequality has remained at the Gini level of 37, about the same as the Gini coefficient for the United States.

As Table 10 makes clear, between 1988 and 1993, inequality increased in three regions, went down slightly in WENAO, and decreased by 1½ Gini

Table 10

RegionalGini Coefficients in 1988 and 1993

(Common-sample Countries; Distribution of Persons by $PPP Income/ Expenditures Per Capita)

	1988	1993
Africa	42.7	48.7
Asia	55.9	61.8
Latin America and Caribbean	57.1	55.6
Eastern Europe, FSU	25.6	46.4
Western Europe, North America, Oceania	37.1	36.6

Note: For the list of countries included in each region, see Table 2.

points in Latin America and the Caribbean. The most important increase occurred in Eastern Europe/FSU, while inequality in both Asia and Africa went up by 6 Gini points.

Comparison between Asia and Africa is instructive. While their mean and median incomes are quite similar (eg in 1993, mean income in Asia was about $PPP 1,600, and in Africa about $1,200; the medians were respectively $PPP680 and PPP750), the shape of the income distribution curve is very different (Fig. 2). This is a reflection of much greater heterogeneity in Asia (presence of rich countries) than in Africa. Consequently, the frequency of the very poor people is much greater in Africa. Note that up to $PPP 300, the density function for Africa lies significantly above the one for Asia. Africa's modal income is extremely low ($PPP200), one-half of Asia's modal income ($PPP400). Asian distribution extends much further to the right. Five percent of Asian population have per capita incomes in excess of $PPP7,600 per year while only ½% of Africans have such high incomes. This is, of course, mostly because of people living in rich Asian countries: 83% of the Japanese have incomes higher than $PPP7,600 per year, as do 60% of the South Koreans, 50% of the Taiwanese and 50% of citizens of Hong Kong. By contrast, there are almost no such people (in statistically significant numbers) in Africa.

Tables 11–15 show for each region the Pyatt (1976)-type decomposition where the overall Gini is broken into three components: (a) within-country

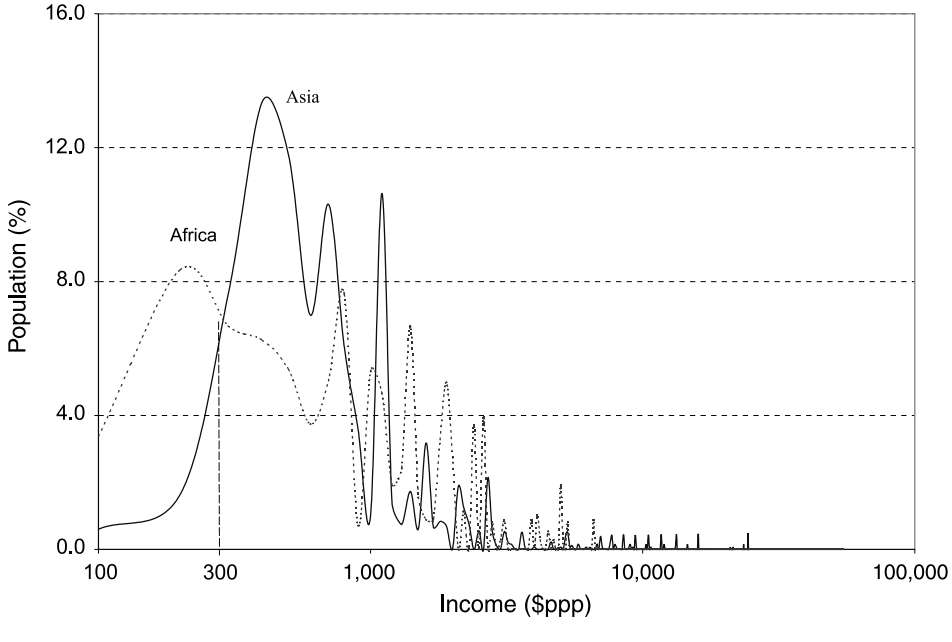

Fig. 2. *Income Distribution* (density functions) *for Asia and Africa, 1993*
Note: *x*-axis in logs. The distribution function is smoothed using kernel function with a bandwidth 0.005

Table 11

Africa: Gini Decomposition, 1988 and 1993

	1988	1993	Change
Within countries	6.2	6.2	0
Between countries	20.9	30.1	+9.2
Overlapping	15.6	12.4	−3.2
Total Gini	42.7	48.7	+6.0
Number of countries	13	13	
Mean country Gini	41.8	41.4	−0.4
Coefficient of variation of Gini	25.2	19.6	−5.6
Average income/expenditures per capita ($PPP)	1,078	1,217	+12.9
Standard deviation income/expenditure per capita ($PPP)	695	806	
Coefficient of variation (%)	64	66	+2

Table 12

Asia: Gini Decomposition, 1988 and 1993

	1988	1993	Change
Within countries	3.2	3.0	−0.2
Between countries	46.3	53.6	+7.3
Overlapping	6.4	5.3	−1.1
Total Gini	55.9	61.8	+5.9
Number of countries	17	17	
Mean country Gini	32.8	34.3	+1.5
Coefficient of variation of Gini	21.4	22.2	+0.8
Average income/expenditures per capita ($PPP)	1,129	1,613	+42.9
Standard deviation income/expenditures per capita ($PPP)	2,178	3,587	
Coefficient of variation (%)	193	222	+29

Table 13

Latin America and the Caribbean: Gini Decomposition, 1988 and 1993

	1988	1993	Change
Within countries	15.0	11.7	−3.3
Between countries	13.9	13.6	−0.3
Overlapping	28.2	30.3	+2.1
Total Gini	57.1	55.6	−1.5
Number of countries	17	17	
Mean country Gini	48.1	49.1	+1.0
Coefficient of variation of Gini	13.4	12.9	−0.5
Average income/expenditures per capita ($PPP)	2,814	3,634	+29.1
Standard deviation income/expenditures per capita ($PPP)	1,221	1,899	
Coefficient of variation (%)	43	52	+9

Table 14
Eastern Europe and FSU: Gini Decomposition, 1988 and 1993

	1988	1993	Change
Within countries	3.9	9.5	+5.6
Between countries	12.5	26.4	+13.9
Overlapping	9.1	10.4	+1.3
Total Gini	25.6	46.4	+20.8
Number of countries	22	22	
Mean country Gini	21.7	32.6	+10.2
Coefficient of variation of Gini	14.6	23.9	+7.2
Average income/expenditures per capita ($PPP)	3,681	2,795	−24.0
Standard deviation income/expenditures per capita ($PPP)	2,000	1,472	
Coefficient of variation (%)	54	53	−1

Table 15
Western Europe, North America, Oceania: Gini Decomposition, 1988 and 1993

	1988	1993	Change
Within countries	8.5	8.3	−0.2
Between countries	14.4	8.9	−5.5
Overlapping	14.1	19.4	+5.3
Total Gini	37.1	36.6	−0.5
Number of countries	22	22	
Mean country Gini	30.4	31.8	+1.4
Coefficient of variation of Gini	15.9	22.0	+6.1
Average income/expenditures per capita ($PPP)	7,817	10,684	+36.7
Standard deviation income/expenditures per capita ($PPP)	3,751	5,284	
Coefficient of variation (%)	48	49	+1

Note: Ginis in Tables 11–15 calculated for individuals within each region ranked according to their household per capita $PPP income or expenditures. Common-sample countries. Regional mean Ginis and their standard deviations are unweighted (it is the simple average Gini, and standard deviation of the Gini for all the countries of the region). Regional mean incomes and their standard deviations are population-weighted. Change in average income per capita is in current $PPP.

inequality, (b) between-country inequality, and (c) an overlapping component.[12] The first component shows that part of inequality which is due to the differences in income between the recipients in individual countries. The second component accounts for inequality due to people living in countries with different mean incomes. In other words, even if within-country inequalities were zero, there would still be differences between individual incomes due to the fact that mean incomes in each country are different. Finally, the third ('overlapping') component appears because the Gini coefficient is not exactly decomposable by recipients. The overlapping component accounts for

[12] The same decomposition formula is derived also by Mookherjee and Shorrocks (1982) and Shorrocks (1984). For different Gini decomposition rules see Silber (1989), Sastry and Kelkar (1994), Yitzhaki and Lerman (1991), Yitzhaki (1994).

the fact that somebody who lives in a richer country may still have an income lower than somebody from a poorer country. One interpretation of the 'overlapping' component is 'homogeneity' of population (Yitzhaki and Lerman, 1991; Yitzhaki, 1994, Lambert and Aronson, 1993). The more important the 'overlapping' component compared to the other two, the more homogeneous the population – or differently put, the less one's income depends on where she lives. Thus, the third, residual component may be viewed as providing some additional information compared to the measures, like Theil index, which are exactly decomposable. The decomposition formula of the Gini is:

$$\begin{aligned} GINI &= \sum_{i=1}^{n} G_i p_i \pi_i + \sum_{i}^{n} \sum_{j>i}^{n} \left(\frac{y_j - y_i}{y_i} \right) \pi_i p_j + L \\ &= \sum_{i=1}^{n} G_i p_i \pi_i + \frac{1}{\mu} \sum_{i}^{n} \sum_{j>i}^{n} (y_j - y_i) p_i p_j + L \end{aligned} \tag{1}$$

where $y_i =$ mean income of country i, $G_i =$ Gini coefficient of country i; $\pi_i =$ income share of country i in total income of the region (where countries are ranked by their mean incomes so that $y_j > y_i$); $p_i =$ country's population share, and $\mu =$ mean income of the region.

A glance at Tables 11–15 reveals that in Africa, Asia, and Eastern Europe/FSU, the between-country component is the largest. In 1993, it was about 54 Gini points in Asia (87% of total inequality in Asia), 30 Gini points in Africa (almost two-thirds of total inequality), and 26.4 Gini points in Eastern Europe/FSU (57% of total inequality).[13] In LAC and WENAO, inequality in countries' mean incomes is indeed important – it 'explains' about ¼ of total inequality – but overlapping is even more important. These two are consequently the most homogeneous regions: note also that they have the lowest coefficient of variation of population weighted income/expenditure per capita. Asia, on the other hand, is by far the most heterogeneous region.

As for the importance of within-country inequality, it is largest in Latin America and the Caribbean (11.7 Gini points), followed by Eastern Europe/FSU, and Western Europe and North America (respectively 9.5 and 8.3 Gini points). In both Africa and Asia, 'within country' inequality is of little importance. This is because the size of the within component depends on the product of the population and income weights (see (1)). Countries with large population weights in Asia (rural India and rural China) have relatively low income weights. The issue is discussed in greater detail in Section 6 below.[14]

[13] When we use the entire sample of countries for Africa (29) rather than the common sample, the 1993 Gini becomes 52.9, the between-country component 32.9, within-country 3.6, and the overlap component 16.4.

[14] In addition, the most populous countries in Asia have relatively low inequality: rural China (30% of Asia's population) has the Gini of 32.9 in 1993; urban China (12% of population) has the Gini of 27; rural India (23% of population) has the Gini of 29; urban India (8% of the population) has the Gini of 35. Therefore, countries accounting for 73% of Asia's population, have Ginis between 27 and 35. In Africa, a similar role is played by three countries: Egypt – 11% of Africa's population with the Gini of 38, Algeria (5% of population) with the Gini of 35, and Morocco (5% of population) with the Gini of 36.

However, the relevance of regional inequality is limited – both because regional 'borders' are often arbitrary, and because study of regional inequality is not fundamentally different from a study of country-level inequality. Our primary interest is world inequality. We turn to this next.

5. World Income Inequality

Fig. 3 shows the density function of world income distribution in 1988 and 1993. It illustrates the rising number of people with extremely low incomes: note that the 1993 curve lies above the 1988 curve for incomes up to $PPP200 per year. The two modes of the distribution are around $PPP400 and a little over $PPP1,100. The mean world income in 1993 was $PPP3,160, some 29% higher than in 1988 (when it was $PPP2,450). These are amounts in current international dollars. In order to be comparable we need to deflate the 1993 value by 22% which is equal to the increase in the US price level (PPP numeraire). We thus find that between 1988 and 1993, mean per capita world income increased by 5.7% in real terms (or by 1.1% p.a. on average). The median income in 1993 was $PPP1,041, some 18% higher than in 1988, or 3% less in real terms.[15] The fact that the mean real income would increase while the median would go down suggests that inequality (skewness) of the distribution increased.

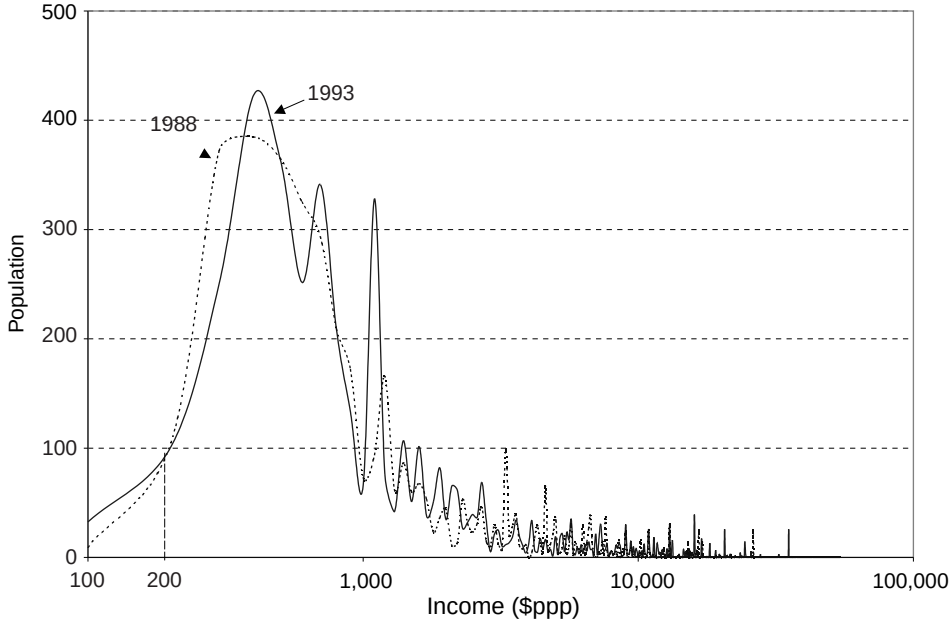

Fig. 3. *World Income Distribution in 1988 and 1993 (in millions of persons)*
Note: *x*-axis in logs. Distribution functions are smoothed using kernel function with the bandwidth of 0.005

[15] The median world per capita income in 1988 was $PPP 885.

5.1. *How Great is World Inequality?*

In 1993, the Gini coefficient for world per capita $PPP income/expenditure distribution was 66.0. The value is almost the same whether we use the common-sample countries or the full sample. Compared to 1988, inequality has increased by 3.2 Gini points (for the common-sample countries) or 3.4 Gini points (for the full sample).[16] The implied increase of about 0.6 Gini points per year is very high. During the 1980s, inequality in the United States and the United Kingdom increased by about ½ a Gini point per year (Atkinson *et al.*, 1995, p. 25). Similarly, Li *et al.* (1998, p. 32) in the panel analysis of 49 countries find that only two countries (China and Chile) had increases averaging more than ½ Gini point per year. Using the Theil index, world inequality is estimated at about 87, an increase of about 11 Theil points compared to 1988. The increase is more important if measured by the Theil index (13%) than if measured by the Gini index (6%). What is remarkable about the increase is that (i) it occurs at an already very high level of inequality, and (ii) is present in all measures reported here – that is, whether we use common-country sample or the full sample, PPP dollars or current dollars, Gini or Theil index (Table 16). Of course, the current dollar inequality is even higher. It reaches a Gini of 80 in 1993.

5.2. *Lorenz Dominance*

A comparison between the Lorenz curves for 1988 and 1993 shows that income distribution for 1988 is Lorenz-dominant (Fig. 4). For any cumulative percent of world population, the 1988 curve lies above the 1993 curve. This is illustrated also by the data in Table 17. Note that the share of the bottom quintile of the population has decreased from 2.3% of total world $PPP income to 2.0%; that of the bottom half from 9.6% to 8.5% etc. Thus, not

Table 16

WorldInternational Dollar Inequality in 1988 and 1993

(Distribution of Persons by $PPP and $ Income Per Capita)

	Full sample		Common sample	
	1988	1993	1988	1993
International dollars				
Gini index	62.5 (3.1)	65.9 (2.6)	62.8 (3.1)	66.0 (2.7)
Theil index	75.8	86.4	76.5	87.3
Dollars				
Gini index	77.8 (2.3)	80.7 (2.0)	78.2 (2.3)	80.5 (2.2)

Note: Gini standard errors given in parentheses.

[16] The standard errors for the calculated Gini were 3.1 Gini points in 1988, and 2.7 Gini points in 1993. This means that the one-standard error range within which the 'true' Gini might have lain in 1988 was 59.7–65.9, and in 1993 63.3–68.7. The standard errors were calculated using the 'jackknife' technique developed by Sandstrom *et al.* (1988).

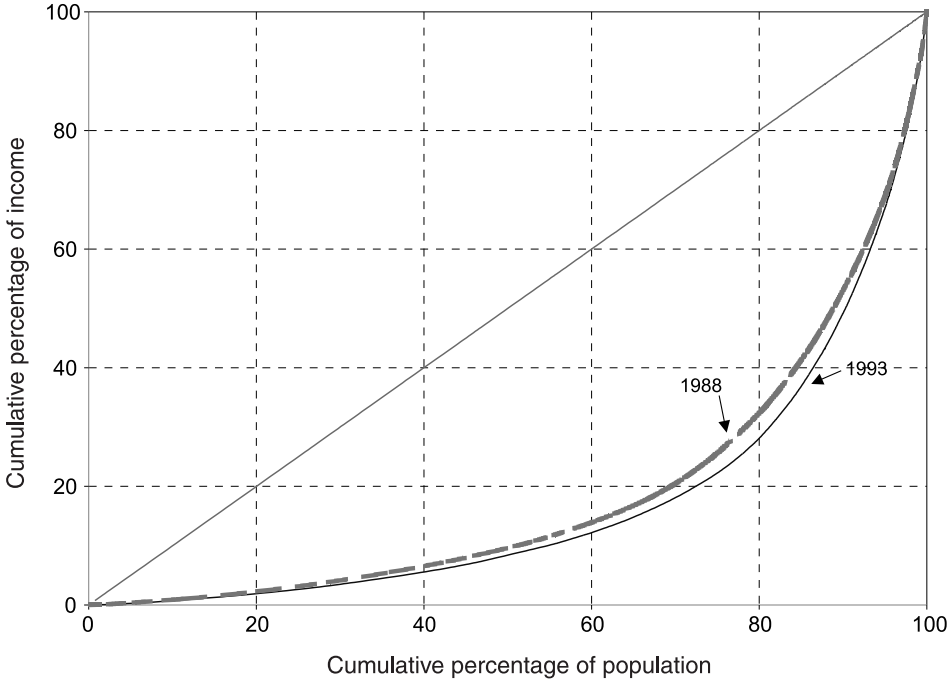

Fig. 4. *World Lorenz curves for 1988 and 1993*

Table 17
Cumulative Percentage of Persons and Income/expenditures

Cumulative percentage of world population	Cumulative percentage of world income/expenditures	
	1988	1993
Bottom 10	0.9	0.8
Bottom 20	2.3	2.0
Bottom 50	9.6	8.5
Bottom 75	25.9	22.3
Bottom 85	41.0	37.1
Top 10	46.9	50.8
Top 5	31.2	33.7
Top 1	9.3	9.5

only is the Gini higher in 1993, but any quasi-convex social welfare function would rank the 1988 distribution above the 1993 distribution – provided, of course, mean incomes are the same. This condition, however, is not satisfied because the 1993 real income was higher than the 1988 real income. We thus move to the investigation of stochastic dominance.

5.3. *Stochastic Dominance*

Lorenz dominance simply shows that inequality in 1993 was unambiguously greater than in 1988. But, as we have seen, world real per capita income increased between 1993 and 1988 by 5.7%. It is therefore possible that at each percentile of income distribution real income in 1993 was higher than in 1988 (first order stochastic dominance). Table 18 shows the data needed to test first order stochastic dominance. It is rejected.[17] We see that income of the bottom 75% of people was less in real terms in 1993 than in 1988. The largest difference was for the bottom five percent and the 70–75th percentile who have lost 14–16% in real terms. Between the 10th and the 30th percentile, the loss amounts to about 10%; it then becomes smaller and nil for the 50th percentile before rising again around the 70th percentile.[18] The 1993 distribution dominates the 1988 distribution for the top quintile only. The people in the top quintile have gained between 3 and 18% in real terms. Thus, in a nutshell, a description of inequality changes that have occurred in the world between 1988 and 1993 is: the poorest 5% have lost almost 1/4 of their real income,[19] the top quintile has gained 12%. Fig. 5*a* displays the charts of first order stochastic dominance for each region. As already mentioned, a distribution *A* is first-order dominant over distribution *B*, if at any given percentile of income distribution, a person in distribution *A* has a higher income than a person in distribution *B*. If we accept that these are the same people (which they obviously are not when we compare two distributions in two different points in time), we can say that distribution *A* is Pareto-superior to *B*.[20] Only WENAO displays the first order stochastic dominance: 1993 dominates 1988. In Eastern Europe and FSU, in contrast, the 1988 distribution would be first-order dominant were it not for the slightly higher incomes at the very top of income distribution in 1993. For other regions, and the world, the two distributions intersect. However, the situation varies between the regions. In Africa, real income of the population up to the 55th percentile was higher in 1988 than in 1993. In LAC, the bottom decile has lost between 1988 and 1993, while for the rest the two distributions criss-cross, although on balance incomes are higher in 1993. Finally, in Asia, the two curves almost coincide up to the 60th percentile, and those above are better off in 1993 than in 1988. These results highlight the well-known decline in real incomes practically across the board in Eastern

[17] The tests of stochastic dominance are done using software DAD developed by Jean-Yves Duclos, Abdelkarim Araar and Carl Fortin (downloadable from http://www.ecn.ulaval.ca/~jyves/#dad).

[18] This last loss is largely caused by income declines in Eastern Europe and the FSU: a large chunk of East European population had incomes around the 70th world percentile in 1988, they slipped downwards, and those who replaced them have lower incomes.

[19] The data in Table 18 are calculated at the exact percentage points. Thus, the real income of a person at the 5th percentile went down by 14% between 1988 and 1993. But the total real income of the bottom 5% of people is 23% less in 1993 than in 1998. The same concern applies to the top quintile.

[20] Note, however, that while *A* may be first-order dominant, distribution *B* can still be Lorenz-dominant. For example, income distribution in (say) Mali can Lorenz-dominate that in the United States, although absolute income level for every percentile may be higher in the United States than in Mali.

Table 18

FirstOrder Stochastic Dominance: Real Per Capita Income by Percentile of Income Distribution in 1988 and 1993 (World)

Percentile of income distribution	(1) Income in 1988	(2) Income in 1993	Ratio (2): (1) (in %)
5	277.4	238.1	86
10	348.3	318.1	91
15	417.5	372.9	89
20	486.1	432.1	89
25	558.3	495.8	89
30	633.2	586.0	93
35	714.5	657.7	92
40	802.7	741.9	92
45	908.3	883.2	97
50	1,047.5	1,044.1	100
55	1,314.4	1,164.9	89
60	1,522.7	1,505.0	99
65	1,898.9	1,856.8	98
70	2,698.5	2,326.8	86
75	3,597.0	3,005.6	84
80	4,370.0	4,508.1	103
85	5,998.9	6,563.3	109
90	8,044.0	9,109.8	113
95	11,518.4	13,240.7	115
99	20,773.2	24,447.1	118

Note: All values expressed in 1993 international dollars. The values show income exactly at a given percentile of income distribution.

Europe/FSU, but also the worsening position of the bottom half of the population in Africa (an issue which should be of greatest concern), and of the bottom decile in Latin America and the Caribbean.

In Fig. 5*b* we look at the second-order stochastic dominance.[21] In this case, the requirement for distribution *A* to dominate distribution *B* is that at each percentile of income distribution mean cumulative income of those in *A* be greater than mean cumulative income of those in distribution *B*. In other words, we require that (say) the bottom 20% of the population have a higher cumulative income – not necessarily that each individual percentile (18^{th}, 19^{th}, 20^{th}) have a higher income as in the case of first-order dominance. Here only Eastern Europe/FSU and Africa pass the test. In both cases, the 1988 distribution dominates the 1993 distribution. For the world, the bottom four quintiles received cumulatively less in real terms in 1993 than in 1988. Income gains were concentrated in the top quintile. For Asia, the 1988 distribution dominates the 1993 distribution up to the 60^{th} percentile, although the difference is small; for LAC countries, the 1988 distribution is better only for the lowest decile.

[21] The first-order dominance implies the second-order dominance. The second-order stochastic dominance means the same thing as generalised Lorenz curve dominance (as in Shorrocks (1983)).

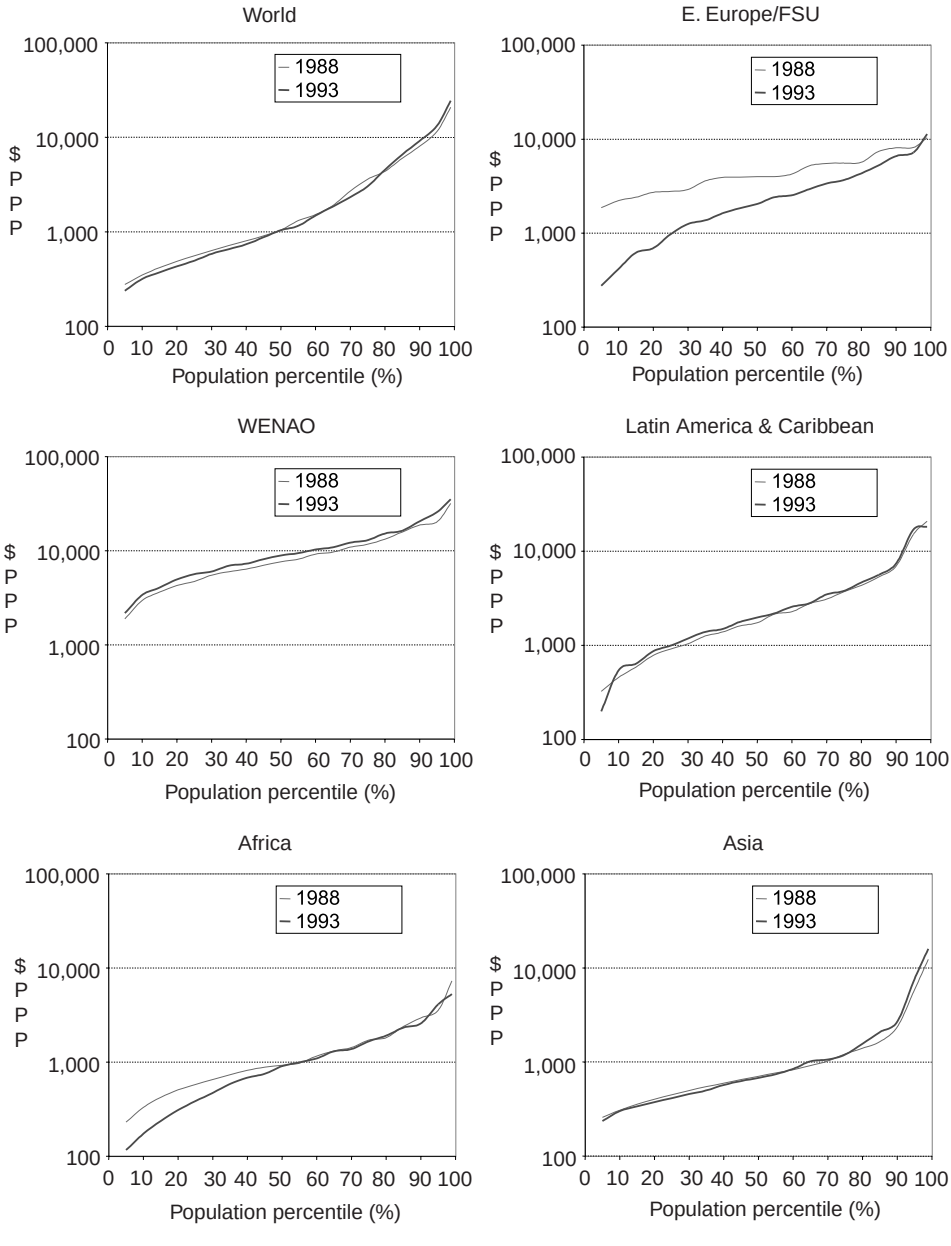

Fig. 5a. *First Order Stochastic Dominance, 1988 vs. 1993* (in 1993 prices)

6. How to Explain the Level, and Change in World Inequality?

6.1. *Decomposition of Total Inequality*

Using the same decomposition formula as before, the between-country component for the world turns out to be 57.8 Gini points in 1993, and

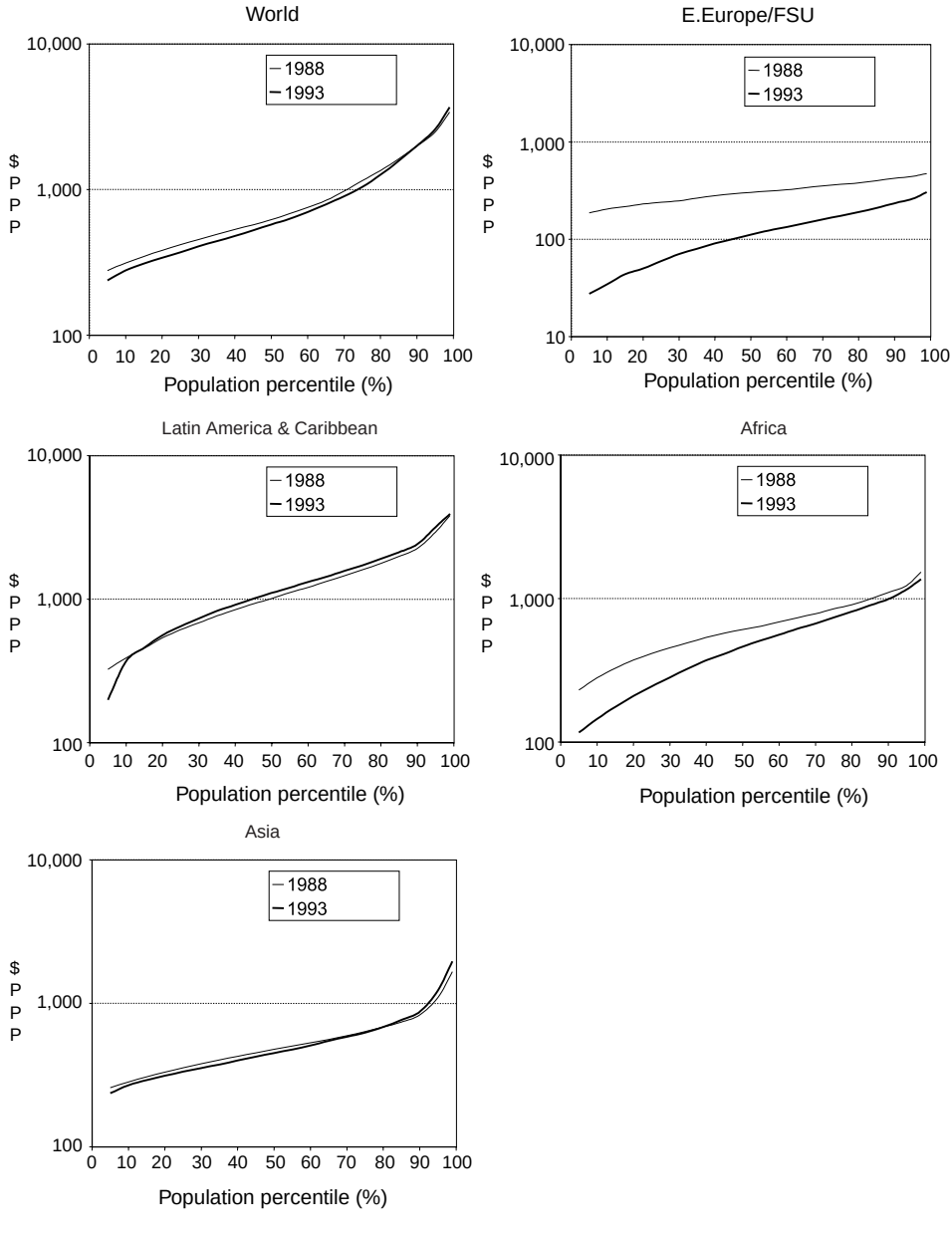

Fig. 5b. *Second Order Stochastic Dominance: 1988 vs. 1993* (in 1993 prices)
Note: First-order stochastic dominance implies that, at each percentile, income of distribution A is greater than income of distribution B. Second-order stochastic dominance implies that, at each percentile, cumulative income of distribution A is greater than cumulative income of distribution B

55.1 Gini points in 1988 (Table 19). This means that 88% of world inequality is due to differences in countries' mean incomes. The within-country inequality accounts for only 1.3 Gini points or 2% of total world inequality. The remainder (10% of world inequality) is due to the 'overlap' component.

According to the Theil index which is exactly decomposable, between-country differences explain ¾ of world inequality, and within-country inequality the remaining ¼ in both 1988 and 1993. According to both Theil and Gini indices, the individual components of inequality increased in step – keeping the composition of inequality the same in both years.

The decomposition results raise three questions that we shall address in turn. They are: (i) what lies behind the very high between-country component of inequality; (ii) why is the 'pure' within-country inequality component in the Gini coefficient so small, and (iii) what drove the increase of 2.7 Gini points in the between-country component which was the main factor behind the increase in the overall world inequality? The first two questions are 'static': they refer to the decomposition of the 1993 measures of inequality. The third question is 'dynamic': it asks why inequality increased between 1988 and 1993.

In the rest of the analysis, I shall consider only inequality adjusted for purchasing power ($PPP) and, in order to avoid spurious changes due to the difference in the composition of the sample, I shall consider only common-sample countries.

What are the main contributors to the between-country inequality? As we know from (1), the between-country component is equal to

$$\sum_{i}^{n}\sum_{j>i}^{n}\left(\frac{y_j - y_i}{y_i}\right)\pi_i p_j = \frac{1}{\mu}\sum_{i}^{n}\sum_{j>i}^{n}(y_j - y_i)p_i p_j \qquad (2)$$

Table 19

WorldIncome Inequality in 1988 and 1993

(Common-sample Countries; Distribution of Persons by $PPP Income/ Expenditure Per Capita)

	Gini 1988	Gini 1993	Theil 1988	Theil 1993
Within-country inequality	1.3 (2%)	1.3 (2%)	19.4 (25%)	22.4 (26%)
Between-country inequality	55.1 (88%)	57.8 (88%)	57.1 (75%)	64.9 (74%)
Overlap	6.4 (10%)	6.8 (10%)	–	–
Total world inequality	62.8	66.0	76.5	87.3
Number of countries	91	91	91	91
Mean country Gini/Theil	33.7	36.9	23.7	26.7
Standard deviation of Gini/Theil	11.2	9.9	19.6	17.1
Average income/expenditures per capita ($PPP)	2,450	3,160		
Standard deviation of per capita income/expenditures	2,552	3,591		
Coefficient of variation	1.04	1.14		

Note: Percentage contribution to total inequality between brackets. Mean country Gini and Theil and their standard deviations are unweighted. Average world income and its standard deviation are population-weighted.

For each pair of countries (*i,j*), its value depends on (i) the difference in mean incomes between these two countries, and (ii) the two countries' shares in total population. The view of the world implicit in Pyatt's decomposition is one populated by representative individuals having mean income of their countries. The greater the number of countries, the greater – under *ceteris paribus* conditions – the between-country component of total inequality.[22] The largest inter-country terms (ICT) will be those interacting poor and rich populous countries. Not surprisingly, therefore, the single largest contributors to total inequality belong, on the one hand, to China-rural and China-urban, and India-rural and India-urban, and, on the other, to the United States, Japan, Germany, France and the United Kingdom. India and China (both rural and urban) account for 45.2% of world population in 1993,[23] and the five rich countries for 12.6%. The difference in mean incomes between these nine countries accounts for 18.9 Gini points or almost 30% of total world inequality (see Table 20).[24]

The greatest contributors to the world Gini are therefore large countries that are at the two poles of the income distribution spectrum, the so-called 'twin peaks' (Quah, 1997). One pole is represented by more than 2.4 billion people who live in countries whose mean income is less than $PPP1,000 per year (Fig. 6).[25] They include both rural and urban India, rural and urban Indonesia, and rural China. The next pole occurs for the income level of over $PPP 11,500. There are more than ½ billion people who live in such rich countries. They include United States,

Table 20

TheLargest Between-country Contributors to Inequality in 1993 (in Gini Points)

	Poor					
Rich	China (rural)	India (rural)	China (urban)	India (urban)	Total Gini points	Population share (%)
United States	3.8	3.0	1.3	1.0	9.1	5.6
Japan	1.7	1.4	0.6	0.5	4.2	2.7
Germany	1.0	0.8	0.3	0.3	2.4	1.8
France	0.7	0.6	0.2	0.2	1.7	1.2
United Kingdom	0.6	0.5	0.2	0.2	1.5	1.3
Total	7.8	6.2	2.7	2.2	18.9	12.6
Population share (%)	18.5	14.3	7.3	5.1		57.8

[22] The approximation to the Lorenz curve implied in Pyatt's decomposition is that of a number of straight lines (one for each country) whose length is proportional to country's population share. The greater the number of such lines, the closer the resulting polygon comes to the true Lorenz curve based on individual incomes. A different view of the world and a different Gini decomposition formula is proposed by Yitzhaki (1994). The latter is not a standard decomposition formula though, and a comparison between it and Pyatt's decomposition is addressed in Yitzhaki and Milanovic (forthcoming).

[23] More exactly, of the common-sample population.

[24] The difference in mean incomes between China (rural and urban), India (rural and urban), and the United States alone explains 9.1 Gini points, or more than 15% of world inequality.

[25] Note that the difference between Fig. 3 and Fig. 6 illustrates the difference between world and international income distribution.

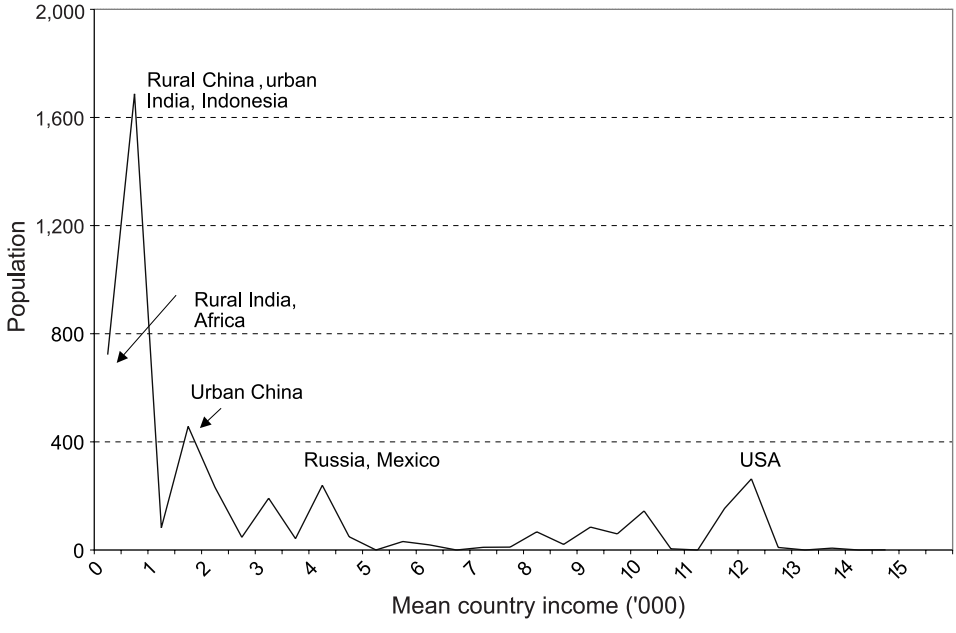

Fig. 6. *Distribution of Population* (in millions) *According to Average per capita Income of Country where They Live* (in '000 $PPP per year)

Japan, Germany, France and the United Kingdom. The poor pole accounts for 45% of world (more exactly, common-sample) population and about 9% of world PPP income; the rich pole accounts for almost 13% of world population and 45% of world PPP income. Populous countries that have 'middling' per capita incomes (eg Brazil, Mexico, Russia) do contribute to inequality but much less so than the two polar sets. Fast economic growth of China and India would therefore have a huge impact on reducing world inequality since the difference between their mean incomes and those of OECD countries would go down. In 1993, the difference in mean per capita income between the United States and rural China was $PPP 11,506, or 3.6 times greater than the average world $PPP income. Suppose that due to faster growth in rural China the difference is reduced to 3 times world average. With unchanged world population shares of rural China and the United States, the ICT will be 3.2 Gini points instead of 3.6 Gini points now. The overall world inequality would be reduced by much more – by almost 4 Gini points due to the decreasing difference between the mean income in rural China and mean income in other richer countries.

However, every synthetic index of inequality, and the Gini is no exception to that, is a very complex statistic. We have just seen that faster per capita growth of China reduces the ITCs between China, and the rich populous OECD countries. It is also absolutely crucial for the reduction of world inequality. As Table 21 shows, if China's and India's income were to increase

Table 21

WorldGini and its Components as China's and India's Per Capita Incomes Increase (Simulations)

	Percent income increase						
	0	10	20	50	70	85	100
Gini points							
Within countries	1.3	1.4	1.4	1.5	1.5	1.6	1.6
Between countries	57.8	56.9	56.0	53.6	52.2	51.2	50.3
Overlapping	6.9	7.0	7.0	7.4	7.5	7.8	7.9
Total Gini	66.0	65.2	64.4	62.5	61.2	60.6	59.8

by between 10 and 100%, while incomes of all other countries are assumed unchanged, world inequality would be reduced by between 0.8 and 6.2 Gini points.[26] All of the decrease occurs through a lower between-country component, while the 'overlap' component – as we would expect since more rich Chinese/Indians would have greater incomes than poor citizens of richer countries – goes up. However, if we suppose that China and India continue to grow faster than other populous countries, there may be a point where the gain in world equality achieved through them getting closer to the rich OECD countries may be offset by the growing difference between China and India, on the one hand, and Indonesia, Nigeria, and Bangladesh on the other, which we assume – for the sake of the argument – not to grow at all. This point occurs only for an extremely high increase in China's and India's per capita income: more than 7 times the current level so that urban China's income would be equal to that of Hong Kong, and rural India's income would equal that of Bulgaria. However, this illustrates the fact that the Gini coefficient is U-shaped even in income growth of the two largest, and among the poorest, countries. A situation might then ensue where instead of a bi-polar world, depicted in Fig. 6, we might have a tri-polar world, with one or several large countries with incomes around the median. Yet this might imply the same or even higher Gini inequality.

6.2. *Why is the Within-country Inequality so Small?*

There are two reasons for this. First, it is because the countries with large total incomes (most OECD countries) have relatively small populations, and the reverse for countries like China and India. (Recall that the *within* component of the Gini coefficient is equal to $\Sigma G_i \pi_i p_i$.) The largest population in the common sample is that of rural China with 18.5% of world population but with only 5% of world $PPP income. Largest income weight is that of the United States with 29% of world income but with only 5.6% of world population. Since the weight attached to the individual country Gini in the Pyatt decomposition is the product of country's income and population shares, this means that the largest weight is

[26] Populations are assumed unchanged throughout.

0.0145 (ie 0.29 times 0.05). For most countries, the weights attached to their Ginis are thus very small and the sum of weights is far smaller than 1 (in 1993, the sum was 0.038). Obviously, if a very large country, like China and India, were also a very rich country its weight in both population and total income would be great, and it would strongly influence the within component. However, in reality, even if the Ginis of a number of countries were to increase significantly, the within-country component would not go up by much. For example, if both China's – rural and urban – Ginis increased to 50 (from the current values of respectively 33 and 27), and the US Gini increased to 60 (from the current value of 37), the within-country component would increase by only ½ Gini point.

This is but a mechanical explanation for the low within-country inequality component. A substantive explanation is as follows. Mean country incomes are very close to each other particularly among poor countries (see Fig. 7). 62 countries have mean HS incomes that are less than $PPP 4,000 per capita p.a. In other words, the countries' mean incomes are 'crowded'.

If mean incomes are very close, then the only way for the overlap component to be small, and for the within-country component to be relatively large, is if countries' own income density functions are very narrow with Ginis close to 0 (see Fig. 8*b*).[27] But since individual country Ginis are, of course, not zero, poor people from a slightly richer country will overlap with the rich

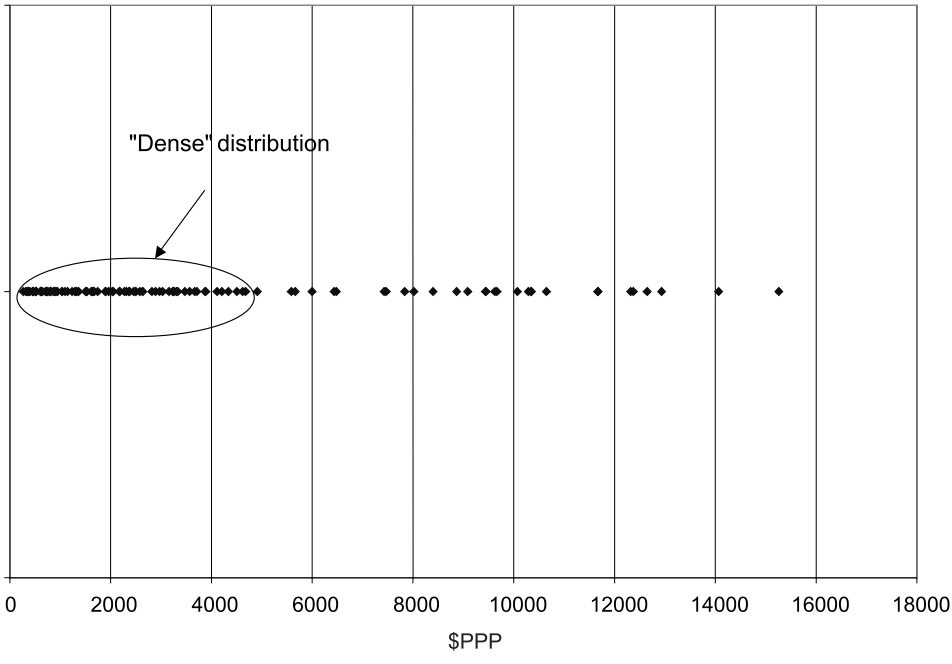

Fig. 7. *Distribution of Countries by Mean Annual $PPP Income Calculated from Household Surveys* (1993)

[27] Imagine the situation where all mean country income differ by only Δx. Then, the overlap component will be 0 *only* if individual country Ginis are 0.

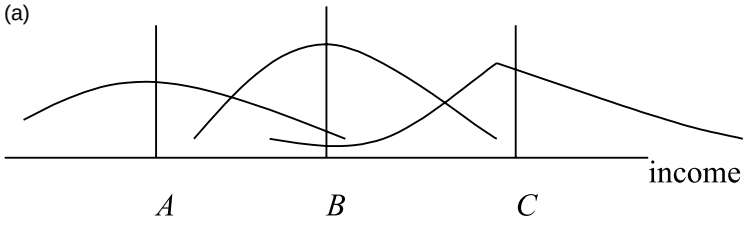

Fig. 8a. *Large Overlap Component in Gini Decomposition*

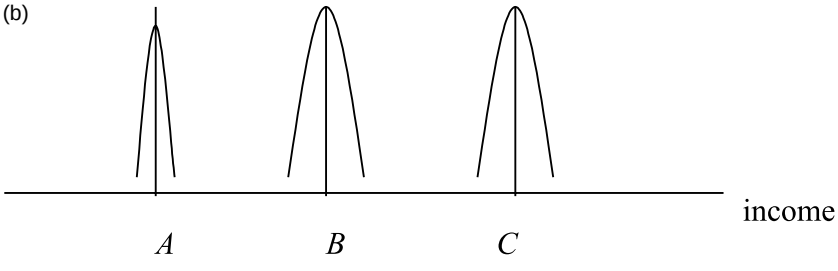

Fig. 8b. *Small Overlap Component in Gini Decomposition*
Note: vertical lines represent countries mean incomes

people from a slightly poorer country (see Fig. 8*a*). To see this, superimpose density functions from Fig. 8*a* onto the mean incomes (dots) in Fig. 7. There would be a lot of overlapping particularly among the poorer countries, whose incomes are not only more 'crowded' but where inequality is also greater so that the density functions have longer tails.[28] Thus any inequality above 0 will 'feed' the overlap component and detract from 'within' component. Or, in other words, the overlap component will be small only if (i) mean incomes are very far (different) from each other, or (ii) individual country distributions are very equal.[29] Neither is the case here.

Another question raised by the finding that most of world inequality is due to the differences between countries mean incomes is, how sensitive world Gini is to distributional changes within countries (which leave mean incomes unchanged). The answer is that it is sensitive although most of the change may occur through the overlap component. For example, if we let US, UK and German distributions experience regressive transfers such that each of the bottom nine deciles loses 10% of its income in favour of the top decile, world Gini in 1993 increases by 0.4 Gini points, 0.3 of which is due to the greater overlap.[30] What happens is that the poor, middle-class etc. end of distribution of these rich countries now shifts to the left (see Fig. 8*a*), and more of those people overlap with people from poorer countries.

[28] The simple correlation coefficient between Gini and level of per capita income (in $PPP) is −0.31 in 1988, and −0.25 in 1993.

[29] This point is also made by Lambert and Aranson (1993, p. 1226) in their reinterpretation of the Gini decomposition.

[30] The assumed distributional changes are significant: they increase Ginis of the three countries by between 5 and 5.5 Gini points.

Finally note that a relatively small importance of within-country inequality and the overlap component in Pyatt-type Gini decomposition does not mean that one can ignore them and, in the absence of large distributional changes within the countries, use the between component as a fully satisfactory proxy for world inequality (as is sometimes argued; see Melchior *et al.* (2000, p. 18)). This is not the case though: when incomes of poor countries like India and China grow relative to those of the rich countries, it does not only reduce the distance between the countries' mean incomes and lowers the value of (2), but also affects – even in the absence of distributional change – the two other Gini components. First, greater weight of China's and India's GDP in the world might increase the within-country component depending on whether India's and China's Ginis are greater than the mean Gini in the world. Second, and more importantly, there is an increase in the overlap term as more people from these poor countries 'mingle' with people from rich countries. This is reflected in the rising overlap component in our simulations in Table 21: while the between term went down by 7½ Gini points, the overlap term increased by 1 Gini point. Using the changes in the between component alone will give a biased view of changes in world inequality.

6.3. *What Factors Were Behind the 2.7 Gini Points Increase in between-country Inequality Between 1988 and 1993?*

We have already seen that the most significant contributor to the overall Gini is the between-country component, and within it, the income differences between the poor populous countries of Asia (India and China), and the rich, but less populous, five OECD countries (United States, Japan, France, Germany and the United Kingdom). But while these ICTs are large they may not be the ones that have *increased* the most between 1988 and 1993, and may not therefore be the ones driving the increase in inequality between the two years. Indeed, as seen in Table 22, some of them have decreased in importance, that is they have contributed to *reducing* inequality. Shrinking difference between, on the one hand, China's mean rural and urban income and, on the other, the mean US income has shaved off almost ½ Gini points from world inequality. Similarly, decreasing income differences between (i) China and rural India, and (ii) three large countries (Brazil, Russia and Ukraine) whose per capita real incomes have gone down, have reduced the world Gini by 1.3 points (Table 22).[31]

But in addition the ICT between rural China and the United States decreased also on account of the shrinking percentage of world population living in rural China. In 1988, 19.5% of world population lived in rural

[31] However, income declines in Eastern Europe/FSU region did not have an overall equalising effect on world income inequality. If we conduct a simulation exercise for 1993 keeping real incomes and inequality in the Eastern Europe/FSU region at their 1988 level, world income Gini becomes 64.7 instead of the actual 66.0. Thus, changes *outside* the transition countries are responsible for an increase of almost 2 Gini points in world inequality (64.7 minus 62.8), while the changes in transition economies added another 1.3 Gini points (66.0 minus 64.7).

Table 22

LargestNegative (Inequality-reducing) Changes in Inter-country Terms Between 1988 and 1993 (in Gini Points)

	China (rural)	China (urban)	India (rural)	Japan
United States	−0.40	−0.05		−0.14
Russia	−0.30	−0.12	−0.17	
Ukraine	−0.21		−0.14	
Brazil	−0.19	−0.09	−0.09	

China; in 1993, that percentage was 18.5. Thus, both the fact that China's income rose compared to the US income, and that its population moved out of the poorer rural areas, contributed to reducing world inequality.

This calculation allows us to illustrate the following problem. Consider growth of rural incomes in India vs. United States. Rural incomes in India increased by only 5%, the mean income in the United States increased by 24%. Since United States started as a richer country, this should, at first glance, imply that the inter-country Gini component should increase, and not decrease. However, note that the formula for each ICT is

$$\frac{y_j - y_i}{\mu} p_i p_j$$

so that – given unchanged p_i and p_j – it will go up only if the difference between the incomes increases faster than the mean world income. (One might remember that Gini is a mean-standardised measure of inequality.) In the case of rural India–United States, the difference between these two countries' mean incomes increased from \$PPP 9,495 to \$11,870. However, this increase (25%) was less than the increase in the mean world income (29%). Thus the difference between mean income in rural India and income in the United States *decreased* from being 3.87 times world mean income to being 3.75 times world mean income. This example illustrates that for a single ICT to go up, and thus to add to world inequality, it is not sufficient that a rich country grow faster than a poor country. The absolute difference between the two countries' incomes must increase faster than world mean income.[32]

What were then the main factors underlying the increase in inequality between 1988 and 1993? They were two. First, slower growth of rural areas in large South Asian countries (India and Bangladesh) and in rural China compared to several OECD countries (France, Japan, Germany)[33] is responsible for 2 Gini points increase of world inequality (see Table 23). Mean per

[32] This can be shown by the total differentiation of the ICT term (denoted by Δ): $d\Delta = 1/\mu[dy_j - dy_i - 1/\mu(y_j - y_i)d\mu]p_i p_j = 1/\mu[r_i y_j - r_j y_i - r_\mu(y_j - y_i)]p_i p_j$ where r_i = growth rate of country i and $p_i p_j$ assumed constant. After some further rearrangements, the condition for $d\Delta > 0$ becomes: $r_j > y_i/y_j(r_i - r_\mu) + r_\mu$. The latter expression is greater than r_i whenever $r_\mu > r_i$. This means that whenever world mean income grows faster than the income of the poorer country, for the ICP to increase it is not sufficient that the rich country simply grow faster than the poor.

[33] And to some extent, with respect to the United States; see the Bangladesh–United States cell in Table 23.

Table 23

LargestPositive (*Inequality-increasing*) *Changes in Inter-country Terms Between 1988 and 1993* (in Gini Points)

	Bangladesh	India(rural)	China(rural)
Japan	0.20	0.28	0.23
Germany	0.12	0.25	0.25
France		0.14	0.14
United States	0.42		
Subtotal	0.74	0.67	0.61
China(urban)		0.22	0.23
Total	0.74	1.11	1.08

capita rural income in India increased by 5% in current $PPP between 1988 and 1993; in Bangladesh the increase was 14%, and in rural China 21%. Meanwhile, mean current $PPP incomes in the United States increased by 24%, in Japan by 60%, and in Germany by 43%.[34] The absolute income differences between a few large OECD countries and populous rural areas in Asia thus increased faster than did world income overall; this in turn increased the ICTs, and added to world inequality.

Second, the widening differences within China between urban and rural areas, and between urban China and rural India, pushed world inequality up by about 0.45 Gini points.[35]

In conclusion, what happens to world inequality is to a large extent determined by what happens to inequality between the countries, and what happens to the inequality between the countries depends, to a large extent, on what is the relationship between mean incomes in China, India, and several large OECD countries. This explains the ambiguous effects produced by the relatively fast growth of mean income in urban China. On the one hand, Chinese urban growth reduced its distance from the middle-income and rich countries and thus the world Gini; on the other hand, though, the widening gap between urban and rural China, and between urban China and rural India, increased world inequality.

7. Comparison with Other Studies

Table 24 shows the estimates of world inequality collected from several other studies mentioned in Section 2. In terms of methodology, Bourguignon and Morrisson (1999) and Berry *et al.* (1983) are the closest to our study because they use income shares derived from household surveys. However, in both cases, income shares for a number of countries are approximated using income shares of 'similar' countries – whether it is done by using econometric

[34] This translates into 2% per capita real growth in the United States, 17% in Germany and about 30% in Japan (all over the 1988–93 period). Compare this with real GDP growth over the same period of 9% in the United States, 15% in Germany, and 16% in Japan.

[35] While current $PPP incomes in rural China increased by 21%, the growth in urban areas was over 70%.

Table 24
World and International Inequality as Estimated by Different Authors

	Gini	Theil	Note
World inequality			
Berry, Bourguignon and Morrisson (1982)	64.9 (1970)		Uses GDP per capita and income shares; approximates distributions for a number of countries
Grosh and Nafziger (1986)	63.6 (1970s)		Uses GDP per capita and income shares; approximates distributions for some 40 countries
Chotikapanich, Valenzuela and Rao (1997)	64.8 (1990)		Uses GDP per capita data; approximates distributions.
Bourguignon and Morrisson (1999)	66.3 (1992)	86.4 (1992)	Uses GDP per capita and income shares; approximates distributions for a number of countries
Milanovic (this paper)	62.8 (1988) 66.0 (1993)	76.5 (1988) 87.3 (1993)	Uses actual HS data
Inter-national inequality			
Theil and Seale (1994)		64.5 (1986)	Only between-country component; uses GDP per capita
Podder (1993)	53.1 (1987)		Only between-country inequality; uses GDP per capita
T. Paul Schultz (1998)	55.2 (1989)		Only between-country component; uses GDP per capita
Firebaugh (1999)	54.3 (1989)	52.6 (1989)	Only between-country inequality; uses GDP per capita
Milanovic (this paper)	55.1 (1988) 57.8 (1993)	57.1 (1988) 64.9 (1993)	Uses actual HS data

Note: Year of estimation between brackets. All GDP per capita are in $PPP terms.

techniques (as in the 1982 paper), or by simply 'assigning' what are deemed to be similar countries. Yet the results for the world inequality are very similar to the ones obtained here. The world Gini coefficient for 1992 is estimated by Bourguignon and Morrisson as 66.3; we find that, in 1993, it is equal to 66.0. Everything else being the same, we would expect to find a lower Gini value than Bourguignon and Morrisson because they use GDPs per capita and we use actual mean incomes from surveys. As mentioned above, the differences between the rich and poor countries are less when we use HS incomes or expenditures than when we use GDP per capita. On the other hand, the fact that for all countries we use actual survey data with at least 10 data points (while they mostly use quintiles) means that our estimation of within-country inequality and the overlap term is more precise and the two terms thus greater. The two effects apparently offset each other. In effect, all four studies of world inequality by other authors as well and ours, show world Gini to lie within a narrow range of 63 to 66. Studies of inter-national inequality, on the other hand, show that the between-country Gini ranges between 53 and 55. Therefore using the standard Gini decomposition, about (or more than) 4/5 of world inequality is due to differences in mean PPP incomes between the countries.

8. Summary and Conclusions

Our main conclusions from the first calculation of world income and expenditure inequality based solely on household surveys – which cover about 84% of world population and 93% of world GDP – can be summarised in several points:

1. World income inequality is very high: the Gini coefficient is 66 if one uses incomes adjusted for differences in countries' purchasing power, and almost 80 if one uses current dollar incomes.

2. World inequality has increased (using the same sample of countries) from a Gini of 62.8 in 1988 to 66.0 in 1993. This represents an increase of 0.6 Gini points per year. This is a very fast increase, faster than the increase experienced by the United States and the United Kingdom in the decade of the 1980s. (The Gini coefficient is scale-invariant: thus larger and smaller units can legitimately be compared.)

3. Differences between countries' mean incomes is the most important factor behind world inequality. It explains between 75 and 88% of overall inequality (depending on whether we use Gini or Theil coefficient to measure inequality).

4. The increase of inequality between 1988 and 1993 occurred as both between-country and within-country inequality increased. However, since their relative proportions remained the same, it was the between-country inequality which, being much larger, drove overall inequality up. More specifically, slow growth of rural per capita incomes in populous Asian countries (China, India and Bangladesh) compared to income growth of several large and rich OECD countries, plus fast growth of urban China compared to rural China and rural India, were the main reasons why world Gini increased.

5. World income distribution in 1988 Lorenz-dominates the distribution in 1993. Neither year is stochastically dominant (either first- or second-order). However, if one considers different regions, in the Western Europe, North America and Oceania (WENAO) region, 1993 stochastically dominates 1988. Other regions display no such regularity. In Africa, and Eastern Europe/FSU, though, 1988 displays a second-order stochastic dominance over 1993.

6. What happens to world inequality depends to a large extent on what happens to the relative position of China and India (on the one end of the spectrum), and United States, Japan, France, Germany and the United Kingdom, on the other end.

7. The bottom 5% of the world grew poorer, as their real incomes decreased between 1988 and 1993 by ¼, while the richest quintile grew richer. It gained 12% in real terms, that is its income grew more than twice as much as mean world income (5.7%).

8. A number of other statistics can be generated from world income distribution. These are some examples:

- The richest 1% of people in the world receive as much as the bottom 57%, or in other words, less than 50 million income-richest people receive as much as 2.7 billion poor.

- An American having the average income of the bottom US decile is better-off than 2/3 of world population.
- The top 10% of the US population has an aggregate income equal to income of the poorest 43% of people in the world, or differently put, total income of the richest 25 million Americans is equal to total income of almost 2 billion poor people.
- The ratio between average income of the world top 5% and world bottom 5% increased from 78 to 1 in 1988, to 114 to 1 in 1993.
- 75% of world population receive 25 of world $PPP income; and the reverse.
- 84% of world population receive 16% of world (unadjusted) dollar income; and the reverse.

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Annex 1. Data sources

All data come from nationally representative household surveys. Most of the data for Western Europe, Northern America and Oceania come from the Luxembourg Income Study (LIS). For some European countries not fully included in the LIS (Greece, Portugal, France), the data were provided by individual researchers, or by countries' statistical offices (Ireland, Switzerland).

Most of the data for Eastern Europe and former Soviet Union are taken from Milanovic (1998) and different World Bank sources (eg poverty assessments for Georgia, Armenia).

For Latin American countries, most of the 1988 data are from Psacharopoulos *et al.* (1997). The 1993 data come from various World Bank sponsored surveys, in particular Living Standard Measurement Surveys, LSMSs (eg Ecuador, Jamaica, Guyana, Nicaragua etc.) and countries' own surveys available in the Bank (kindly provided by Kihoone Lee and Julie Van Domelen). Some of the surveys were obtained from an extensive data base created and maintained by the Inter-American Development Bank (Dominican Republic, Costa Rica, Mexico, Peru, El Salvador, and Venezuela). They were kindly provided by Miguel Szekely, Mariane Hilgert, and Ricardo Fuentes. Finally, several surveys were obtained directly from countries' statistical offices (Brazil, Honduras).

For Africa, most of the data come from World Bank organised surveys which have been assembled and standardised in the Africa ISP-Poverty monitoring group. They have been kindly supplied by Olivier Dupriez and Hyppolite Fofack. In addition, some of the surveys were provided by the countries' statistical offices directly (South Africa, Mauritius).

For most Asian countries, the data were kindly supplied by Shaohua Chen and Benu Bidani. Some of these data were used in the book on East Asia by Ahuja *et al.* (1997), and in Ravallion and Chen (1997) work on world poverty. Again, LSMS data and Diane Steele's help were invaluable. Data for some countries (Singapore, Hong Kong, South Korea) were supplied by the countries' statistical offices. For some of the countries (Nepal), household surveys were obtained from a very good and expanding World Bank's Poverty Monitoring Database maintained by Giovanna Prennuschi. The Database either provides the surveys themselves or identifies the institutions or people who might be contacted.

Many other people in the World Bank (Luisa Ferreira, Paul Glewwe, Jacqueline Baptist, Richard Adams, Bahjat Achikbakche, Peter Lanjouw, Ruslan Yemtsov, Francisco Ferreira, Kihoone Lee, Boniface Essama Nssah, Roy Canagaraja, Jeanine Braithwaite) and outside (Peter Krause for the East German data; Carlos Farinha Rodriguez for the Portuguese data; Carol Ernst for the Swiss data; Panos Tsakloglou for the Greek data; Yap Yee Liong for the Singapore data) also helped with the information. Yonas Biru and Yuri Dikhonov helped me generously with the International Comparison (ICP) data. I am extremely grateful to all of them: clearly the project would have been impossible without their help. Costas Krouskas and (in the very early stages of the project, Nadia Soboleva) have done a splendid job in interlinking the country and regional files and providing research assistance.

About ¾ of the country data used in the study are calculated from individual (unit record) data. Most of them come from four sources: HEIDE data base for East European and FSU countries, LSMS Surveys, Africa ISP-Poverty monitoring group, and Luxembourg Income study.[36] This, of course, means that variables and recipient units could be defined to reflect precisely what I needed.

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[36] The web sites are: for HEIDE data base: http://www.worldbank.org/research/transition/index.htm; for LSMS surveys: http://www.worldbank.org/html/prdph/lsms/lsmshome.html; for Luxembourg Income Study: http://lissy.ceps.lu/index.htm

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