

Global Income Distribution 1965–98: Convergence and Marginalisation

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1. Introduction

In 1998, the richest country in the world possessed 115 times the per capita income of the poorest. The richest 20 per cent of the world's population had a per capita income 13 times that of the poorest 20 per cent.¹ Almost a quarter of the world's inhabitants live in poverty. The extent of global inequality is thus massive. How has the extent of inequality changed over time? If there has been an unambiguous increase in worldwide inequality, we might conclude that the global economic system is fundamentally flawed, and that little hope exists unless its institutions are fundamentally changed. If global income gaps have narrowed, on the other hand, there is more room for optimism. The assessment of global inequality is thus important for the evaluation of policies and institutions. If we want to fight inequality and poverty, a reliable assessment is needed.

During the last four decades, a number of countries in South-East Asia have experienced rapid economic growth and narrowed their income gap *vis-à-vis* the richest nations, thus contributing to global income convergence. Since 1980, on the other hand, several countries in sub-Saharan Africa have experienced low growth or even reduced incomes. The marginalisation of these countries has

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1 These comparisons are based on income data that are adjusted for differences in purchasing power.

clearly contributed to worldwide economic divergence. How do these contrasting developments add together in the analysis of global inequality?

The Human Development Report 1999 (UNDP, 1999) published by United Nations Development Programme (UNDP), draws a gloomy picture of the development of global inequality. It is not alone in stating as a fact that ‘Inequality between countries has ... increased’ (UNDP, 1999: 3). The United Nations Conference on Trade and Development (UNCTAD) similarly refers to an ‘enormous increase in the income gap between the richest and the poorest quintiles of world population’ (UNCTAD, 1997: 81).² In this article, we examine the foundation of such statements, present our own calculations and examine other research findings, in order to check whether such statements are correct or not.

We follow many other authors by focusing on income inequality *between countries*, measured by their income per capita.³ Implicitly, we think of income as a proxy for living standards. Income is highly correlated with a number of indicators of living standards (Easterly, 1999). Some aspects of international inequality in terms of living standards are addressed in Melchior, Telle and Wiig (2000b: Chapter 4). While the relationship between income and living standards is complex and interesting, an examination of this issue is beyond the scope of this article, which focuses on income.

2. One Country, One Vote?

The contrasting development in Asia and Africa immediately suggests that our conclusion regarding inequality has to be heavily affected by how we *weight* the different countries when measuring inequality. Weighting has two different dimensions: the first is related to country size, and the second concerns whether countries in different parts of the income distribution are given the same weight or not. Since many Asian countries are large, population-weighted measures will be more influenced by growth in Asia, and we are likely to find income convergence. Since most countries in sub-Saharan Africa are poor, an inequality measure that gives more influence to the poorest countries is more likely to show income divergence.

2 See also World Bank (2000: 51) or a recent publication from the WTO (World Trade Organisation) (Nordström, 2000: 3) for similar statements.

3 Thus we do not analyse income inequality *within* countries, although this is surely also an important component of global inequality. Some comments on this issue will be offered in later sections.

The issue of weighting for country size is in fact crucial for the results we obtain. The reason is simply that many of the slow-growing countries are small, while some of the fast-growing developing countries are large – like China and Indonesia, and India after 1980. For example, 10 countries in Africa experienced a reduction in income from 1965 to 1997. If we consider economic growth for the 40 countries that were poorest in 1965, a population-weighted average shows mean growth per annum of 3.5 per cent during 1965–97.⁴ A simple arithmetic average of growth rates for these 40 countries, on the other hand, shows a growth rate of only 1.0 per cent. The arithmetic average shows growth rates below those prevailing for the richest countries, while the population-weighted average indicates that poor countries grew faster than rich ones.

It seems obvious that measures of international inequality should be population-weighted, and this is also the approach to be followed here. This is also the approach mostly used when calculating various inequality measures, such as, for example, the Gini coefficient or the ratio between per capita incomes in the top and bottom parts of world income distribution.

In one strand of the relevant literature, however, weighting for country size has normally not been undertaken. This is the empirical literature on ‘growth convergence’ (see, for example, Barro, 1997). Neoclassical growth theory predicts that poor countries will have a lower capital-labour ratio, and the marginal returns to capital investments will then be higher and lead to higher growth in poor countries and thus to income convergence (given that differences in saving and population growth are controlled for). The simplest empirical approach is to regress growth rates on initial levels of income per capita. A negative coefficient on the income variable will then show growth convergence, while a positive coefficient will show divergence. In such regressions, each country is normally given the same weight, with the obvious implication that fast growth in, for example, China and Indonesia, will be outnumbered by African countries experiencing economic decline. This effect is especially strong after 1980, due to the economic stagnation in sub-Saharan Africa. As a simple illustration, Table 1 shows unweighted and weighted regression of average annual growth rates (for each country) in the 15-year period 1982–97 on their initial per capita income level (in logs) in 1982.

4 This is based on a data set with purchasing power adjusted (PPP) figures for income per capita for 115 countries from 1965 to 1997 (PPP-115, see Appendix).

Table 1. Simple regressions on income convergence 1982–97, weighted and unweighted

	<i>Unweighted</i>	<i>Weighted by 1982 population</i>
Constant	-0.040 (0.016)	0.092 (0.041)
Income 1982 (logs)	0.0060 (0.0020)	-0.0081 (0.0047)
Adjusted R ²	0.10	0.06
Observations	127	127

Note: Heteroskedasticity-corrected standard errors in brackets.
Data source: PPP-115 (see Appendix).

Although the explanatory power of this extremely simple equation is not impressive, it serves to illustrate that the results depends on whether we give all countries equal weights or not. While the weighted regression above shows convergence, the unweighted version shows divergence. When the empirical growth convergence literature has failed to find empirical support for simple ‘unconditional convergence’ of the type examined in Table 1 (i.e., without ‘conditioning’ for other explanatory variables) (see, for example, Sachs and Warner, 1995; Ben-David, 2000), it may thus be because they gave all countries the same weights. In ‘conditional’ growth regressions, however, the stagnation in small and poor countries in Africa is captured by variables reflecting education level, political stability etc., and the growth regressions now support the convergence hypothesis (Sachs and Warner, 1995; Barro, 1997). While unweighted regressions are plausible when causal relationships between country characteristics and growth are to be examined, one should observe that the coefficients on initial income in growth regressions should not be interpreted as a description of changes in world income distribution. One should thus distinguish between causal explanation and description of world income distribution.

In this article, we shall mainly focus on the descriptive issue; i.e., how income gaps have changed, and not how these changes are to be explained. We shall thus stick to population-weighted measures. Such measures will obviously give considerable prominence to countries like China and India. It is certainly appropriate that each world citizen counts equally, instead of letting a Chinese citizen count 1/1000 of an inhabitant of, for example, Gambia (with 1.2 million people in 1997).

The second weighting issue is related to whether poor, intermediate and rich countries should have the same influence on our inequality measure. If the marginal utility of income is decreasing, one might

argue that a 1 per cent increase in income per capita for a poor country improves world welfare more than a similar increase for a rich one. Several inequality measures have the property that a proportionate increase in income for all countries leaves inequality unaffected. This applies to the Gini coefficient, and it applies to simple ratios between average per capita incomes in selected (top and bottom) parts of the income distribution. Some other inequality measures give more weight to income changes in the lower end of the distribution. The standard deviation of the logarithm of income has this characteristic. Other inequality measures, such as the Atkinson index and the generalised entropy measure, may also have this property, for a suitable choice of the variable parameters involved in these indexes. For a discussion of the properties of various inequality measures, see, for example, Sen (1997), Cowell (1995), or Cowell (2000).

In the following section, we present results on how international inequality has developed, using the Gini coefficient. The Gini coefficient has some attractive properties, but also some disadvantages. While a proportionate increase in all incomes will leave the Gini coefficient unaffected, this measure has some weighting properties that matter when income or population changes vary over the income distribution. We shall revert to these aspects when interpreting the later results, in order to check whether the results are unduly influenced by specific or undesirable properties of the index. An advantage when using the Gini coefficient is that it has been very widely applied in the related literature. Our results may thus easily be compared to other studies.

3. International Inequality 1965–98: Gini Coefficients

Leaving aside for a while the issues related to weighting and welfare, we may now see how the Gini coefficient for international inequality in terms of per capita incomes has developed over time. While our analysis will mainly be based on income data that are adjusted for price level differences (PPP data, for 115 countries), we also show how the Gini coefficient has changed if we use income data that are based on official exchange rates (OER data, for 136 countries). As we shall see, the choice of data is of great importance.

Based on PPP data, the Gini coefficients suggest that international inequality has been reduced more or less continuously since 1968.

Diagram 1. Gini coefficients for differences in average per capita incomes between 115 countries 1965–98 (population-weighted). Data: PPP-115 and OER-136 (see Appendix).

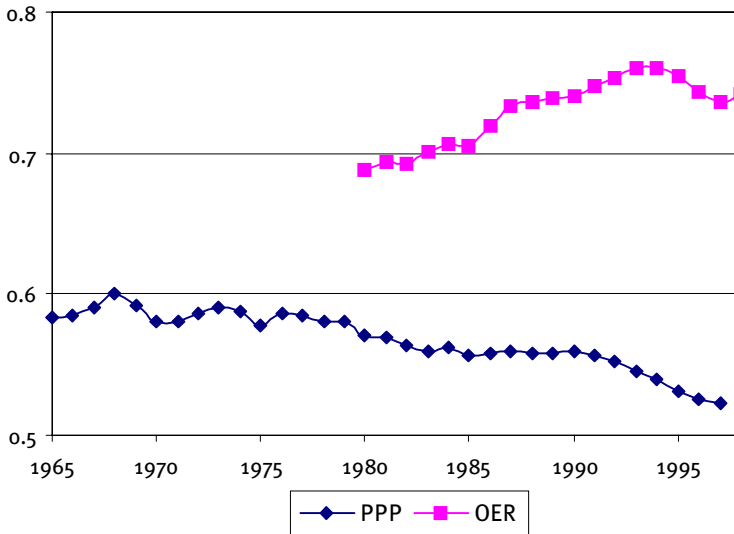
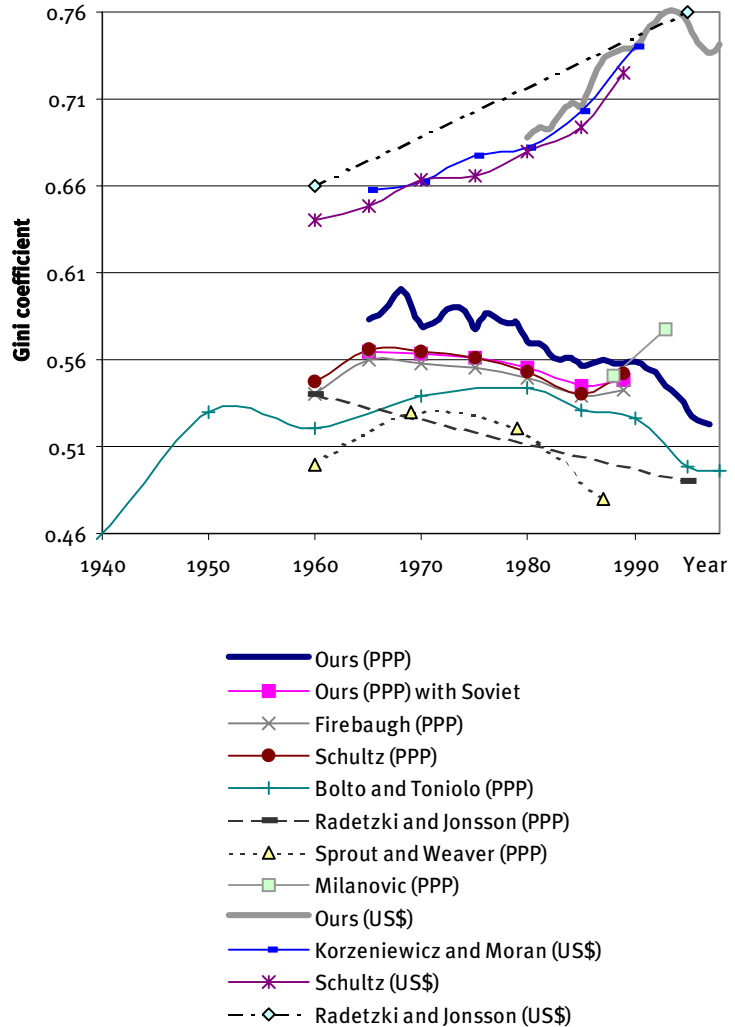


Diagram 2 shows that our results are in line with other research contributions. In the diagram, the upper curves depict results based on OER data, while the lower bundle of curves are based on PPP data. Our results based on PPP data are broadly in accordance with those of Sprout and Weaver (1992), Firebaugh (1999), Schultz (1998) and Boltho and Toniolo (1999) for the period 1965-90. They all conclude that inequality increased during most of the 1960s, but that a modest decline in inequality can be observed from the late 1960s until around 1990. The only alternative study that covers the period 1990-97 is Boltho and Toniolo (1999), although with only two observations after 1990 and with a more limited data set from different sources. They obtain, nevertheless, a trend for the 1990s that supports our results.⁵

While PPP data thus suggest that international inequality has declined during the last decades, our result based on OER data in Diagram 1, as well as other contributions illustrated in Diagram 2 (for example, Korzeniewicz and Moran, 1997; Radetzki and Jonsson, 2000), suggest that international inequality widened until the early 1990s. The other studies based on OER data also suggest that ine-

⁵ The Gini coefficients derived here are somewhat higher than the similar coefficients in the other studies. This tendency generally disappears if we include the former Soviet Union in our sample, see Melchior, Telle and Wiig (2000b: 40) for details. PPP data are not available for the former Soviet Union for the whole period.

Diagram 2. Gini coefficients in different studies.
Data source: See references in text.



quality increased during the period 1960-79 (not covered in Diagram 1). During 1994-97, however, our results suggest that inequality has been reduced even when OER data are applied.

We thus have two sets of results, based on two different types of data. Both suggest that international inequality increased during the 1960s and declined after 1993, but for the intermediate period, 1968-93, the two sets of results are in conflict. Which one provides the most reliable description of trends in international inequality? Or which data set presents the most appropriate measure of the phenomenon that we intend to analyse?

4. The Data Issue: PPP versus OER

For comparing incomes between different countries, we need data that are comparable. For OER data, this is obtained by converting national accounting data at the current official exchange rates.

The basic problem with OER data is that they do not take into account price-level differences between countries. In general, poor countries have lower prices, and the real income of inhabitants in these countries is therefore underestimated when OER data are used. OER data thus exaggerate the extent of international inequality. As an example, the ratio between per capita incomes in the USA and China in 1997 was 40:1 when measured by OER data, but only 8:1 when using PPP data. For our purpose, we are not interested in measuring what a Chinese person could buy in international markets for his or her income, but his or her purchasing power in China.⁶ On such grounds, PPP data should obviously be preferred.

Another disadvantage with OER data is that exchange rates fluctuate over time and create changes in relative incomes that do not reflect underlying changes in real incomes. Furthermore, exchange rate regimes vary across countries and change over time and create changes in relative OER incomes that do not reflect trends in real incomes. During parts of the period studied here, several developing countries had overvalued currencies (see, for example, Shats and Tarr, 2000), and many countries pegged their currencies to the US dollar. Overvalued currencies imply that the OER value of a poor country's income is exaggerated, and inequality is thus underestimated. If currency overvaluation for poor countries is eliminated, their relative OER incomes will fall, and this might contribute to an increase in inequality.⁷ This is, therefore, one possible explanation of why OER- and PPP-based inequality trends over time differ.

Such problems with OER data were the reason why the United Nations in 1967 started the International Comparison Programme (ICP), in order to create a better data set for comparing incomes and economic growth between countries and over time. The intention was to create data that properly take into account differences in price levels between countries. The basic building blocks of PPP data are price surveys ('benchmark studies') for a selection of

6 PPP data, for example, are more highly correlated with national consumption data than OER data (see, for example, United Nations, 2000).

7 Radetzki and Jonsson (2000) implicitly seem to maintain the opposite, that an elimination of exchange rate overvaluation in poor countries should lead to a reduction in inequality.

commodities, undertaken in each country at (mostly) five-year intervals. While the ICP project in 1970 covered only 10 countries, the coverage has expanded to more than 100 at present.

In order to construct PPP data from the benchmark studies, a specific methodology is needed. In fact, different methods are used by different international organisations, and all currently applied methods have their weaknesses (see Neary, 2000, or Ahmad, 1994, for a discussion). As a consequence, different PPP income estimates exist. The data applied here are based on the Penn World Tables (PWT) (see, for example, Summers and Heston, 1991). The methodology used for constructing these data implies that income gaps between rich and poor countries are slightly *underestimated* (Neary, 2000). The practical implication is that Gini coefficients for international inequality may be in the order of 2 per cent lower than they should have been, if an ideal methodology had been applied. The magnitude of this error, however, is much smaller than the corresponding exaggeration of inequality obtained when using OER data: as demonstrated by Diagram 3, Gini coefficients based on OER data may be 10–20 per cent higher than with PPP data.

Another problem with PPP data is due to the limited coverage of benchmark studies: a considerable amount of extrapolation has been undertaken in order to construct a data set that covers so many countries for such a long time period (see Ahmad, 1994, for a discussion of the methods applied). For recent years, the country coverage of the benchmark studies is so extended that such problems should be more limited. Considering the limited number of benchmark studies during earlier years, however, one might expect PPP data for the 1970s and before to be less reliable (for a discussion of error margins in PWT data, see Heston and Summers, 1996). Concerning the coverage over time series, observations between two ‘benchmark’ years are normally filled in using real GDP growth (or growth in the main components of GDP) from national data.

For the purpose of studying changes in inequality over time, a crucial issue is whether PPP-based growth rates are reliable. Nuxoll (1994) compared PPP (PWT) growth rates with real income growth rates from national accounts for 1960–85. He found that some discrepancy was present, but the bias was not correlated with initial income levels. This suggests that PPP data do not imply a systematic bias related to the magnitude of income gaps between rich and poor countries over time. Studies of international inequality in terms of living standards also suggest international convergence during the last decades, in fact at least as strong as when PPP income data

are applied (see, for example, Melchior, Telle and Wiig, 2000b: Chapter 4).

As a specific example of how time trends in OER and PPP data differ, here we may also use the ratio of per capita incomes in the USA and China: According to PPP data, this gap was reduced from 20:1 in 1965 to 8:1 in 1997. That China has narrowed its income gap *vis-à-vis* rich countries, is what we are led to believe by several sources (see, for example, World Bank, 1997). According to OER data, however, the income gap between the USA and China changed very little from 1965 to 1997; in fact it increased from 37:1 to 40:1.

While PPP data thus have their problems and weaknesses, there is, to our knowledge, no evidence that such data lead to a systematic bias when measuring changes in inequality over time. PPP data are no doubt the conceptually proper ones to apply when comparing real incomes in different countries. OER data, on the other hand, severely exaggerate inequality and are subject to changes over time due to exchange-rate fluctuations and exchange-rate regime changes. Our conclusion is, therefore, that *studies of international inequality and its changes over time should primarily rely on PPP data.*

This said, it should be added that further research needs to be undertaken in order to explain the differences between results based on PPP versus OER data. Some caution should also be exercised when using PPP data, especially for earlier years when the coverage of benchmark studies was limited.

Consequently, our assessment is that *international inequality has been more or less continuously reduced since the late 1960s, when measured by the Gini coefficient.*

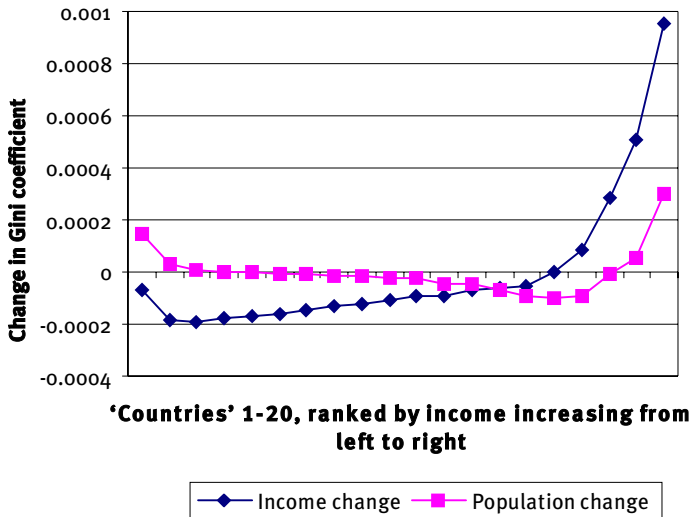
5. What Drives the Change in International Inequality?

Obviously, changes in large countries will have a disproportionately strong influence on the Gini coefficient. This influence depends, however, partly on the position of each country in terms of world income distribution. As noted above, the Gini coefficient has some weighting properties that affect the results. These properties cannot be described in a simple mathematical way, since they depend in a complex manner on the exact income distribution and the ranking of countries. For this reason, it is useful to use numerical simulations to shed light on the issue. An artificial data set with 20 countries was therefore constructed, with income levels and a distribution that approximately correspond to the income distribution

in 1982,⁸ and with all countries originally of equal size (with 1/20 of the total population). This set gives a Gini coefficient of 0.55. We then simulate two types of changes: (i) how the Gini coefficient is affected by a 1 per cent increase in per capita income for each country (the ranking of each country is unaffected), assuming that all the other income levels are unaffected, and (ii) how the coefficient is affected by a 1 per cent increase in population for each country, assuming that the populations of all the other countries remain unchanged. The results are shown in Diagram 3.

As we might expect, income increases in poor countries contribute to less inequality, while income growth in the richest countries widen the income gaps. For some intermediate value, which is approximately 4000 PPP\$, the Gini coefficient is unaffected, and for values close to this threshold level, income changes have a moderate impact on the Gini coefficient.⁹ Disproportionate income changes in the richest countries will have the strongest impact, but also income changes in the lower part of the distribution will significantly change the extent of inequality. The very poorest countries, however, have a tiny share of world income, and income changes in these countries will not affect the Gini coefficient very much.

Diagram 3. Simulation of how income and population changes in different countries affect the Gini coefficient.



⁸ Details may be obtained from the authors on request.

⁹ The threshold value in the simulation is close to the level that applies for the real data set, where this level increases from around 3800 PPP\$ in the 1960s, to around 4500 PPP\$ in 1997.

The curve reflecting population changes illustrates that excessive population growth in the very poorest and very richest countries contributes to a higher Gini coefficient, while population growth in intermediate countries will generally reduce inequality. For relatively poor intermediate countries, however, the impact will be modest.

On this basis, we may examine how income and population growth for each country deviated from the world average, and obtain an understanding of how various countries contributed to the changes in the Gini coefficient. Table A1 in the Appendix includes the 30 largest countries in our sample (based on 1965 populations), and shows whether their income or population growth was above the world average or not. Recall also that the influence of each country will increase with its population size. For some especially important countries, we checked their influence by calculating the Gini coefficients with these countries deleted from the sample. For other countries, the discussion above and the table in the Appendix give a basis to assess their impact.

For the reasons outlined above, populous countries such as China, Indonesia and Brazil should contribute to reduced inequality, due to their above-average income growth combined with population growth close to the world average. This also applies to the Asian NICs Thailand, South Korea and Taiwan during the first part of the period, but at some stage these countries passed the threshold level so that their continued growth contributed to greater inequality.

China is of special importance, due to its large population. A closer examination reveals that fast economic growth in China is in fact a main reason behind the reduction in inequality. If China is deleted from the sample, there is not much change in the Gini coefficient over the period (for more details, see Melchior, Telle and Wiig 2000b: 42ff.). This does not imply that 'it is all due to China'; one may also say that 'even without China, the poor countries kept pace with the richest countries'. Out of the 21 developing countries included in Table A1 in the Appendix, 11 had faster income growth than the world average. The 11 that grew fast, had a combined population of 2939 million in 1997, while the 10 that grew slowly, had a combined population of 681 million. A number of large developing countries thus contributed to reduced inequality. Poor and large developing countries such as Zaire and Sudan, with slow economic growth and high population growth, surely contributed to more international inequality. This also applied to India during the first half of the period. From the early 1980s, however, economic growth in

India accelerated and India contributed to a reduction in inequality. Over the whole period, India did not have a large impact on the Gini coefficient. This was confirmed by calculating Gini coefficients with India excluded from the sample.

The shrinking population shares of rich countries such as the USA, the UK, France, Canada and the Netherlands, combined with income growth close to the world average, imply that these countries are likely to have contributed to less inequality. If both China and the USA are deleted from the sample, international inequality increased from 1965 to 1997. Mainly due to its low population growth, the USA thus contributed to less inequality.¹⁰

Calculations without Japan confirm that, over the whole period, Japan's economic growth contributed to increased inequality in spite of its shrinking population share. This contribution was strongest during the intermediate period. During the 1990s, Japan's economic growth slowed down and its influence on the Gini coefficient declined. During the earliest years, economic growth in Japan was particularly strong, but the income level of Japan was just above the threshold level, and this reduced its influence on the Gini coefficient.

6. Alternative Inequality Measures

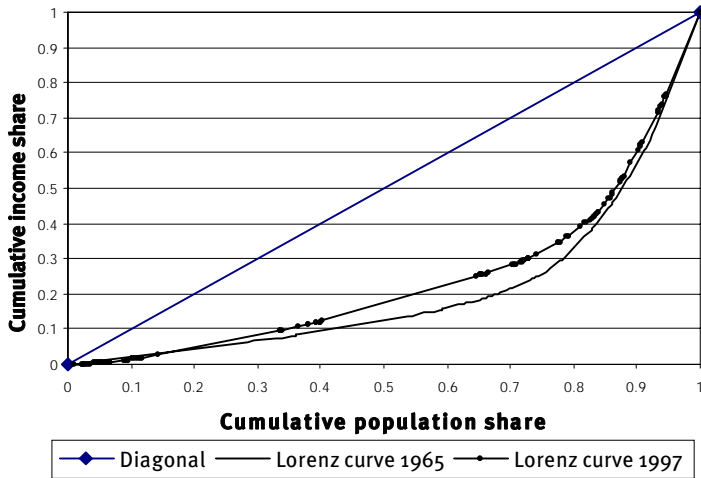
As noted before, the Gini coefficient is not the only possible measure of international inequality. Could it be the case that other measures show another trend? Or does the Gini coefficient have undesirable properties, so that another measure should be preferred?

In order to answer the first of the two questions, a useful point of departure is to show the Lorenz curves underlying the Gini coefficients for 1965 and 1997 (Diagram 4).

To construct the diagram, we have ranked the 115 countries according to income per capita (PPP). The horizontal axis measures the cumulative share of the world population, and the vertical axis the cumulative share of world income. If all countries had the same per capita income, the Lorenz curves would coincide with the diagonal. Due to income inequality, the Lorenz curves become gradually steeper. The Gini coefficient measures (twice) the area between the Lorenz curves and the diagonal. Since most of the 1997 Lorenz curve is above the 1965 curve, the Gini coefficient has declined during the period.

10 Germany is not included in our data, due to the problems of obtaining comparable data for the periods before and after reunification. Other studies suggest, however, that the trend in inequality over time was similar during 1960-89 when Germany was also included (Schultz, 1998; Firebaugh, 1999).

Diagram 4. Lorenz curves for 1965 and 1997.
Data: PPP-115 (see Appendix).



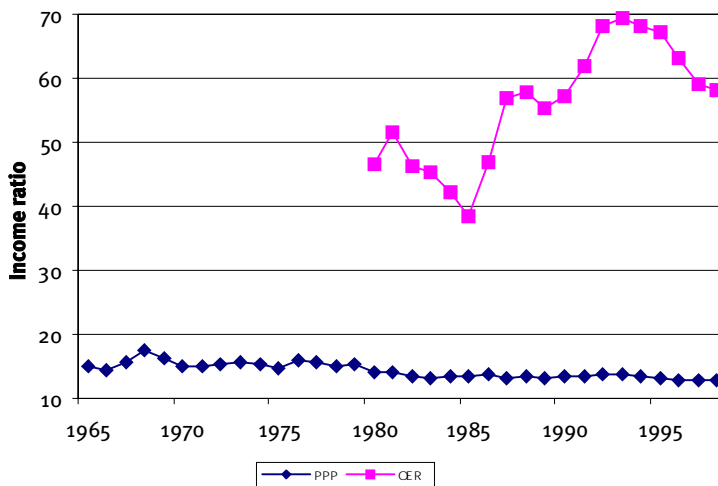
Observe, however, that the two Lorenz curves cross when the cumulative population share of the poorest countries is at 17 per cent. The share of world income held by the poorest countries including 17 per cent of the world population was, therefore, the same in 1997 as in 1965. For the poorest 10 per cent, however, the income share had declined. For the poorest 20 per cent, or for any higher share, it increased. This illustrates that it matters whether we compare the richest and poorest decile, quintile, third or half. If we compare the top and bottom 10 per cent, we are more likely to find that world inequality has increased. If we compare the top and bottom third, the reverse will be true.¹¹ A comparison between the top and bottom 20 per cent (quintiles) is a measure frequently applied, for example by the UNDP. Diagram 5 shows that this measure implies trends over time that are similar to those observed when using Gini coefficients.

The ratio based on PPP data (the lower curve) shows a small but more or less constant decline from 1968 to 1998.¹² According

11 When the World Bank (2000: 51) compares average income in the 20 richest and the 20 poorest countries in 1960 and 1995 - excluding China from the poorest 20 in 1960 - they find that the income gap (measured in GDP-PPP) has increased. This is because the poorest 20 countries (excluding China) represent less than 10 per cent of the world population.

12 There was an increase from 1966 to 1968, and this also applies to the whole period 1960-68. The period 1960-64 is not included here due to missing data for some countries.

Diagram 5. The income ratio between the countries including the richest and poorest 20% of the world's population.
Data sources: PPP-115 and OER-136 (see Appendix).



to our assessment of the data, this is the more appropriate indicator of the two shown in the diagram. The measure based on OER data (the upper curve) is of some interest because it corresponds to the figures presented by UNDP as evidence on increased global inequality, and referred to in the introduction. UNDP (1999: 3 and 36) referred to the *increase* of this ratio from 30 in 1960 to 60 in 1990, and finally to 74 in 1997.¹³ Our results show that there was an overall increase in this ratio from 1985 to 1993. After 1993 the ratio fell.¹⁴

While Gini coefficients as well as comparison of the top and bottom quintiles show reduced inequality, a comparison of top and bottom deciles (10 per cent) indicate that inequality increased to-

13 The absolute values differ between ours and UNDP's results although the trend is similar. Since UNDP's calculations are not well documented, we are not able to check whether this is due to data, country coverage or other aspects. UNCTAD (1997) also used OER-based income ratios as a basis for their statements about worldwide inequality.

14 In fact, this fall is also documented by the UNDP since they reported the ratio to be 82 for 1995 (UNDP, 1998: 29). According to UNDP's own figures, there was a fall between 1995 and 1997. This was, however, not mentioned in the Human Development Report for 1999, which focused on global inequality! Notwithstanding UNDP's important and useful other contributions in the field, the omission demonstrates that some of UNDP's statements about increasing world inequality were based on a very limited analysis.

wards the end of the period. In fact, this ratio first decreased from 23:1 in 1962 to 18:1 in 1982, and then increased rather sharply to reach 27:1 in 1997. When using such ratios, it should be observed that the countries included in the poorest or richest deciles change over time. China was part of the poorest 10 per cent in 1965, but not in later parts of the period, due to its fast economic growth. Such ratios thus do not tell the whole story about 'how the poorest developed'.

The increase in inequality between the top and bottom deciles in 1982-97 illustrates the economic decline in several poor countries during this period. From 1982 to 1997, 36 countries – mostly poor countries in Africa – experienced a reduction in their average per capita incomes. These countries, taken together, had a share of the world population of 11 per cent in 1997. This massive decline for a number of countries is not enough to prevent the Gini coefficient (or the quintile ratios) from showing reduced international inequality. Could it be the case that other measures give another result?

An alternative index that gives more weight to the lower end of the income distribution is the standard deviation or variance of the logarithms of income. This measure, however, also shows that international inequality has declined. The percentage reduction in inequality from 1965 to 1997 (15 per cent) is even larger than for the Gini coefficient (10 per cent) (see Melchior, Telle and Wiig, 2000b: 103). The reason is again that some poor countries such as China have experienced rapid growth and have a large share of the world population. Yet another possibility might be the Atkinson index (see Atkinson, 1983), where parameters can be chosen in order to select the degree of 'inequality aversion' (i.e., the weight given to poor countries) that one wishes. It can be shown that with parameters that are normally regarded as representing 'high inequality aversion', the result is still that international inequality has been reduced over time.¹⁵

This result, namely that international inequality has been reduced over time, is thus confirmed by a number of different inequality measures. Only when we focus exclusively on the top and bottom parts of the income distribution, is the result obtained that inequality increased. As noted in the introduction, this is the inevitable consequence of the contrasting experiences of Africa and Asia. When concluding that international inequality has declined, we should of

¹⁵ Based on unpublished work by one of the authors. Details may be provided on request.

course not forget the divergent trends for different regions. The decline in Africa should not, however, make us forget the success in Asia.

7. Welfare Considerations

Does the observed reduction in international inequality imply that world welfare has also increased? In the literature on inequality and welfare, aspects of welfare are normally discussed with reference to individuals. Applying this to countries may not be entirely appropriate, since we do not consider within-country inequality here. Nevertheless, we shall include some reflections on whether such welfare criteria are applicable to the assessment of inequality between countries. It is also evident that inequality and income levels are not the only aspects that affect welfare. It is, nevertheless, of interest to examine the welfare implications of changes that only relate to these aspects.

There is a huge literature studying to what extent it is possible to rank income distributions in terms of welfare (for an overview, see, for example, Cowell, 2000; Sen, 1997; or Cowell, 1995). According to this literature, one may define specific normative principles, or define a *social welfare function* based on such criteria, in order to rank different income distributions. Furthermore, this literature studies to what extent specific inequality measures may correspond with certain welfare criteria. Means of measuring welfare such as the Atkinson index or the generalised entropy measure are motivated by such welfare considerations. The welfare properties of the Gini coefficient are, however, not easily derived from a standard social welfare function, even if the Gini measure satisfies most of the normative criteria that inequality measures should have. If we were to interpret the Gini coefficient as a welfare index, it would imply a particular welfare function where the ranking of countries plays an important role (Sen, 1997: 33). For such reasons, we should not draw conclusions about welfare that are based solely on the Gini coefficient.

The Lorenz curves underlying the Gini coefficient may, however, be given a welfare interpretation that is more plausible. The case for ranking two income distributions based on welfare criteria is in fact easiest if the Lorenz curves for the two distributions do not intersect. It is well known from the literature that, in such a case, we may conclude that welfare is highest in the situation with lower inequality, based on a social welfare function with certain proper-

ties.¹⁶ Since the Lorenz curves for 1965 and 1997 intersect, however, we know that the poorest countries had a lower share of world income at the end of the period. Even if inequality has decreased, we may not conclude, based on the Lorenz curve ranking, that welfare has increased. This test is therefore inconclusive.

This criterion of ‘Lorenz curve dominance’ does not take into account that the average income for the world has increased during the period. If, for example, the income of every country in the world had doubled during the period, few people would object to the conclusion that welfare had increased. The Lorenz curve and the Gini coefficient would remain unchanged, however, and we may not draw any conclusion about welfare that is based on them.

We might therefore check whether conclusions about world welfare may be drawn if we also take into account that average income levels have changed. In the literature, several formulas have been suggested for how Gini coefficients and mean incomes may be combined in a measure that takes both aspects into account (see Cowell, 2000: 120). In our case, all these measures would obviously suggest that welfare has increased, since inequality has declined and the mean income has increased. To draw such a conclusion would, however, be premature, since we still have the problem that the Gini coefficient is not a plausible measure of welfare.

Another approach that takes into account inequality and income levels simultaneously, and which may be grounded on plausible welfare criteria, is to examine the *generalised Lorenz curves*. These are simply the Lorenz curves scaled up by mean income. In some cases the generalised Lorenz curves do not intersect, even if the Lorenz curves do. In such cases, one may also draw unambiguous welfare conclusions based on specific normative criteria.¹⁷ Diagram 6 shows the generalised Lorenz curves in our case, for 1965 and 1997.

The right-hand side end-points of the two curves are equal to mean income, which has increased considerably. As seen from

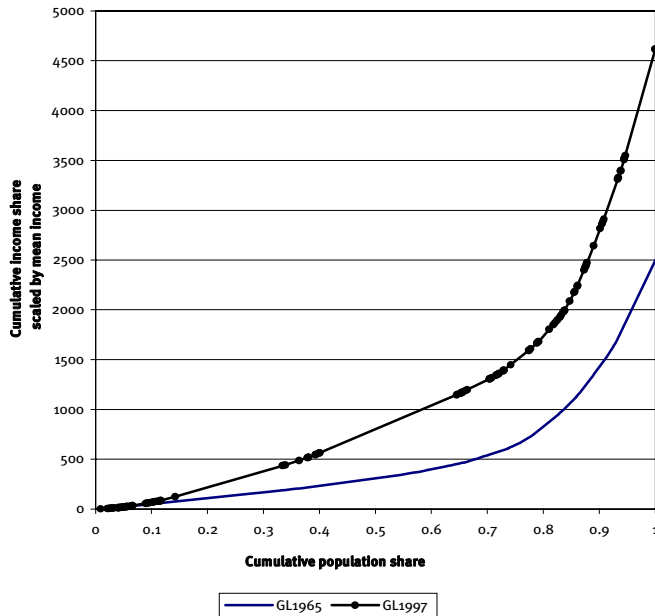
16 See Sen (1997: 48ff.), Cowell (1995: 42) or Shorrocks (1983) for a discussion of the welfare criteria involved.

17 This is the concept of so-called second-order dominance, which can be founded on a social welfare function that is (i) individualistic (the welfare of each country depends on its own income only), (ii) increasing (an income increase for one country, with unchanged incomes for the rest, increases welfare), (iii) additive (social welfare is the sum of individual welfare levels), (iv) strictly concave (an income increase for a poor country is considered better than an increase for a richer country). For a discussion, see Cowell (2000: 103), Cowell (1995: 42) or Shorrocks (1983).

Diagram 6, the two generalised Lorenz curves intersect.¹⁸ The test based on generalised Lorenz curves is thus also inconclusive.

We are thus left with a situation where it is difficult to draw unambiguous welfare conclusions based on these formal welfare criteria. The inconclusiveness is due to the fact that the poorest countries are worse off. As noted above, some inequality measures that reflect high ‘inequality aversion’, such as the decile ratios or the Atkinson index with very high inequality aversion, even suggest that inequality has increased. Even if such measures do not, in our opinion, give a representative picture of the world’s development, they may be defended on the basis of individual preferences. In terms of welfare criteria, they imply that income changes in the lower part of the distribution are given higher weight. A special version of preferences of this kind is the ‘Rawlsian’ approach where welfare is evaluated, based on the outcome for the poorest, and richer countries are given zero weight in the welfare function. In

Diagram 6. Generalised Lorenz curves for the international income distribution in 1965 and 1997.
Data: PPP-115 (see Appendix).



¹⁸ The intersection occurs at a cumulative population share of 6 per cent. This is higher than the population share of the countries that experienced a decline in real income from 1965 to 1997, which was 3.7 per cent of the population in the sample.

that case, the outcome with our data would depend on whether we chose the poorest country, the poorest 5 per cent of countries, or even the poorest 50 per cent, as the basis for our evaluation. The choice would be rather arbitrary, and there may also generally be an objection to using a welfare function where considerable parts of the world population are given zero weight.

The discussion leads us to the conclusion that, on welfare grounds, it is difficult to establish strict criteria that are widely accepted and allow us to draw unambiguous conclusions about world welfare. Welfare has most likely increased in some countries, but declined in others. Because the income of the latter group has fallen both in relative and absolute terms, it is a highly normative question whether the development is to be regarded as good or bad.

While we refrain from drawing conclusions about average world welfare, this does not imply that we can say nothing about inequality. Since a variety of measures show that inequality has declined, our conclusion about this remains valid. The discussion shows, however, that the marginalisation of some poor countries is also part of the picture. Some inequality measures that give extremely high weight to the poorest countries thus indicate that international income gaps have increased. While this is important, it does not tell a representative story about how the world economy has developed.

8. Concluding Remarks

The assessment in this article is thus that international inequality, measured in terms of each country's income per capita, declined between the late 1960s and 1997. In order to obtain this conclusion, one has to take into account the population size of each country, and use data that take into account differences between the price levels in each country. We have argued that data that are based on official exchange rates and fail to reflect differences in purchasing power, exaggerate inequality and are subject to variations that do not reflect real income changes in each country, for example due to exchange-rate variations. While PPP data also have some problems, they are the conceptually proper ones to use for comparing real incomes, and research so far does not suggest that growth rates based on such data are biased in terms of analysing time trends in income gaps between rich and poor countries. While more research should be undertaken in order to explain why the two types of data give different conclusions about inequality, PPP data should be considered as the appropriate data source for such studies.

Notwithstanding the main conclusion about reduced international inequality, it is beyond doubt the case that the development of poor countries has been characterised by divergence: while some very poor countries such as China, Indonesia and (since the 1980s) India have experienced fast growth, a number of other poor countries have faced economic decline. Even if the latter group had a much lower share of the world population than the group of developing countries that grew fast, the stagnation in several countries is an important challenge in the world economy. As noted above, if we focus only on the gap between the top and bottom deciles, it shows that income gaps have increased.

This article has not examined every important aspect of global inequality. While the focus here has been on inequality between countries, inequality within countries is also an important part of overall global inequality. Other studies suggest that the between-country component is the most important aspect of global inequality (Sprout and Weaver, 1992; Korzeniewicz and Moran, 1997; Quah, 2000). For parts of the period covered here, other studies also confirm that the trend in world inequality over time is not very different when within-country inequality is also included (Sprout and Weaver, 1992). Milanovic (1999), however, found that world inequality increased from 1988 to 1993 when within-country inequality was also included. His results were based on household survey data and household expenditure data. Since the increase in inequality in Milanovic's study was mainly due to changes in China and South Asia, it may be noted that the period 1988–93 was not representative for the development over a longer period in these countries: in China, there was an increase in poverty during 1985–91 (Yao, 2000), and in India and Pakistan, growth was relatively low during this period. Although interesting and important, Milanovic's results may not necessarily be representative for a longer time period. More research and better data are needed in order to obtain a more complete picture of how global inequality has developed when intra-country inequality is also taken into account.

In this article we have not attempted to *explain* the changes in inequality. This is of course also a vast and important subject, which it has been beyond the scope of this article to address.

Our main conclusion is supported by a variety of inequality measures. It seems fair to conclude that some of the international organisations mentioned in the introduction have contributed to a biased assessment of world inequality. As also noted in the introduction, we need a reliable assessment of world development if we

are to attack poverty and inequality. Concern for the poorest should not make us forget that some countries in the world have in fact made significant progress in the struggle against poverty. This is the main feature that underlies our conclusion about inequality.

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Appendix: Data Sources

Two data sets are applied in the empirical analysis. These are:

- PPP-115: This includes income per capita in PPP\$ for 115 countries during 1965–97, and was obtained from the World Bank. Population data were also taken from World Development Indicators 1999 (World Bank, 1999). The data are mainly based on the Penn World Table 5.6 (RGDPCH). A complete list of countries may be obtained from the authors on request.

- OER-136: This data set includes income per capita in US\$ and was kindly provided to us by W. Prince at the World Bank. Population data were obtained from World Bank (1999).

Appendix Table A1. Income and population growth for the 30 countries with the largest populations in 1965 in the sample of 115 countries

Country	GDP per capita (PPP\$)		Average annual income growth	Population (millions)		Annual growth in excess of average for the sample of 115 countries, 1965–97, for	
	1965	1997	1965–97	1965	1997	Population	Income
China	577	2387	4.54	715	1227	-0.16	2.60
India	751	1624	2.44	487	962	0.29	0.50
USA	11649	20049	1.71	194	268	-0.86	-0.23
Indonesia	608	2735	4.81	105	200	0.19	2.87
Japan	4491	16003	4.05	99	126	-1.10	2.11
Brazil	1871	4449	2.74	84	164	0.23	0.80
Bangladesh	1136	1779	1.41	58	124	0.51	-0.53
UK	7679	14472	2.00	54	59	-1.60	0.06
Pakistan	889	1472	1.59	53	128	0.97	-0.35
Italy	5691	13357	2.70	52	58	-1.55	0.76
France	7304	14650	2.20	49	59	-1.28	0.26
Nigeria	624	960	1.35	46	118	1.09	-0.59
Mexico	3351	6435	2.06	43	94	0.61	0.12
Spain	4580	10685	2.68	32	39	-1.22	0.74
Philippines	1243	1873	1.29	32	74	0.77	-0.65
Turkey	1812	4396	2.81	31	63	0.34	0.87
Thailand	1136	5038	4.76	31	61	0.29	2.82
Egypt	1024	2106	2.28	29	60	0.41	0.34
South Korea	1058	10131	7.32	29	46	-0.36	5.37
Ethiopia	290	369	0.76	25	60	0.85	-1.18
Argentina	5018	6489	0.81	22	36	-0.38	-1.13
South Africa	2617	3134	0.56	20	41	0.40	-1.38
Canada	8664	17616	2.24	20	30	-0.50	0.30
Colombia	1816	3813	2.35	20	40	0.40	0.41
Romania	590	1724	3.41	19	23	-1.33	1.47
Zaire (Congo)	548	197	-3.14	18	47	1.24	-5.08
Morocco	1221	2231	1.90	13	27	0.41	-0.04
Taiwan	1660	11729	6.30	13	22	-0.17	4.36
Sudan	854	1032	0.59	12	28	0.70	-1.35
Netherlands	7396	14683	2.17	12	16	-1.11	0.23

Data source: PPP-115 (see Appendix). Note: For the whole sample of 115 countries, average population growth per year was 1.86 per cent, while average per capita income growth (population-weighted) was 1.94 per cent.