Économie internationale 100 (2004), p. 13-25.

ÉCONOMIE INTERNATIONALE

DECLINING INTERNATIONAL INEQUALITY AND ECONOMIC DIVERGENCE: REVIEWING THE EVIDENCE THROUGH DIFFERENT LENSES

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ABSTRACT. In recent years, an ample literature has emerged on the evolution of global inequality during the last two decades. A few stylized facts emerge. If one weights countries by their population, then inequality across countries has declined. However, if one treats countries equally – as in the macroeconomic convergence (divergence) literature – then there has been increasing inequality. Which view is the correct one? In this paper, we use the 2004 version of the World Bank's World Development Indicators to re-examine the evidence over the 1980-2002 period, and the data reaffirm the two trends described above. Even if inequality declined by most common aggregate inequality indices, there is neither full Lorenz dominance of 2002 over 1980 in population-weighted terms, nor first-order dominance. The aggregate inequality indices also mask the tremendous mobility of countries, and in particular, the impoverishment of about two dozen countries at the bottom of the distribution over the period in question. Tracking mobility is a less "anonymous" approach to the analysis, and it also can explain divergent views on increasing or decreasing international inequality. If one cares only about final outcomes and not initial starting positions, then inequality decreased by most criteria. However, if mobility itself is part of the welfare criteria, and if one is willing to put more weight on those countries that have lost, then the world distribution of income has worsened.

JEL Classification: D30; D31; D63; F0; I30; O00.
Keywords: Income Distribution; Inequality; Convergence; Mobility; Growth.

RÉSUMÉ. Récemment, une littérature abondante s'est développée sur l'évolution des inégalités à l'échelle mondiale au cours des deux dernières décennies. Quelques faits stylisés en ressortent. Si l'on pondère les pays par leur population, l'inégalité entre les pays a baissé. Mais si l'on traite les pays de la même manière – comme c'est le cas dans la littérature sur la convergence (divergence) macroéconomique, alors l'inégalité s'est accrue. Quelle est la bonne approche ? Dans cet article, les résultats obtenus pour la période 1980-2002 sont

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réexaminés en se fondant sur l'édition 2004 du *World Development Indicators* publié par la Banque mondiale, données qui confirment ces deux tendances présentées ci-dessus. Même si l'inégalité, mesurée par la plupart des indicateurs généralement utilisés, a baissé, il n'y a ni une dominance absolue *à la* Lorenz – en 2002 par rapport à 1980 – en termes pondérés par la population, ni une dominance de premier ordre. Les indicateurs aggrégés d'inégalité cachent également une très forte mobilité des pays, particulièrement l'appauvrissement, sur la période étudiée, de deux douzaines pays qui se situent en bas de la distribution. Repérer cette mobilité est une approche moins "anonyme" dans cette analyse qui peut aussi expliquer les opinions divergentes quant à l'accroissement ou au recul de l'inégalité internationale. Si l'on ne s'attache qu'aux résultats finaux, et non aux situations initiales, l'inégalité a diminué au regard de la plupart des critères. Cependant si la mobilité même est incluse dans les critères de bien-être, et si l'on accorde un poids plus élevé aux pays qui ont régressé, alors la répartition mondiale du revenu s'est détériorée.

Classification *JEL* : D30 ; D31 ; D63 ; F0 ; I30 ; O00.
Mots-clefs : Répartition des revenus ; inégalité ; convergence ; mobilité ; croissance.

Introduction

There has been an active literature in recent years on the world distribution of income. Some discussions of inter-country (or international distribution) of income weigh countries equally, with China having the same weight in the distribution as Barbados (see Baumol, 1986; Barro and Sala-i-Martin, 1992; Sheehey, 1996; Jones, 1997; Quah, 1996 & 1997). Other studies still treat countries as the unit of analysis, but weigh their influence on world income distribution by population size (Ram, 1989; Theil and Seale, 1994; Firebaugh, 1999). Some of these papers combine estimates of within-country inequality with those of inter-country inequality to arrive at a more complete picture of income distribution (see Berry *et al*., 1983; Bourguignon and Morrisson, 2002; Dikhanov and Ward, 2002; Milanovic, 2002; Schultz, 1998; Sala-i-Martin, 2002).

In this paper[2], we focus on the inter-country distribution of income, abstracting from the admittedly critical element of within-country inequality, but the purpose of our study allows us to ignore that component of global inequality. We will show that a more detailed analysis of individual countries' mobility along the income per capita scale provides an interesting perspective on the two seemingly contrary streams of the literature: the economic divergence literature (Jones, 1997; Pritchett, 1997; De Long, 1988), and the literature showing that inequality across countries has decreased over the recent period (Sala-i-Martin, 2002; Bhalla, 2002). Our argument would not be fundamentally modified if within-country inequality was taken into account. A practical reason for overlooking that source of inequality is that calculations are simpler and that we can abstain from the recent debate on whether

2. Some of these results were presented at the World Bank's Annual Bank Conference on Development Economics (ABCDE), Washington D.C., May 3rd, 2004 and at the "ABCDE-Europe", Brussels, May 10th 2004.

weighted inequality should be based on household survey data or national accounts data (Sala-i-Martin, 2002; Bhalla, 2002 *vs* Milanovic, 2002; Ravallion, 2001). Besides, it has been shown that inter-country inequality accounted for approximately 60 percent of overall inequality across the world's citizens as recently as 1992, and it represents an even higher share of the variation of inequality over time (Bourguignon and Morrison, 2002).

We used the World Bank's World Development Indicators (WDI) 2004 for data on population and gross national income (GNI) in PPP-adjusted dollars. To calculate real growth rates, we deflated the GNI, PPP series.[3] A number of countries were eliminated from our sample due to an incomplete time series of GNI, PPP for the period under study. We arrived at a constant sample of 138 countries representing approximately 91-92 percent of world population over the 1980-2002 period.[4] (See APPENDIX 2 for the list of countries.)

FIGURE 1 reveals details about the inter-country distribution of income in 2002. In population-weighted terms, the poorest 40 percent of world population received just over 10 percent of world GNI, while the richest 20 percent got more than 60 percent of world's wealth. If we compare the two extremes, the ratio of the top vintile's GNI per capita to the bottom decile's GNI per capita is 32 to 1. The population-weighted Gini coefficient for 2002 was 53.1, which is higher than inequality in all but three countries, for which the Gini coefficient was available in 2001 – Nicaragua (55.1), Brazil (58.5) (WDI, 2004) and South Africa (58) (Hoogeven and Ozler, 2004).[5] Thus, if the world was a country, it would be one of the most unequal countries in the world.

INEQUALITY HAS FALLEN

Using the data discussed above, we derived Lorenz curves and calculated standard inequality indices to represent inter-country distribution of world income over the 1980-2002 period. (For a graphical representation of the Lorenz curves for 1980 and 2002, see FIGURE A1.1 in the APPENDIX 1.) The figure below represents the same information as the Lorenz curve in discrete terms of evolution of nine deciles and the top two vintiles of countries' GNI, PPP over the period. FIGURE 2 reveals a clear increase in the income share of the bottom 80 percent of the countries, weighted by population; the noticeable improvement in deciles 2 through 6 offsets the shrinking shares of the seventh and eighth deciles. The poorest decile improved somewhat during the middle of the period; however, this progress was reversed in the latter part of the period.[6] The figure also reveals a small increase in the income share of the top vintile, from 20 to 22 percent of global GNI.

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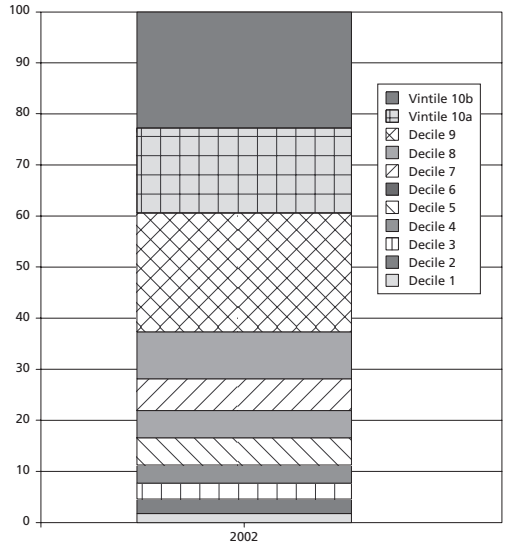
3. Implicit United States GDP deflator was used, also from World Development Indicators.
4. Estimates for GNI were made to trace the former Soviet Union economies (then Soviet republics) for the pre-1992 period. Data on the evolution of Net Material Product, in real terms, were used to calculate real GNI. Assuming constant PPP factors, these growth rates were applied to arrive at GNI in PPP terms, using WDI's GNI in 1992. Net Material Product data were taken from PlanEcon, Volume VIII, Numbers 11-12-13. Our gratitude to Yuri Dikhanov for bringing our attention to this data.
5. We used a comparison with 2001 Gini coefficients since the series contained only 2 observations in 2002.
6. Indeed, if we zoom in on the bottom decile of the Lorenz curve, we see that up to the first 9.65 per cent of population, the share of wealth they had in 1980 was higher than the share of wealth they had in 2002.

Figure 1 - 2002 Distribution of global GNI (1995 PPP dollars)



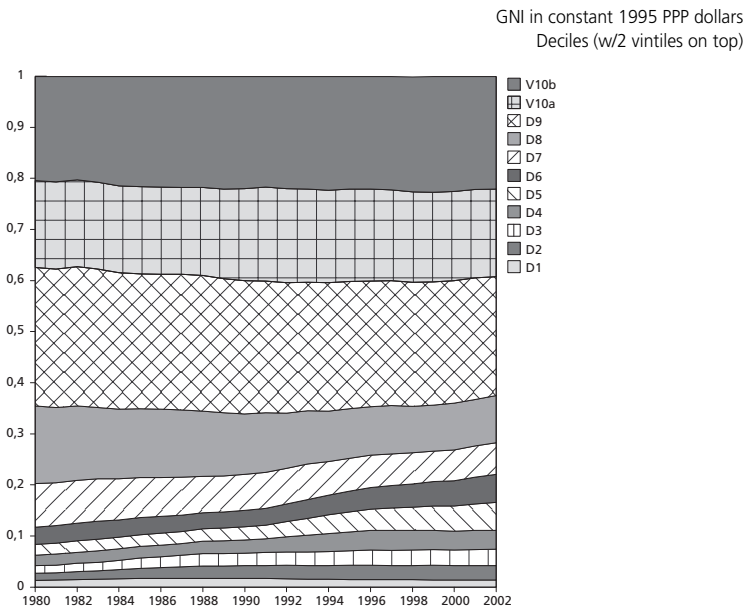
Source: Authors' calculations based on data from WDI 2004.

Comparing 1980 and 2002, it is clear that there is no Lorenz dominance. Even though the cumulative share of the bottom deciles increased or remained constant up to the 8th decile, the share of the bottom 90 and 95 percent decreased. Furthermore, there is no first-order dominance. In other words, it is not the case that the income of the poorest increased wherever the poverty line is set. According to the data, the poorest country in our sample in 1980, Malawi, had GNI/capita of $516, and the poorest country in 2002, Sierra Leone, had GNI/capita of $445 (all in 1995 PPP$). In effect, this evolution is observed up to the 6th percentile of the world distribution.

It follows that, although most conventional inequality measures will show a drop in inequality due to the upward shift of the bottom of the Lorenz curve, some measures will also show an increase[7]. It can be seen from FIGURE 3 that this is the case for the Atkinson index if the inequality aversion is sufficiently high (above 5). If analysts and policy makers disagree with

7. There are a variety of inequality measures based on the axiomatic approach. The four axioms are anonymity, scale independence, population independence and transfer principle. All indices above comply with these axioms used in the literature. The Gini coefficient is perhaps the most commonly used measure of inequality. It has a simple geometric interpretation based on a Lorenz curve of cumulative income and population shares. The Gini measures the area of the difference between the line of perfect equality and the Lorenz curve itself, as a share of the area of the right triangle demarcated by the line of perfect equality and the two axes. Atkinson and Theil indices are entropy measures that give one a sense of the divergence of values from the mean. All these indices are normalized between 0 and 1, with zero implying perfect equality of income. Atkinson measures have the particular feature that one may alter one parameter in the formula to put greater weight on all divergence from the mean, leading to higher measured degree of income inequality for the same distribution of incomes. Hence, the term for this parameter is the degree of "inequality aversion."

Figure 2 - Historical trend in the distribution of global GNI



Source: Authors' calculations based on data from WDI 2004.

such a high degree of inequality aversion, then they would conclude that world inequality has decreased over the last 22 years, a conclusion that coincides with Sala-i-Martin (2002)[8] and Bhalla (2002).[9]

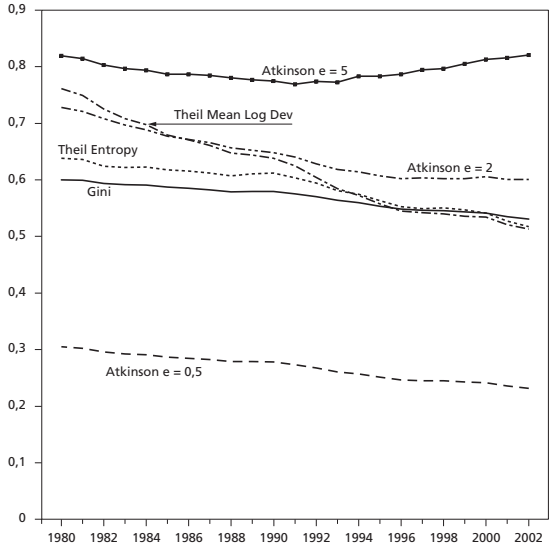
Mobility

In effect, the preceding conclusion is contested by some analysts, who invoke the fact that some poor countries have become poorer, whereas the rest of the world was getting richer. Such an argument raises the issue of income mobility, a subject rarely dealt with in the literature on world inequality, despite its relevance.[10]

Figure 4 illustrates the issue of income mobility through an apparent paradox. If, on the one hand, we trace the growth of GNI per capita of each decile allowing countries to move in and out of those deciles (the anonymous approach followed in the previous section), and on the other hand, we trace the growth of GNI per capita of countries that started the period in a given decile (fixing the composition of the deciles in 1980), then two rather different

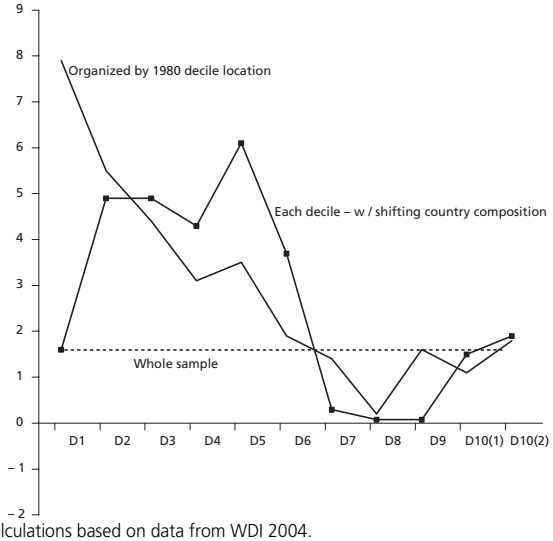
8. Note that Sala-i-Martin (2002) finds Lorenz dominance because the sample he uses excludes Russia, which belongs to decile 8, whose share of world GNI decreases in the period under study.
9. See Bourguignon and Coyle (2003) for a discussion of these issues.
10. Fields (2001) discusses the different methodologies of measuring economic mobility, noting that this type of studies is still in its infancy due to limited availability of panel data (p. 139); the examples of mobility methodology application in Fields' work are limited to country-level studies.

Figure 3 - Trends in population-weighted inter-country inequality



Source: Authors' calculations based on data from WDI 2004.

Figure 4 - Annual growth of GNI per capita per decile, 1980-2002 (population-weighted)



Source: Authors' calculations based on data from WDI 2004.

patterns emerge. The income of those individuals who were the poorest in 1980 grew much faster between 1980 and 2002 than that of richer individuals of 1980, which would seem to imply a drop in inequality. The poorest decile's income increased at an annual rate of close to 8 percent. Yet, when one compares the poorest of 2002 and the poorest of 1980, a very different pattern appears. The income growth comparison for the bottom decile now suggests an annual increase of 1.5 percent – about the world average. What happened? Simply, the composition of the first decile, and of several other deciles, changed drastically between 1980 and 2002. Indeed, fast-growing China, which was populating most of the first decile in 1980, left that decile by 1991 and was gradually replaced by twenty-six poor-performing countries, mostly from Africa, many of them with negative income growth.

TABLE 1 below tracks the performance of GNI per capita for the countries that were in the bottom decile in 1980 and 2002. Not only did the poorest countries of 1980 (other than

Table 1 - Breakdown of the performance of income per capita: Bottom decile (population-weighted)

%

1980	Share of decile's population	Annual growth rate (1980-2002)
Malawi	1.52	–0.10
Guinea-Bissau	0.20	–0.19
Mozambique	2.98	1.52
Congo, Rep.	0.44	–0.07
Chad	1.10	1.26
Burundi	1.02	–0.94
China	92.74	8.20
Pop-weighted average of decile		**7.86**
2002	**Share of decile's population**	**Weighted averages of group's annual growth rate (1980-2002)**
Same countries as above, except for China	8.80	0.72
26 more countries, of which:	91.20	–0.85
a) 19 countries with negative growth (Central African Rep., Comoros, Congo (DRC), Cote d'Ivoire, Gambia, Haiti, Kenya, Kyrgyz Rep., Madagascar, Moldova, Niger, Nigeria, Rwanda, Sierra Leone, Solomon Islands, Tajikistan, Togo, Uzbekistan, Zambia)	60.90	–2.26
b) 7 countries with positive growth (Bangladesh, Benin, Burkina Faso, Mali, Nepal, Senegal, Sudan)	30.30	1.77
Pop-weighted average decile		**–0.76**

Source: Authors' calculations based on data from WDI 2004.

China and Mozambique) not perform as well as the world average, but some posted negative annual growth rates over the period. Yet, since China's population occupied nearly 93% of the bottom decile in 1980, its rapid growth is responsible for the high growth rate of those individuals who were in the first decile of the world distribution in 1980. However, if we look at the performance of the 26 countries that replaced China[11] in the bottom decile by 2002, they experienced an average annual negative growth of about –0.85%. As a result, the poorest 10 percent of the world in 2002 were on average only slightly less poor than the poorest 10 percent in 1980.

More generally, one may also look at "income mobility" of countries across the whole income scale. The mobility matrix below (TABLE 2) is set in absolute terms: income per capita in constant PPP dollars. The cells in the matrix describe the countries that had the given row's GNI per capita range in 1980 and moved to the column's GNI per capita range in 2002.[12] The figures are in population-weighted terms. For example, of the countries with GNI per capita below $710 (constant PPP dollars) in 1980, the Chinese population comprised 97 percent of the total population.[13] Since China's income per capita moved into the 2,890-10,000 range in 2002, we see an entry of 97 percent in that column of the first row. The table shows substantial upward mobility; however, it also reveals some troubling downward mobility and stagnation. Note that 8 percent of each of the second and third income ranges fall into the bottom range over the period. In addition, there is stagnation in some low-income countries. These phenomena mirror the picture presented in TABLE 1. The countries in the bottom decile of 1980 all had GNI/capita below $710. Meanwhile, more than a quarter of the 19 negative growth countries that entered the bottom decile in 2002, as mentioned in table 1 above, correspond to the countries in the second and third income ranges in 1980 that dropped below $710 in 2002 in the mobility matrix shown in TABLE 2.

Looking at the evidence presented in this section, it is clear that no Pareto improvement has taken place in the world between 1980 and 2002, which leaves room for different value judgments about the evolution of world welfare, inequality, and relative poverty (Ravallion, 2004).[14] In particular, a critical factor in forming those views is whether one takes an "anonymous" approach to the distribution or whether one tracks the income trajectories of the inhabitants of particular countries.

INEQUALITY HAS INCREASED

Some researchers of inequality and macroeconomic convergence have focused on income comparisons between countries as singular units that express unique geographical, historical

11. In population-weighted terms, only part of China was in the bottom decile in 1980. Here we are referring to the countries that replaced that part of China in the bottom decile.
12. The income ranges were chosen to approximate the quintile cutoffs in 1980.
13. Since we are using absolute income level cutoffs for this exercise, countries are not split between groups here.
14. On the other hand, absolute poverty rates have declined, and a variety of studies have confirmed this trend. See World Bank, 2004.

Table 2 - Mobility matrix in absolute country per capita income levels, 1980 to 2002

%

	Income in 2002				
Income in 1980	< 710	711-1100	1101-2890	2890-10000	10001 >
< 710	1.28	1.64	0.00	97.08	0.00
711-1100	8.23	3.89	87.88	0.00	0.00
1101-2890	8.09	0.56	59.08	32.28	0.00
2890-10000	0.00	0.00	0.98	90.84	8.17
10001 >	0.00	0.00	0.00	3.99	96.01

Source: Authors' calculations based on data from WDI 2004.

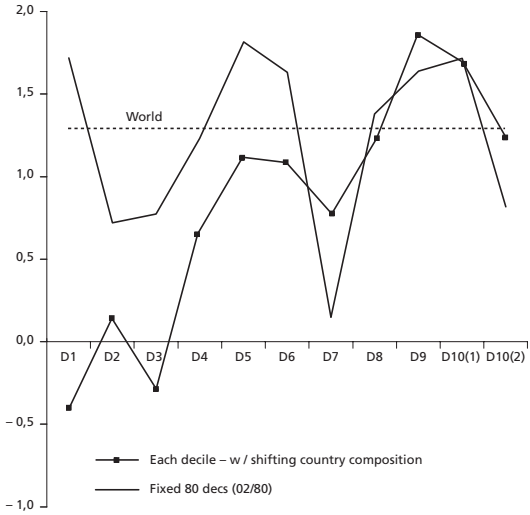
and policy characteristics. Thus, instead of weighing countries by their population, these studies of international inequality treated all countries equally. Arguing that there has been "big time" divergence between developed and developing world in 1870-1990, Pritchett (1997) treats each country as one observation, thus muffling the spectacular convergence that happened between more than 1.5 billion of people residing in India and China and the residents of the developed world in 1980-1994.[15] Since Pritchett's research question concerns the challenges of backwardness and policy implications for growth laggards rather than presenting the trends in world welfare, this equal-weighted approach is justified. The literature on macroeconomic divergence has resonated with the international policymaking community. Focusing on the regional distribution of GDP/capita around the world, UNDP (2002) decries the "grotesque levels" of global inequality, highlighting progresses and setbacks in regional growth trends.

To look at the evidence put forth by macroeconomic divergence studies, let us now analyze the same GNI/capita data giving equal weights to every country. Then the remarkable progress of large, previously-poor countries is muted. We calculated the standard inequality indices, treating each country as an individual, and there is clearly an strong upward trend. This type of result is consistent with the literature that finds convergence at the top of the distribution but divergence between the top and the bottom (Jones, 1997; Pritchett, 1997; Quah, 1997). It is interesting to note that the trend starts to level off during the last three years of the period, as Asian, Eastern European and former Soviet economies recover from their 1990s recessions.

Another representation of this increasing inequality is given in FIGURE 5. Giving countries equal weights, growth in 1980-2002 appears strongly and positively correlated with income levels if we look at shifting decile composition. In effect, growth was negative or very close to zero for the bottom three deciles of our 138 countries.

15. See Table 3, last column in Pritchett 1997.

Figure 5 - Annual growth of GNI per capita by decile, 1980-2002 (equal weight per country)



Source: Authors' calculations based on data from WDI 2004.

Conclusion: Did inequality increase or decrease?

The apparently contradictory results on inequality obtained with weighted and unweighted data is another way of expressing the mobility argument.

It is not clear that equally weighted inequality is a very interesting concept per se. Yet the discrepancy with population weights and the insistence of some analysts on the conclusion that inequality has increased is worth considering.

A possible explanation is that those who insist upon equal-weights inequality and corresponding worsening of the distribution have in mind the implicit mobility argument. They are not convinced by the anonymity of the population-weighted view. For them, the fact that some world citizens lost (for example, in Sub-Saharan Africa or the Former Soviet Union) is not necessarily compensated by the fact that others, initially poorer, in China or India have gained. The initial income position matters and the social cost of falling incomes is not compensated by the social gain of increasing incomes, even if these changes take place in the same income range.

This argument is a restatement of the non-Pareto superiority of the change in the distribution between 1980 and 2002. On the contrary, the anonymous view with population weights implicitly argues that increasing mean income in the world without a worsening of inequality implies something like a Pareto improvement. The person ranked at position "i" in the distri-

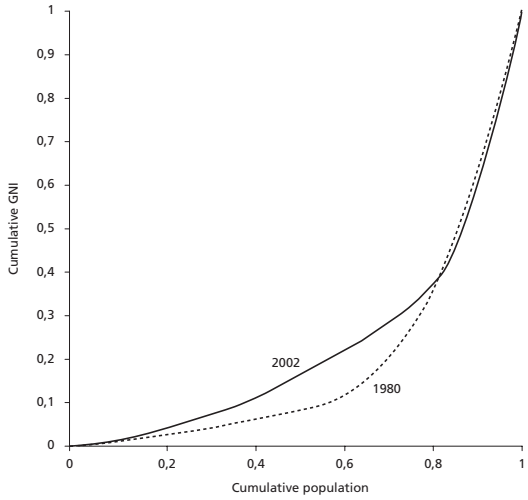
bution earns more in 2002 than in 1980, for every "i", which is indeed an achievement. The problem with this argument is that this person at rank i is not the same![16]

Thus, statements such as "inequality increased" and "inequality decreased", or more precisely, "world welfare increased" and "world welfare decreased" do not appear as contradictory. If one's concept of welfare depends only on the final income, irrespective of where people were before, world welfare has increased, by most standards. However, it may have decreased if welfare depends on both the initial and final levels of income, or in other words, if the status quo matters. Although mainstream economic analysis favors the anonymous view, there does not seem to be any theoretical reason to ignore the status quo. The only way of reconciling these two views is indeed to provide international support so as to prevent any one country getting poorer over time.

F. B., V. L. & D. R.

Appendix 1

Figure A1.1 - Population-weighted Lorenz curves: 1980 and 2002



Source: Authors' calculations based on data from WDI 2004.

16. Note also that as noted in section II, this property does not hold for the first few percentiles of the distribution. In 2002 people in those positions were poorer than in 1980. As a result, there are some inequality measures (like the Atkinson index with extremely high inequality aversion in FIGURE 3) that would reveal increasing inequality in anonymous terms. However, it is unlikely that most observers have such an extreme inequality aversion. Note also that, even if first order dominance were to hold, then mobility considerations still provide an alternative lens for evaluating the trend in inequality.

Appendix 2

Table A2.1 - Country list

Albania	Germany	Norway
Algeria	Ghana	Oman
Antigua and Barbuda	Greece	Pakistan
Argentina	Grenada	Panama
Armenia	Guatemala	Papua New Guinea
Australia	Guinea-Bissau	Paraguay
Austria	Guyana	Peru
Bahrain	Haïti	Philippines
Bangladesh	Honduras	Portugal
Barbados	Hong Kong, China	Romania
Belarus	Hungary	Russian Federation
Belgium	Iceland	Rwanda
Belize	India	Saudi Arabia
Benin	Indonesia	Senegal
Bolivia	Iran, Islamic Republic	Sierra Leone
Botswana	Ireland	Singapore
Brazil	Israel	Solomon Islands
Bulgaria	Italy	South Africa
Burkina Faso	Jamaica	Spain
Burundi	Japan	Sri Lanka
Cameroon	Jordan	St Kitts and Nevis
Canada	Kazakhstan	St. Lucia
Central African Republic	Kenya	St Vincent and the Grenadines
Chad	Korea, Rep.	Sudan
Chile	KyrgyzRepublic	Swaziland
China	Latvia	Sweden
Colombia	Lesotho	Switzerland
Comoros	Lithuania	Syrian Arab Republic
Congo, Dem. Rep.	Luxembourg	Tajikistan
Congo, Rep.	Madagascar	Thailand
Costa Rica	Malawi	Togo
Côte d'Ivoire	Malaysia	Trinidad and Tobago
Cyprus	Mali	Tunisia
Denmark	Malta	Turkey
Dominica	Mauritania	Turkmenistan
Dominican Republic	Mauritius	Ukraine
Ecuador	Mexico	United Arab Emirates
Egypt, Arab Rep.	Moldova	United Kingdom
El Salvador	Morocco	United States
Estonia	Mozambique	Uruguay
Fiji	Namibia	Uzbekistan
Finland	Nepal	Vanuatu
France	Netherlands	Venezuela, RB
Gabon	New Zealand	Zambia
Gambia, The	Nicaragua	Zimbabwe
Georgia	Niger	

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