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# Global economic inequality and international trade

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# Foreword

This paper is an output of the work on "global economic integration and employment policy" being carried out by the Employment Strategy Department. It focusses on the recent trends in global economic inequality and on the nature of linkage between these trends and the recent developments in the area of international trade. These are subjects of considerable current interest for international organisations, national policy makers, the academic community and the civil society organisations.

The main findings of the paper are as follows. Since the beginning of the eighties, inter-country income inequality has certainly been increasing but international income inequality (population-weighted inter-country income inequality) has actually been declining. Moreover, while the rising inter-country inequality represents a continuation of a long-term trend, the declining international inequality represents a break from the long-term trend. The reason for the diverging trends in the two types of inequality is that although only a small number of low-income countries achieved substantially higher growth of per capita income than high-income industrialised countries, these low-income countries account for a majority of the population of the developing world. The effect of trade liberalisation on the two types of inequality was rather complex. The evidence shows that growth of trade orientation had a positive impact on economic growth, and that the impact was larger for more populous countries. But trade liberalisation did not always increase trade orientation. Many low-income countries actually experienced a decline in trade orientation in the wake of trade liberalisation; economic growth in these countries was adversely affected. Thus trade liberalisation contributed to the growth of inter-country inequality. But because it helped increase the trade orientation of some populous low-income countries, trade liberalisation also had the effect of reducing international inequality.

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**GLOBAL ECONOMIC INEQUALITY AND INTERNATIONAL TRADE**

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# 1. Introduction

Global economic inequality has for long been a subject of much interest to economists. Of late, however, it has also become a subject of much popular interest. Underlying this interest is a perception that income inequality among nations and people of the world has been growing, at least over the last two decades. The perception derives from some well-known facts. It is widely recognised, for example, that the gap in per capita income between the richest and the poorest countries increased substantially over the past two decades. In fact, there is evidence to suggest that, in general, the growth of per capita income has tended to be slower in the poorer countries. Some recent studies have also indicated a tendency for income inequality to grow in a number of countries. Thus there certainly are reasons to wonder if income distribution may have been worsening not only among nations but also among the world's population. Recently, moreover, the alleged growth of income inequality has been linked to globalization. The current popular opposition to globalization stems in large part from a widely shared belief that globalization hurts the poor and benefits the rich.

Yet a review of the relevant literature shows that the empirical evidence, available so far, does not unambiguously indicate growth of global economic inequality. There is little doubt that the gap between the richest and poorest countries in terms of per capita income has been widening, but this does not necessarily imply a deterioration in income distribution among nations or the world population. On the other hand, there is in fact no consensus among researchers as yet that income distribution has worsened in a significant number of countries in recent years. In any case, no straightforward conclusion about the trend in world income distribution can actually be deduced from observed trends in income distribution in individual countries. There exist a few empirical studies which attempt to construct sophisticated indices of global economic inequality, but these do not produce unambiguous evidence of its growth. In short, the empirical evidence on trends in global economic inequality, available so far, remains inadequate and inconclusive.

The issue of a possible linkage between global economic inequality and trade performance or openness of economies also remains controversial in the economic literature. In this case, standard economic theory does predict that growth of world trade would lead to a reduction of income disparities across the trading nations. It also predicts that, under certain circumstances, income distribution would worsen in richer nations but would improve in poorer nations. But these predictions, apart from being based on some dubious assumptions, do not tell us much about what happens to global economic inequality. In the first place, there is no reason to suppose that all nations must emerge as successful trading nations when world trade expands. We know, for example, that during an earlier period of globalization, only a small number of nations of Europe and the "new world" emerged as important trading nations.[1] We also know that while these nations showed remarkable convergence among themselves, the income-gap between them

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* Employment Strategy Department. The author gratefully acknowledges the invaluable assistance provided by Makiko Matsumoto, particularly in carrying out the statistical exercises. Thanks are due to Peter Richards and David Kucera for helpful comments. The author alone is responsible for the views expressed.

[1] The "new world" consisted of countries often referred to as European "outposts" - the USA, Canada, Australia, New Zealand and Argentina.

and the rest of the world widened very sharply. Secondly, economic theory only tells us that when trade expands, income distribution improves in some countries and worsens in others; it says nothing about the consequent change in world income distribution.

These observations define the context for this study which is concerned with empirically examining the trend in global economic inequality and its linkage with trade. The next section is devoted to an empirical analysis of the trend in global economic inequality since the beginning of the eighties. It starts by considering the different notions of global economic inequality employed in the existing literature. It then focusses on the notions which are judged as appropriate in the context of this paper and accordingly analyses the trend. The following section seeks to investigate the extent to which the observed trends in global economic inequality may have been linked to the trends in world trade. The concluding section summarises the main findings and indicates emerging policy concerns.

## 2. Global economic inequality: an analysis of recent trends

### *Some preliminaries*

Global economic inequality can be measured in three possible ways. The first measure refers to inter-country inequality in terms of per capita GDP. This effectively treats each country as an individual so that the relevant inequality is that of the distribution of per capita GDP among countries. The problem, of course, is that the per capita GDP of China is accorded no more importance than that of Madagascar even though the former clearly affects a vastly larger segment of the world population. The second measure is that of international inequality. This attaches due importance to the population size of a country (so that China's per capita GDP counts for much more than that of Madagascar) but assumes that all individuals in a given country receives an income equal to the per capita GDP of that country. The third measure is that of inequality of world income distribution. The relevant notion of income here is that of personal disposable income. The world distribution can in principle be obtained by combining observations either on summary indicators of distributional inequality in individual countries or on actual incomes received by individuals or groups (decile or quintile groups, for example) of individuals in each of the countries of the world. The notions of inequality embodied in the three measures are evidently quite distinct and, as we shall see below, it is extremely important to bear this in mind in analysing trends in global economic inequality.

The available evidence on trends in global economic inequality comes mainly from two types of studies. Studies of the first type have been concerned with empirically testing the catching-up or convergence hypothesis. This states that less developed countries and regions should be expected to grow faster than more developed ones. The hypothesis clearly refers to what we have called inter-country inequality and proposes that we should expect this to decline over time.[2] Three main arguments have been advanced in support of the hypothesis. First, the late-comers into the world of modern economic growth enjoy an advantage because they can simply adopt and exploit technologies which the pioneers had to develop through their own efforts (and

[2] In the relevant literature, this is referred to as beta-convergence.

hence had to absorb the costs and lags associated with development of new technologies).[3] Second, a standard assumption in growth theory is that there are diminishing returns to factor inputs.[4] This implies that capital productivity is higher in less developed economies which are capital-scarce. Thus, for equivalent rates of investment, the less developed economies should be able to achieve higher growth. Third, the bulk of the workers in less developed economies tend to be in low-productivity agricultural activities. As growth occurs, workers move to high-productivity manufacturing and service activities. The structural change in employment that accompanies economic growth is thus a source of growth of labour productivity.[5] The importance of this source of productivity growth, however, declines with development as productivity tends to equalise across sectors and activities, and fewer and fewer workers remain in low-productivity activities.

None of these arguments, however, is entirely convincing. First, the expansion of the technological frontier can conceivably be such that there always remains a substantial technological gap between the pioneers and the late-comers. There is no reason why pioneers cannot derive advantages from their accumulated experience of developing leading-edge technologies. Second, because there is considerable scope for "learning by doing", there may actually be constant or even increasing returns to factor inputs.[6] Third, precisely because of the catch-up needs, there is a tendency (even a compulsion), in developing economies, for premature adoption of technologies with relatively low labour intensity so that the process of labour transfer (from low-productivity to high-productivity activities) tends to be extremely slow in reality.[7] As a result, productivity gains arising from inter-sectoral labour transfers often tend to be rather insubstantial.

The standard method of empirically testing the convergence hypothesis has been to study the relationship between the initial level of per capita GDP and its rate of growth over a certain period for a cross-section of countries. A general result obtained from this type of exercises is that there is no evidence of a tendency towards convergence among countries and regions though

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[3] The idea owes its origin to Gerschenkron (1962).

[4] The reference here is to neoclassical growth theory. The classic formulation is that of Solow (1956).

[5] The classic work which emphasises this point is that of Lewis (1954).

[6] The possibility of non-decreasing returns to factors receives much attention in the literature on endogenous growth. See, for example, Romer (1986) and Robelo (1991).

[7] For an empirical analysis of the patterns of inter-sectoral labour transfer in developing countries, see Ghose (1990).

it is possible to identify "convergence clubs", i.e., small groups of countries which show convergence among themselves, for particular periods.[8] The implication is that inter-country inequality has not shown any long-term tendency to decline.

Studies of the second type have attempted to directly estimate indices of international inequality for specific periods so as to study the time-trends. Although these studies could also be interpreted as explorations of the convergence hypothesis[9], their main focus is on distributional outcomes of growth rather than on processes of growth . The availability of estimates of GDP in "purchasing power parity" (PPP) dollars for a large number of countries now makes it relatively easy to measure international inequality and several studies have attempted to analyse the trend in this type of inequality (the results are reviewed below).

But per capita GDP is a poor indicator of welfare and income distribution among the population within individual countries can be very unequal. If our concern is with the welfare of the world's population, then global inequality should obviously refer to the inequality of world income distribution. Unfortunately, the available statistical data on income distribution in individual countries, apart from being inadequate, suffer from serious problems of reliability and comparability, both across countries and over time. Thus though a few serious attempts to estimate indices of world income distribution have been made, the usefulness of these estimates remains open to reasonable doubts.[10]

This study focusses on the related notions of inter-country and international inequality; we do not attempt to measure the inequality of global income distribution. The justification for this choice of focus derives not only from the fact that the cost involved in estimating quantitative indices of world income distribution far exceeds the benefit (given the limitations of statistical data) but also from the fact that there is no known methodology which can be employed to study the effects of trade on world income distribution.

The well-known limitations of the available statistical data on income distribution in individual countries seriously limit the usefulness of the quantitative indices of world income distribution that can be computed. In the first place, such data are available only for a limited number of countries. Second, even where the data are available, often they are available only for

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[8] Baumol (1986) and Abramovitz (1986) study long-term convergence among the industrialised economies and O'Rourke and Williamson (1999) study the same phenomenon in the context of the 1870-1910 globalization episode. For analysis of global convergence/ divergence, see Barro and Sala-i-Martin (1992); Mankiw, Romer and Weil (1992); and Ben-David (1999). The first two studies also argue that there is evidence of conditional convergence among countries, i.e., there is convergence once the effects of variations in saving/ investment rate, stock of human capital and population growth have been taken into account. This line of reasoning, however, is hard to swallow. We should expect less developed economies to have lower saving/ investment rate, lower stock of human capital and higher rate of population growth than more developed economies. Hence it is hard to make sense of the argument that the less developed economies would catch up with more developed economies if only they had comparable rates of saving/ investment rates, stocks of human capital and rates of population growth.

[9] Declining dispersion of per capita incomes across countries is referred to as sigma-convergence in the relevant literature.

[10] These studies, moreover, reach rather dissimilar conclusions. Chotikapanich, Valenzuela and Rao (1997) use per capita GDP (in PPP dollars) and Gini Coefficients for 36 countries to derive estimates of world income distribution for the years 1980,1985 and 1990; they find that world income inequality remained stable during the eighties. Bourguignon and Morrison (1999) use per capita GDP (in PPP dollars), data on income shares from a limited number of countries and some heroic assumptions to derive estimates of world income distribution for selected years between 1820 and 1992; they find statistically insignificant change in world income inequality between 1970 and 1992. Milanovic (2000) uses estimates of disposable income and distributional parameters for 91 countries to derive indices of world income inequality for the years 1988 and 1993; he finds a significant rise in inequality between these two years.

a single or a few points of time. These points of time, moreover, are different for different countries. Third, concepts, definitions, sampling methods and coverage vary fairly widely across countries. Thus, in any attempt to derive world income distribution from country-level data on income distribution, serious problems of reliability as well as of cross-country and inter-temporal comparability are inevitably encountered. While statistical techniques can provide reasonable solutions to some of the problems, simplifying assumptions are required to overcome others.[11]

Besides, conceptually, it is not at all clear how and through what mechanisms trade might affect world income distribution. It is easy to see that trade can affect inter-country inequality in so far as it can affect growth. The relationship between inter-country inequality and international inequality, though not straightforward, is analytically tractable; to this extent, there is no conceptual difficulty in analysing the effect of trade on international inequality. But changes in inter-country inequality tell us virtually nothing about changes in the world distribution of income.[12] As a matter of fact, even if income distribution in individual countries were assumed to remain unchanged, it would still be impossible to predict the change in world income distribution on the basis of observed changes in inter-country inequality. For, the change in world income distribution would still depend on the effect of interactions among the countries' relative positions in terms of per capita income, their population sizes and the country-level degrees of inequality.

An alternative possibility is to focus on changes in country-level income distribution since we know something about how this might be affected by trade. Unfortunately, observed changes in personal income distribution in individual countries also cannot provide any clue to changes in world income distribution. The effect of a change in income distribution in any particular country on world income distribution depends on the country's relative position among all countries in terms of per capita income, on the relative size of its population as also on the relative growth rate of its per capita income. Thus it is impossible to predict changes in global income distribution on the basis of observations on changes in income distribution in individual countries. A worsening of personal income distribution in one or more countries can in fact be consistent with either a worsening or a stability or an improvement of world income distribution.

The main point to be noted is that if we are interested in studying the linkage between trade and inequality, our focus has to be on inter-country and international inequality. If, on the other hand, we are interested in monitoring changes in global welfare, a focus on global income distribution would be appropriate. But we can do precious little beyond monitoring. Since neither changes in inter-country inequality nor changes in country-level inequalities can tell us much about changes in world income distribution, it is difficult to see how the effect of trade on world income distribution can be traced.

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[11] For discussions of the limitations of the available data and of examples of techniques and assumptions used to overcome them, see Deininger and Squire (1996), Li, Squire and Zou (1998), Chotikapanich, Valenzuela and Rao (1997), Milanovic (2000), and Bourguignon and Morrison (1999).

[12] The only thing we know is that changes in the world distribution of income are driven mainly by changes in inter-country inequality basically because inter-country inequality changes much more frequently and dramatically than income distribution within countries.

***Recent trends in global inequality***

Our analysis covers the 16-year period 1981-97 and is based on a sample of 96 economies.[13] The sample excludes those countries which had a population of less than 0.5 million in 1981 as well as the transition economies of Eastern Europe and Central Asia.[14] It also excludes Germany and Taiwan (China) as the relevant data were not available to us. The 96 sample economies accounted for 82 percent of the world population and 86 percent of the world GDP (in current dollars) in 1981. The basic statistical data used in this study are presented in Appendix Table 2 which also indicates the sources.

Figures 1 and 2 present the first set of results which confirm that inter-country inequality has indeed been growing over the past two decades. Figure 1 shows that there has been no tendency towards income convergence among the countries sampled. In fact, per capita GDP tended to grow at a slower rate in poorer economies; regression exercises show the relationship between the rate of growth of per capita GDP and the initial per capita GDP (in PPP dollars) to be positive and statistically significant (see the note to Figure 1). Figure 2 presents estimates of "unweighted" measures of cross-country dispersion of per capita GDP (in PPP dollars) - the Gini Coefficient, the Standard Deviation of logarithms and the Theil Index for the period 1981-97.[15] In deriving these estimates, each country has been treated as an individual (so that the world is assumed to be inhabited by 96 individuals) each with an income equalling the corresponding per capita GDP (in PPP dollars). These estimates directly show what is only suggested by Figure 1: there has been a steady growth of inter-country inequality. Estimates of trend equations show a statistically significant trend-increase in all three inequality indices.[16]

However, this growth of inter-country inequality did not mean growth of international inequality. This is clear from Figure 3 which presents estimates of "weighted" measures of dispersion.[17] In deriving these estimates, each country's population is taken into account (as weights) but the entire population of a country is assumed to have the same income which is set equal to the per capita GDP (in PPP dollars). The estimates show that international inequality has in fact been steadily declining. It is clear from the regression results (Appendix Table 4) that all three indices of international inequality showed statistically significant declining trends.

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[13] A full list of the countries and regions is presented in Appendix Table 1.

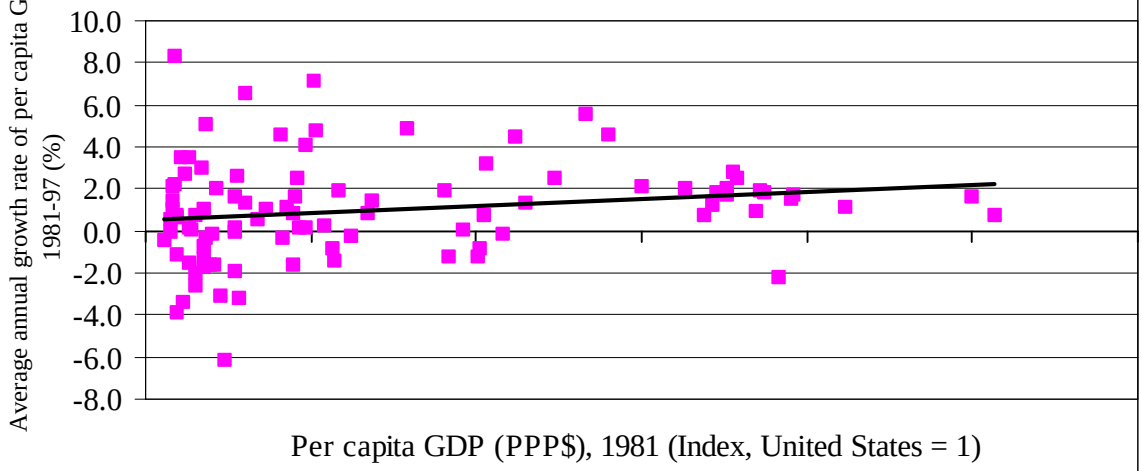
[14] For most of these countries, the necessary information were not in fact available for the whole period. In view of this, and given the very special situation of these countries, it seemed sensible to leave out even those few for which the required information was available.

[15] The values and the algebraic expressions are presented in Appendix Table 3.

[16] See Appendix Table 5.

[17] The values and the algebraic expressions are presented in the Appendix Table 3.

**Figure 1. Convergence/divergence, 96 economies**




Note: Average annual growth rates refer to per capita GDP in constant local currency unit.

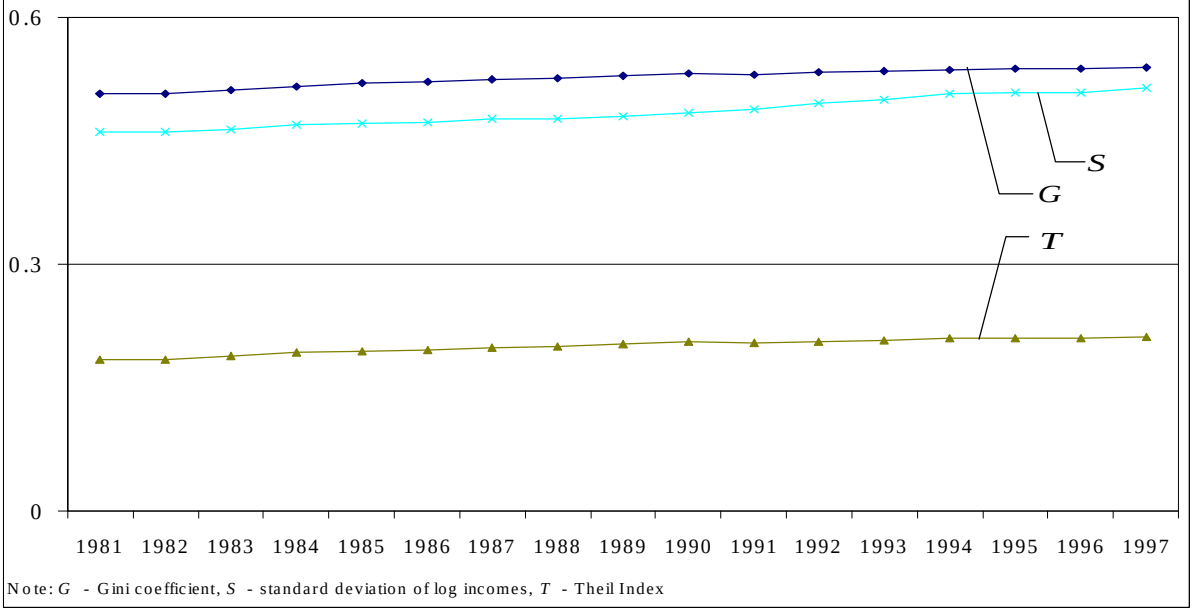
The estimated regression equations are:

$y = 0.538 + 1.657\ x$, Adj. $R^2 = 0.024$, $F = 3.31$; $y = 1.806 + 0.450 \ln x$, Adj. $R^2 = 0.030$, $F = 3.93$

(1.543) (1.821)* (3.810)** (1.982)*

* significant at 10%, ** significant at 0.1%

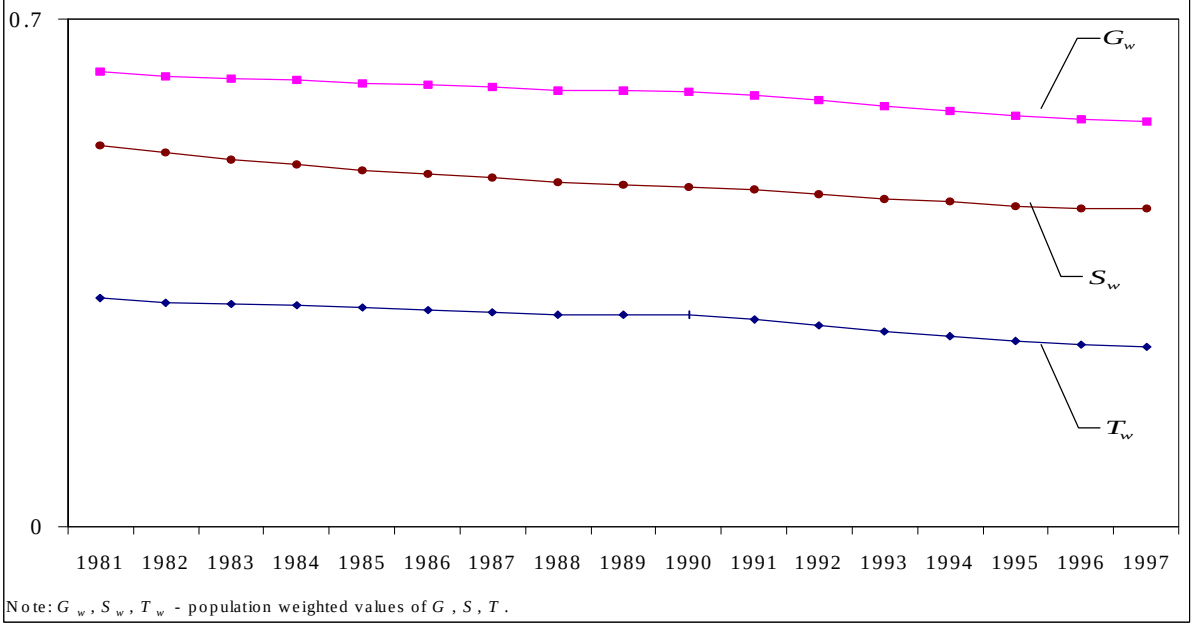
**Figure 2. Inter-country inequality, 96 economies, 1981-97**




Note: *G* - Gini coefficient, *S* - standard deviation of log incomes, *T* - Theil Index

It is also a significant fact that, at the beginning of the eighties, international inequality was actually much higher than inter-country inequality (this can be seen from a comparison of Figure 3 with Figure 2 as also from the estimates presented in Appendix Table 3). Throughout the eighties and the nineties, the two inequalities tended to converge. By the end of the nineties, international inequality was not significantly different from inter-country inequality.

**Figure 3. International inequality, 96 economies, 1981-97**

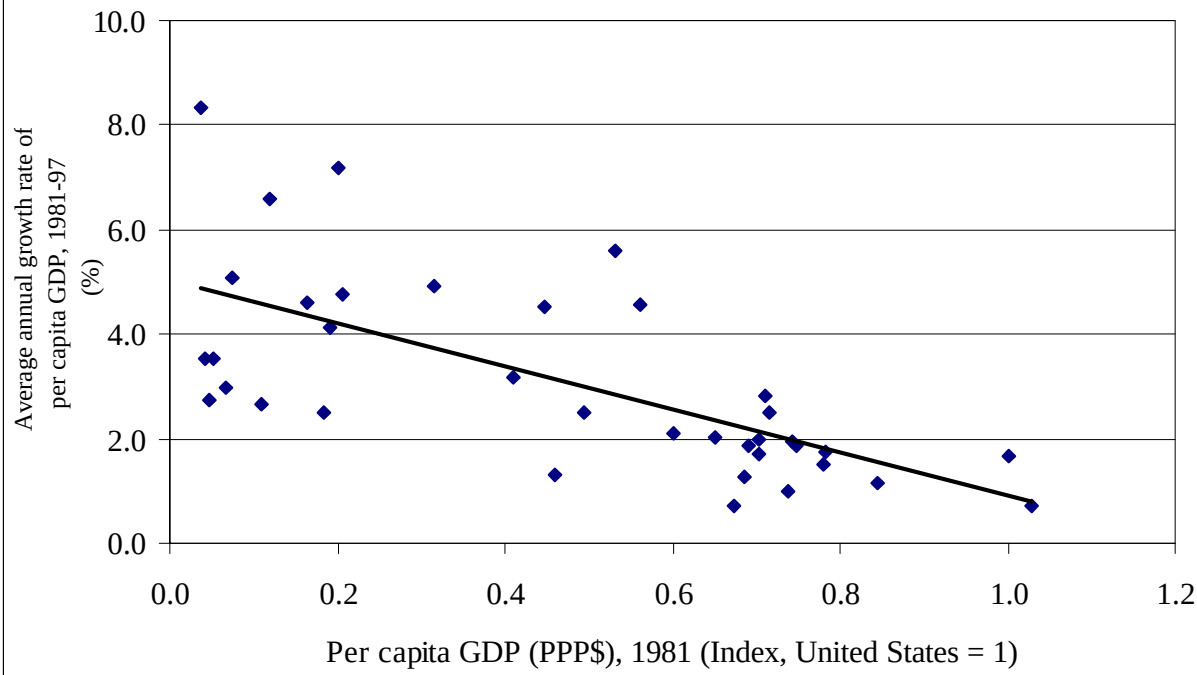



Note: $G_w$, $S_w$, $T_w$ - population weighted values of $G$, $S$, $T$.

Before proceeding further, it is useful to check if the finding that international inequality declined during 1981-97 is seriously at odds with the findings of similar existing studies. Two studies in particular need to be mentioned in this context. In a benchmark study, Berry, Bourguignon and Morrison (1983) analysed the trends in international inequality between 1950 and 1977. Their sample included 113 non-socialist (even countries with minuscule population were included) and 9 socialist economies. For the group of non-socialist countries (which excluded China), their main finding is that international inequality increased between 1960 and 1972 but remained stable in both pre-1960 and post-1972 periods. For the whole group of 122 countries (which included China), they found no discernible time-trend. In a more recent study, Schultz (1998) considers a group of 120 countries (both very small and socialist economies are included in the sample) and analyses the trend in international inequality during the period 1960-1989. He finds that international inequality increased between 1960 and 1973 and declined thereafter. These studies differ from the present study in terms of coverage of countries and period. But their findings are mutually consistent and do not contradict the finding of this study that international inequality showed a significant tendency to decline since the beginning of the eighties. Indeed, it seems possible to combine the findings to draw a general conclusion: international inequality remained stable in the fifties, increased through the sixties till the mid-seventies and declined through the eighties and the nineties. Throughout this entire period, inter-ountry inequality increased (as the studies on convergence show).

What explains the fact that international inequality declined in the last two decades despite the growth of inter-country inequality ? Given the nature of definitional differences between the two notions of inequality, the explanation must be that even though low-income countries in general recorded a slower growth of per capita GDP than high-income countries, there exists a group of low-income economies which achieved a significantly higher growth of per capita GDP than the high-income industrialised economies and that this group accounts for a large majority of the population living in low-income countries. An effort, therefore, is made to identify this group.[18] Figure 4 shows the result. There is an identifiable "convergence club" consisting of 37 economies[19] which accounted for 75 percent of the total population of the 96 sample economies in 1981. The regression equation presented in the note to Figure 4 confirm their convergence. Seventeen developing economies belong to this "convergence club"; they accounted for 76 percent of the combined population of the 37 economies and 70 percent of the combined population of all the developing economies included in the sample of 96 economies in 1981.

**Figure 4. The "convergence club", 37 economies**




Note: Average annual growth rates refer to per capita GDP in constant local currency unit.
The estimated regression equations are:
$y = 5.037 - 4.138\ x$, Adj. $R^2 = 0.439$, $F = 29.13$; $y = 1.863 - 1.096\ \ln x$, Adj. $R^2 = 0.344$, $F = 19.86$
(11.738)* (-5.397)* (5.065)* (-4.456)*

* significant at 0.1%

[18] The method employed is that of progressive elimination of low-growth developing economies from the sample.

[19] A full list of these economies is presented in the Appendix Table 5. As already noted, Germany and Taiwan (China) are not included in the sample of 96 countries. Had they been included, they would have belonged to the "convergence club".

One remarkable fact is that 10 of these 17 developing economies belong to the Asia-Pacific region and include some of the most populous low-income economies of the world (China, India, Indonesia and Pakistan). Four rather small and non-typical countries (Botswana, Lesotho, Mauritius and Swaziland) belong to Sub-Saharan Africa. Only one country - Chile - belongs to Latin America. The remaining two countries are Israel and Turkey which are usually regarded as European. It turns out, therefore, that the observed declining trend in international inequality is explained basically by the relative growth performance of a select group of large-sized Asian economies vis-à-vis the group of advanced industrialised economies.

Not all of the seventeen developing economies are low-income economies; some - Hong Kong (China), Israel and Singapore - had a higher per capita GDP (in PPP dollars) in 1981 that some of the industrialised economies - Greece, Ireland, Portugal and Spain. But it is easy to see that the main conclusion would not be altered even if these three economies were counted among the industrialised economies. The declining international inequality is fundamentally attributable to the growth performance of four low-income economies - China, India, Indonesia and Pakistan. Indeed, the growth performance of only China and India, together accounting for about one-third of the world population, would be sufficient to explain the observed decline in international inequality.

It is, of course, also remarkable that the "convergence club" excludes as many as 59 of the 76 developing economies included in the sample.[20] Clearly, a large majority of the developing economies have been falling behind rather than catching up. This "global exclusion" or "marginalisation" of so many developing economies is certainly a matter of grave concern. But, in the context of our discussion here, two points must be emphasised. First, not all these developing economies are low-income economies; quite a number of high-income and middle-income economies (including virtually all the petroleum-exporting economies) belong to the group. Second, the combined population of the 59 "marginalised" developing economies (926 million) was smaller than the combined population of China and India alone (1.7 billion) in 1981.

The main conclusions that emerge from the analysis so far can be stated as follows. Inter-country inequality has undoubtedly been rising over the last two decades, but this in fact represents a continuation of a trend observed over a much longer period. International inequality, on the other hand, has actually been declining over the last two decades and this represents a break from the past trends. A new "convergence club" seems to have emerged; it includes a minority of the world's economies but a majority of the world's population as it includes some of the most populous countries of the world.[21] This can be contrasted with the "convergence club" that emerged during the earlier period of globalization (1870-1910) which included not only a small number of countries but also a small part of the world's population.[22] This is why both inter-country and international inequalities had increased rather sharply during that period. A recent

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[20] Seven of these (Bangladesh, Colombia, Egypt, El Salvador, Nepal, Tunisia and Uruguay) achieved growth of per capita income either equal to or slightly higher than that achieved by the group of advanced industrialised countries. The growth rates achieved by another 22 developing countries (mostly from Latin America) were positive but lower than that of the group of industrialised countries. The remaining 30 countries, mostly from Sub-Saharan Africa, recorded negative growth of per capita income.

[21] It, of course, remains to be seen how stable this new "convergence club" is. The "East Asian crisis" has already dislodged Indonesia. Pakistan too currently faces a serious economic crisis. It is worth recalling in this context that Argentina was a member of the "convergence club" of 1870-1910 but subsequently failed to retain its membership.

[22] Cf. O'Rourke and Williamson (1999).

study by Bourguignon and Morrison (1999) shows that China and India were the great laggards not only during the earlier globalization period but also during the first fifty years of the twentieth century and that this was the root cause of increasing international inequality observed during this entire period (1870-1950). The really distinctive feature of the post-1980 developments is the growing importance of populous Asian economies - particularly China and India - in the world economy.

## 3. Trade and global inequality

***The issues***

To what extent were the observed changes in inter-country and international inequality linked to the changing patterns of world trade ? Clearly, trade could have affected these inequalities only through its effect on economic growth in individual countries. A central issue, therefore, concerns the possible effect of trade on economic growth.

The view that trade stimulates growth is currently widespread among academic economists and is virtually conventional wisdom for the multilateral institutions such as the World Bank, the IMF, the WTO and the OECD. The theoretical arguments are well-known: trade promotes specialisation, allows realisation of economies of scale by expanding markets and facilitates diffusion of technology. Empirically, however, the proposition is not as yet well-established.[23] In broad terms, two lines of enquiry have been pursued in the literature. Some authors have tried to test if a higher trade-GDP ratio is associated with a higher income per capita.[24] The problem with this approach is that even if such an association is found, it does not say very much about the effect of trade on growth. Per capita income is an indicator of level of development and the fact that the countries which trade more are also more developed does not necessarily imply that trade causes growth. Other authors have tried to examine the relationship between openness and growth.[25] But construction of appropriate indices of openness has proved difficult. Besides, openness is not the only determinant of trade volume or its growth. It is not the case that more open economies necessarily trade more and there obviously are instruments of trade promotion which have nothing to do with openness.

It must also be recognised that the proposition, by itself, does not say anything about the direction of change in inter-country and international inequality. We need to know, additionally, something about the pattern of variation in trade performance among countries. We might ask, for example, if low-income countries benefit more (less) from the expansion of world trade than high-income countries and if large low-income countries benefit more (less) than small low-income countries.

There are some reasons to think that low-income economies have more to gain from trade

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[23] See Edwards (1993) and Rodriguez and Rodrik (2000) for good reviews of the relevant literature.

[24] A good example is the study by Frenkel and Romer (1999).

[25] See, for example, Edwards (1998).

than high-income economies. First, trade should enable the low-income countries to increase the rate of investment through two mechanisms. In so far as there are diminishing returns to factor inputs, trade should induce capital flows from high-income (capital-abundant) to low-income (capital-scarce) countries. Moreover, trade could relax the foreign exchange constraint[26] which limits investment in many developing countries.[27] Second, trade should facilitate technology diffusion ® & D spillovers) thereby reinforcing the Gerschenkronian advantage of low-income countries.[28]

It is also possible to think of circumstances in which large low-income countries have more to gain from trade than small low-income countries. If, for example, trade expands in goods whose production involves increasing returns to scale, then large countries should have an advantage in so far as their large domestic markets facilitate the realisation of scale economies.[29] To the extent that this is so, larger countries can also be expected to attract more foreign capital than smaller countries. It is to be noted in this context that the expansion of trade in the last two decades has basically involved the expansion of trade in manufactures.[30] As increasing returns to scale are much more commonly found in manufacturing than in agriculture or services, it is possible that large low-income countries gained more from the expansion of trade in the last two decades than small low-income countries.

But low-income countries -large and small - may also have more to lose from trade than high-income countries. Expansion of trade is associated with the intensification of international competition. Enterprises in low-income countries often find it hard to withstand international competition and hence freer trade can have a negative effect on growth. A more subtle negative effect of trade is emphasised in the literature on endogenous growth. Trade could drive low-income countries to specialise in goods whose production brings no benefit in terms of learning-

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[26] The classic formulation of the idea of a foreign exchange constraint is to be found in Chenery and Strout (1966).

[27] These outcomes, however, are not inevitable. Inflows of foreign capital, for example, could lead to a decline in domestic saving rates. And whether or not trade relaxes the foreign exchange constraint for a particular country depends on the import-intensity of its exports as also on the propensity of its prosperous citizens for conspicuous consumption.

[28] The point is emphasised by Grossman and Helpman (1991). They, however, also emphasise that not all low-income economies are in a position to benefit from R & D spillovers.

[29] The presence of increasing returns to scale as a source of comparative advantage is emphasised in the works of Krugman. See, in particular, Krugman(1981, 1995).

[30] See Ghose (2000).

by-doing effects or development of technological capability. Long-term growth prospects could thus be harmed rather than enhanced by trade in certain circumstances.[31] In the case of industrialised countries, these possibilities can be ruled out.

It is clear that there is no strong *a priori* presumption about trade improving or worsening inter-country and international inequality. In view of this, rather modest objectives are set for the analysis of this section. The search is for contingent empirical relationships. Does the available evidence suggest that trade had a positive impact on economic growth of countries in the last two decades ? If the answer is yes, then are there good grounds for arguing that the changes in the patterns of trade in the last two decades actually contributed to the growth of inter-country inequality and the decline of international inequality ?

***The evidence***

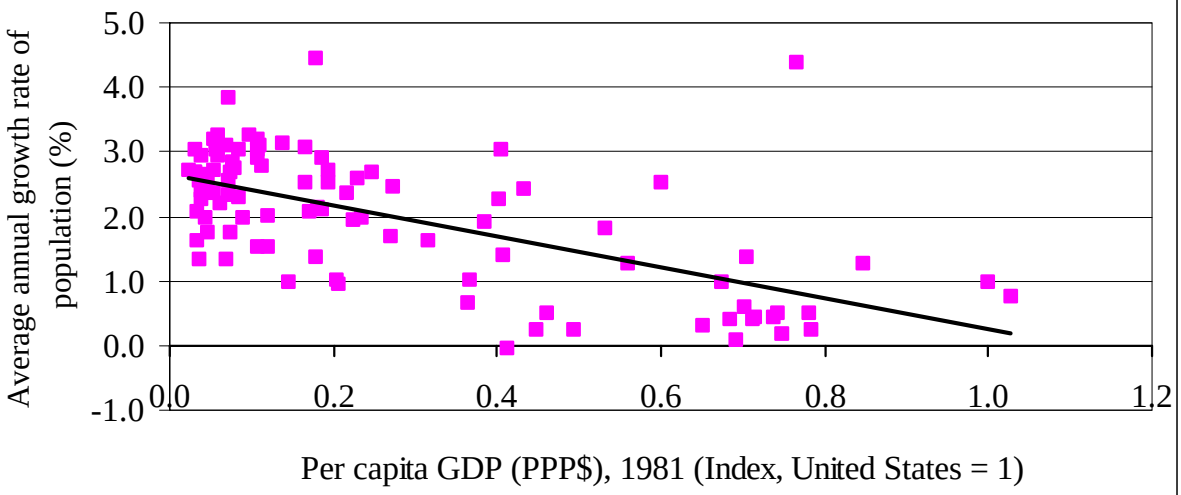
In searching for answers to these questions, we must begin by recognising that the pattern of demographic growth across countries was actually a major contributor to the growth of inter-country inequality during the period under study. As Figure 5 shows, lower-income countries in general experienced higher population growth. This, of course, is what the theory of demographic transition would predict.[32] At a low level of development, a country is in an early phase of demographic transition where the population growth is both high and accelerating (because mortality declines faster than fertility); at a high level of development, a country is in a late phase of demographic transition where the population growth is both low and decelerating (because fertility declines faster than mortality). Thus a snapshot across countries is expected to show a negative relationship between the rate of population growth and the level of development. That this pattern of demographic change contributed substantially to the growth of inter-country inequality is obvious from the fact that the latter widened even though the average growth performance of low-income economies was no worse than that of advanced industrialised economies (Figure 6). Its effect on international inequality was also negative; as Figure 7 shows, international inequality would have declined more sharply than it actually did had the rate of population growth been the same for all countries.[33]

[31] The argument is developed in Grossman and Helpman (1991), Matsuyama (1992) and Rodriguez and Rodrik (2000).

[32] See Birdsall (1988) and Kelley (1988) for relevant discussions.

[33] See also the estimated trend equations presented in Appendix Table 4.

**Figure 5. Demographic changes and income, 96 economies**



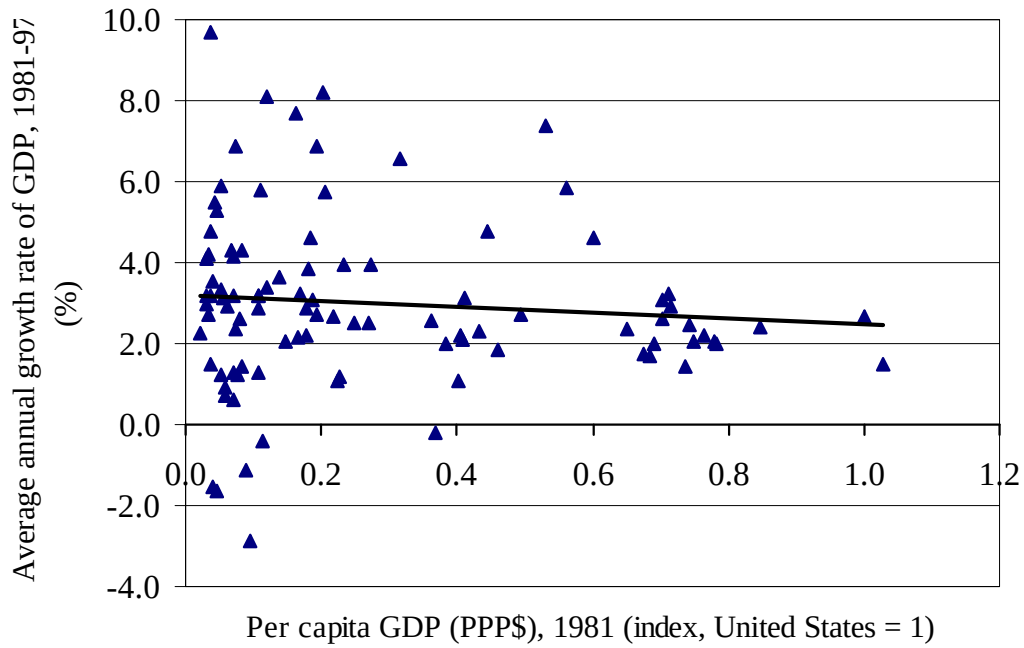

The estimated regression equations are:

$y = 2.660 - 2.395\ x$, Adj. $R^2 = 0.385$, $F = 60.57$; $y = 0.993 - 0.558\ \ln x$, Adj. $R^2 = 0.334$, $F = 48.63$

(22.542)* (-7.783)* (5.933)* (-6.973)*

* significant at 0.1%

**Figure 6. Convergence/Divergence, 96 economies**

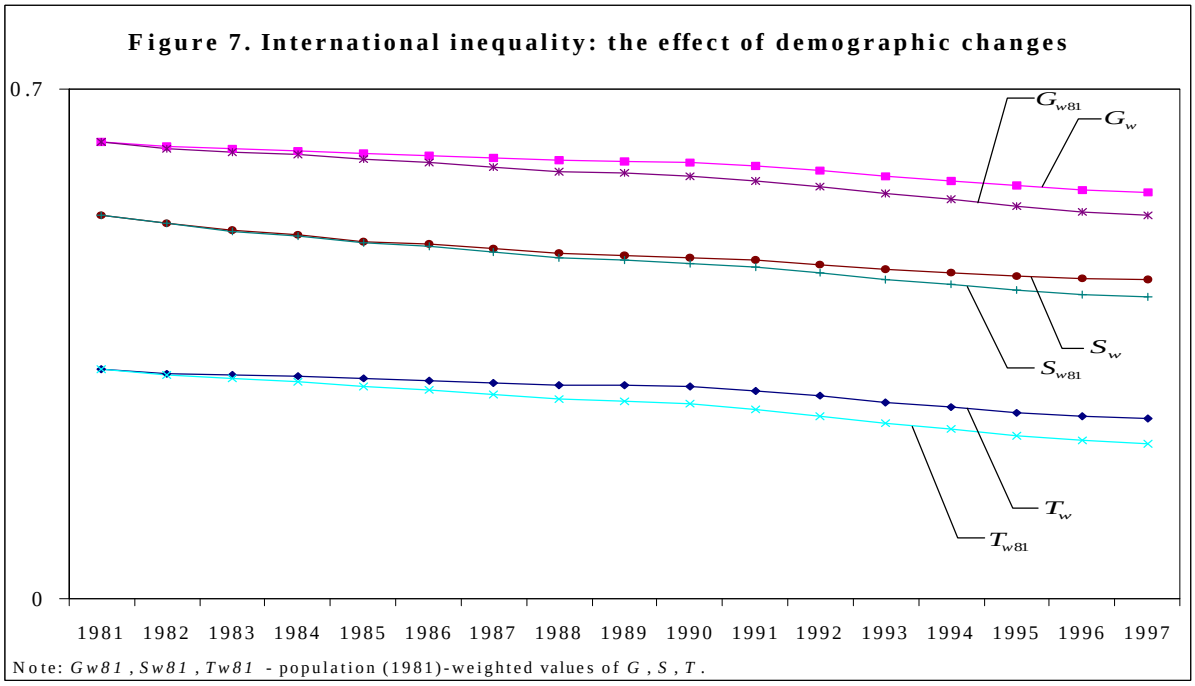



Note: Average annual growth rates refer to GDP in constant local currency unit.

$y = 3.198 - 0.737\ x$, Adj. $R^2 = -0.002$, $F = 0.81$; $y = 2.799 - 0.109\ \ln x$, Adj. $R^2 = -0.008$, $F = 0.28$

(10.204)*** (-0.902) (6.537)*** (-0.530)

*** significant at 0.1%




These findings imply that, in analysing trade-growth linkage, growth must be interpreted to mean growth of total GDP and not growth of per capita GDP, since it cannot be supposed that trade influences population growth.[34] The analysis that follows focusses on the relationship between growth of trade and overall economic growth. The regression results presented in Table 1 indicate that growth of trade did have a positive impact on economic growth in the eighties and the nineties. The statistically significant positive relationship between the rate of growth of GDP and the rate of change in trade-GDP ratio (Equations 1a and 1b) suggests that countries which succeeded in increasing the trade-GDP ratio also achieved higher growth. The relationship is basically the same irrespective of whether we consider only low- and medium-income developing economies or all economies in the sample.

[34] This point needs to be made only because, in the literature on the subject, growth has often been interpreted to mean growth of per capita GDP. For example, Frenkel and Romer (1999) analyse the cross-country relationship between per capita GDP in PPP dollars and trade-GDP ratio in an attempt to establish that trade has a growth enhancing effect.

**Table 1: Trade and growth: regression results (dependent variable - average annual rate of growth of GDP)**

| | Equation 1 | | Equation 2 | | Equation 3 | |
|---|---|---|---|---|---|---|
| | (a) | (b) | (a) | (b) | (a) | (b) |
| Constant | 2.588<br>(10.723)**** | 2.465<br>(7.709)**** | 0.177<br>(0.287) | 0.471<br>(0.622) | 0.376<br>(0.632) | 0.787<br>(1.084) |
| Annual rate of change in trade-GDP ratio | 0.256<br>(2.582)** | 0.295<br>(2.548)** | 0.349<br>(3.722)**** | 0.362<br>(3.228)*** | 0.267<br>(2.848)*** | 0.266<br>(2.385)** |
| Average rate of investment, 1981/83 | - | - | 0.104<br>(4.175)**** | 0.088<br>(2.867)*** | 0.090<br>(3.738)**** | 0.069<br>(2.317)** |
| Population, 1981 (index, China's population = 1) | - | - | - | - | 4.595<br>(3.009)*** | 5.038<br>(2.880)*** |
| Adjusted R-square | 0.0598 | 0.0790 | 0.2078 | 0.1737 | 0.2749 | 0.2607 |
| F-statistic | 6.67 | 6.49 | 12.67 | 7.73 | 12.25 | 8.52 |

For equations 1(a), 2(a) and 3(a), the sample includes 90 economies. Data on some of the variables were missing for 6 economies - Botswana, Lesotho, Mongolia, Namibia, Sudan and Swaziland.

For equations 1(b), 2(b) and 3(b), the sample includes 65 economies. The economies excluded are: 20 industrialised economies; 5 high-income economies - Hong Kong (China), Israel, Saudi Arabia, Singapore and Venezuela; and the 6 economies for which data were missing.

The figures in parentheses are t-statistics.
** significant at 5% level
*** significant at 1% level
**** significant at 0.1% level

When an additional variable - the initial rate of investment - is introduced into the regression equation (Equations 2a and 2b in Table 1), the results improve substantially and both variables show a statistically significant positive relationship with the rate of growth of GDP. The idea here is that an economy's growth is fundamentally a function of its rate of investment which is determined by a multitude of factors. Economic growth in any given period can then be seen to depend on the historically given investment rate and the extent to which this rate is sustained or augmented. As noted above, there are reasons to think that trade can help in sustaining or augmenting a given rate of investment, particularly in developing economies. Hence it is reasonable to expect that the variation in the rate of economic growth across countries in a given period is explained by the variation in the historically given investment rate and the variation in the change in trade orientation. This expectation is obviously borne out by the regression results. In fact, it can also be directly shown (the regression results presented in Table 2) that change in trade orientation affected growth through its effect on investment.

**Table 2: Investment and trade: regression results (dependent variable - annual rate of change in the rate of investment)**

| | 90 economies | 65 economies |
|---|---|---|
| Constant | -0.793<br>(-3.227)*** | -0.796<br>(-2.363)** |
| Annual rate of change in trade-GDP ratio | 0.606<br>(6.006)**** | 0.656<br>(5.371)**** |
| Adjusted R-square | 0.2827 | 0.3032 |
| F-statistic | 36.08 | 28.85 |

The samples are the same as those defined in the note to Table 1.
The figures in parentheses are t-statistics.
** significant at 5% level
*** significant at 1% level
**** significant at 0.1% level

Interestingly, it turns out that the size of a country (in terms of population) mattered too (Equations 3a and 3b in Table 1); for a given rate of initial investment and a given annual rate of change in trade-GDP ratio, countries with larger initial population tended to achieve higher growth.[35] This could be interpreted to mean that larger developing countries derived larger benefits from trade and investment either because the foreign exchange constraint had been stronger for them[36] or because they were able to reap the benefits of scale economies. These are, of course, only hunches; this is not the place to attempt a full investigation into the issue.

[35] It might be thought that this result is obtained because of inclusion, in the sample, of China and India which could be regarded as outliers with reference to population size. But the result survives exclusion of these two economies from the sample. The estimated regression equation for the sample of 63 developing economies (excluding China and India from the sample of 65 developing economies) is:

RGDP = 0.589 + 0.256 RTG + 0.064 IRI + 21.317 P, Adjusted R-square = 0.1805, F = 5.55
(0.809) (2.334)** (2.179)** (2.582)**

where RGDP is annual rate of growth of GDP, RTG is annual rate of change in trade-GDP ratio, IRI is rate of investment in 1981/83 and P is population in 1981.

[36] It is noteworthy that, till the eighties, large low-income economies tended to be far less open than small low-income economies.

For our purposes here, it is sufficient to note that, *ceteris paribus*, larger countries tended to achieve higher growth. On the other hand, the rate of growth does not show any systematic variation with the initial level of development. Average per capita GDP (in PPP dollars) in 1981/83 was introduced into the regression equation as one of the explanatory variables but its coefficient turned out to be statistically insignificant.

Thus there is evidence to suggest that growth of trade orientation did provide a stimulus to economic growth and that the stimulus was larger for larger economies. The question that naturally arises is: why was there a wide variation in the trade performance of countries in a period when world trade was expanding rapidly and virtually all countries were liberalising their trade regimes ? It is by now well-known that world trade grew considerably faster than world GDP in the last two decades. For our sample of countries, the aggregate trade-GDP ratio rose from 37 percent in 1981/83 to 43 percent in 1995/97.[37] Nevertheless, the ratio declined for a fairly large number of countries, very substantially in some cases. At the other end of the spectrum, the ratio showed quite spectacular growth for a small number of countries. Yet all these countries substantially liberalised their trade regimes during the period.

Obviously, trade liberalisation was not a sufficient condition for increasing trade-orientation and a little probe tells us why. As noted above, the expansion of merchandise trade in the eighties and the nineties is explained largely by the expansion of trade in manufactures; world demand was growing not for primary commodities but for manufactures.[38] It is reasonable to hypothesise that, in this setting, a country's trade performance was linked to its ability to export manufactures (countries dependent on exports of primary commodities would have faced stagnating demand, prices and revenues and hence stagnating import capacity). The hypothesis receives strong support from the regression results presented in Table 3. They show a very strong positive relationship between the rate of change in trade-GDP ratio and the rate of change in the ratio of manufactured trade to GDP across countries.

[37] These figures actually are for 94 of the sample countries. For Mongolia and Sudan, the relevant data for the were not available.

[38] Trade in services was also growing, but this was of little relevance to developing economies.

**Table 3: Trade and trade in manufactures: regression results (dependent variable - annual rate of change in trade-GDP ratio)**

| | 90 economies | 65 economies |
|---|---|---|
| Constant | 0.084<br>(0.415) | 0.312<br>(1.168) |
| Annual rate of change in the ratio of trade in manufactures to GDP | 0.553<br>(9.002)**** | 0.521<br>(7.293)**** |
| Adjusted R-square | 0.4746 | 0.4492 |
| F-statistic | 81.40 | 53.19 |

The samples are the same as those defined in the note to Table 1.
The figures in parentheses are t-statistics.
**** significant at 0.1% level

The story told by the regression results is as follows. In the eighties and the nineties, trade performance was an important determinant of growth performance of economies - both developed and developing. The countries which increased their trade orientation also achieved or sustained high growth; correspondingly, the countries which suffered a stagnation or decline in trade orientation achieved poor growth. But increasing trade orientation required increasing manufactured exports, not just trade liberalisation. In the developing world, only a few countries had the requisite manufacturing base and physical and social infrastructure to be able to expand manufactured exports. The larger of these countries, moreover, derived larger benefits from trade expansion, probably because they reaped benefits of scale economies. On the other hand, a large majority of developing countries continued to depend on exports of primary commodities; they faced stagnation or decline in trade orientation and consequently found it difficult to sustain rapid economic growth. [39]

It does seem, therefore, that the recent developments in world trade adversely affected the economic growth of a substantial number of low- and medium-income countries and hence contributed to the growth of inter-country inequality. At the same time, however, the same developments were also responsible for the decline in international inequality. They enabled some low-income countries to achieve accelerated economic growth by increasing their trade orientation and these included some of the most populous low-income countries of the world.

[39] It is true that there was too little liberalisation of trade in primary commodities and this may have been a reason for slow growth of world demand for these commodities. But there are also reasons to think that there has been a long-term tendency for world demand to shift away from primary commodities into manufactures. See Ghose (2000) for some details.

Overall, the trends in global economic inequality are thus explicable in terms of the interactions between the effect of trade and the effect of demographic change. In the absence of the changes in the patterns of world trade, the effect of demographic change would have been to increase both inter-country and international inequality. The changes in the patterns of world trade also served to increase inter-country inequality thus reinforcing the effect of demographic change. But the same changes (in the patterns of world trade) had the effect of reducing international inequality and the effect was strong enough to outweigh the effect of demographic change.

## 4. Conclusions

It is much too simplistic to say that global economic inequality has been growing over the last two decades. There are at least three ways of defining global economic inequality and the conclusion about the direction of change depends very much on the particular definition used to study the change. Thus inter-country inequality has indeed been growing, but international inequality has been declining at the same time. Both of these notions of inequality, of course, ignore within-country income distributions. Work on the evolution of world income distribution has only just begun and it is not clear if this distribution has been worsening or improving.

The reason why international inequality has been declining even while inter-country inequality has been increasing is that while the growth of per capita income in a large majority of the developing economies has been slower than that in high-income industrialised economies, it has been substantially higher in a few populous low-income economies of the Asia-Pacific region. The result has been a rapid growth of per capita income for a majority of the population of the developing world residing in a minority of the countries.

There are two other significant facts. First, while the growth of inter-country inequality represents the continuation of a long-term trend, the decline in international inequality represents a break from the past. Inter-country inequality has been rising at least since 1950 and most probably since 1870. International inequality went through phases of stability and growth between 1870 and the end of the seventies; it showed a declining trend for the first time during the eighties and the nineties. Declining international inequality is thus a new feature of the world economy; indeed, it is a feature that distinguishes the current period of globalization from the earlier period (1870-1910) which was associated with growth of international inequality. Second, at the beginning of the eighties, international inequality was substantially higher than inter-country inequality (implying that the more populous countries tended to be poorer); indeed, this appears to have been a feature of the world economy for a fairly long period. The contrasting trends in the two inequalities throughout the eighties and the nineties led to their convergence; towards the end of the nineties, the two inequalities were roughly of the same order.

The pattern of demographic change across countries was a major cause of the growth of inter-country inequality in the last two decades. The average rate of GDP growth achieved by the poorer countries was certainly no lower than that achieved by the advanced countries; indeed, many of the poorer countries achieved significantly higher growth. But the poorer countries had

to contend with much higher rates of population growth and consequently ended up with slower growth of per capita income. The cross-country pattern of population growth also had the effect of slowing down the decline in international inequality.

The effect of trade liberalisation on economic growth across countries during the period under consideration was complex. The growth of world trade essentially reflected growth of trade in manufactures. Fundamentally, this is what explains the 'global exclusion' or 'marginalisation' of a large majority of the developing countries which were in no position to export manufactures as they had neither a significant manufacturing sector nor the necessary physical and social infrastructure. They continued to depend on exports of primary commodities the world demand for which was stagnating. Trade liberalisation in these circumstances tended to have a constraining rather than a stimulating effect on their economic growth; it failed to increase earnings from exports of primary commodities but exposed the nascent manufacturing sector to international competition.

On the other hand, trade liberalisation did have a stimulating effect on economic growth of the few developing economies which had the capacity to use the opportunity, created by the expansion of world trade, to increase their manufactured exports. These few included some of the largest (in terms of size of population) developing economies. Indeed, there is some evidence to suggest that larger economies derived larger benefits from trade expansion. Easing of the foreign exchange constraint and the existence of scale economies in manufacturing production are among the probable reasons.

The developments in world trade, therefore, simultaneously contributed to the growth of inter-country inequality and to the decline in international inequality. In the case of inter-country inequality, trade liberalisation reinforced the adverse effect of demographic change. In the case of international inequality, the favourable effect of trade liberalisation was strong enough to outweigh the unfavourable effect of demographic change.

Three concluding observations on the implications of these findings for international policy are worth recording. First, the fact that the pattern of demographic change has had the effect of increasing inter-country inequality should not lead to the view that a policy of population control holds the key to reducing inequality. Demographic transition has been a feature of the development process in all countries. The problem is that the transition process was set in motion in different countries at different points in historical time and population policy cannot address such a problem. The primary focus of international policy has to be on accelerating the pace of growth in low-income economies and not on controlling their populations. Second, it is often asserted that globalization has generated both opportunities and risks. It is not always realised, however, that both opportunities and risks arise from the same sources. Trade liberalisation, for example, has created opportunities for some countries and risks for others. The problem for international policy is one of minimising the risks without minimising the opportunities. Third, the stagnation in world demand for primary commodities may have been partly due to the lack of progress in liberalising trade in them, but it does not follow that liberalisation of trade in these commodities can overcome the problem of 'global exclusion' or 'marginalisation' of a large majority of developing economies. Slow growth of demand for primary commodities has been a long-term trend in the world economy and there are no good reasons to suppose that this trend can be reversed. Liberalisation of trade in primary commodities is desirable since it will undoubtedly benefit some of the 'marginalised' countries, but it is most unlikely to benefit all of them. The benefit, moreover, can only be once-for-all in nature. To effectively overcome

'marginalisation', these economies will need to diversify their exports away from primary commodities towards manufactures. For the high-and middle-income 'marginalised' economies, this is largely a matter of domestic policy. The low-income 'marginalised' economies, however, will need international assistance to achieve the requisite infrastructure development. International policy must be concerned with mobilisation and delivery of such assistance.

# Appendix Table 1: List of 96 countries included in the sample

**High income countries (including non-OECD countries):**

1 Australia
2 Austria
3 Belgium
4 Canada
5 Denmark
6 Finland
7 France
8 Greece
9 Ireland
10 Italy
11 Japan
12 Netherlands
13 New Zealand
14 Norway
15 Portugal
16 Spain
17 Sweden
18 Switzerland
19 United Kingdom
20 United States
21 Hong Kong, China
22 Israel
23 Singapore

**Upper middle income countrie**s:

24 Argentina
25 Botswana
26 Brazil
27 Chile
28 Gabon
29 Korea, Rep.
30 Malaysia
31 Mauritius
32 Mexico
33 Saudia Arabia
34 South Africa
35 Trinidad and Tobago
36 Uruguay
37 Venezuela

**Lower middle income countries:**

38 Algeria
39 China
40 Colombia
41 Costa Rica
42 Dominican Republic
43 Ecuador
44 Egypt, Arab Rep.
45 El Salvador
46 Fiji
47 Guatemala
48 Honduras
49 Jamaica
50 Jordan
51 Morocco
52 Namibia
53 Paraguay
54 Peru
55 Philippines
56 Sri Lanka
57 Swaziland
58 Syrian Arab Republic
59 Thailand
60 Tunisia
61 Turkey

**Low income countries**

62 Bangladesh
63 Benin
64 Burkina Faso
65 Burundi
66 Cameroon
67 Central African Republic
68 Chad
69 Congo, Dem.Rep.
70 Congo, Rep.
71 Côte d'Ivoire
72 Ethiopia
73 Gambia, The
74 Ghana
75 Haiti
76 India
77 Indonesia
78 Kenya
79 Lesotho
80 Madagascar
81 Malawi
82 Mali
83 Mauritania
84 Mongolia
85 Mozambique
86 Nepal
87 Niger
88 Nigeria
89 Pakistan
90 Rwanda
91 Senegal
92 Sierra Leone
93 Sudan
94 Togo
95 Zambia
96 Zimbabwe

## Appendix Table 2: Basic data

| Country | Per capita GDP (PPP$), 1981 | Population (in millions) | | Average annual rate of GDP growth (in constant LCU), 1981-97 | Average annual rate of population growth, 1981-97 | Trade-GDP ratio, 1981/83 average | Annual percentage change in trade-GDP ratio, 1981-97 | Manufactured trade-GDP ratio, 1981/83 average | Annual percentage change in manufactured trade-GDP ratio, 1981-97 | Rate of investment (percent), 1981/83 average |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1981 | 1997 | | | | | | | |
| Portugal | 5566 | 9.85 | 9.95 | 3.15 | -0.02 | 65.90 | 0.34 | 30.43 | 2.04 | 33.65 |
| Ireland | 6046 | 3.44 | 3.66 | 4.78 | 0.25 | 103.41 | 1.71 | 60.82 | 2.18 | 25.81 |
| Greece | 6235 | 9.73 | 10.52 | 1.83 | 0.51 | 39.60 | 0.10 | 18.38 | 0.83 | 25.97 |
| Spain | 6694 | 37.74 | 39.32 | 2.73 | 0.24 | 39.24 | 1.57 | 15.49 | 3.69 | 21.66 |
| United Kingdom | 8828 | 56.35 | 59.01 | 2.34 | 0.31 | 51.12 | 0.80 | 28.84 | 1.51 | 15.78 |
| New Zealand | 9133 | 3.15 | 3.76 | 1.73 | 0.99 | 62.24 | -0.46 | 22.94 | 0.42 | 25.19 |
| Finland | 9273 | 4.80 | 5.14 | 1.69 | 0.42 | 62.39 | 0.56 | 36.71 | 1.23 | 25.98 |
| Italy | 9363 | 56.50 | 57.52 | 1.98 | 0.10 | 46.48 | 0.42 | 24.76 | 1.15 | 23.60 |
| Netherlands | 9505 | 14.25 | 15.61 | 2.60 | 0.60 | 107.97 | -0.35 | 52.20 | 1.22 | 18.76 |
| Australia | 9533 | 14.93 | 18.53 | 3.09 | 1.37 | 31.84 | 1.47 | 12.22 | 1.92 | 24.29 |
| Japan | 9625 | 117.65 | 126.09 | 3.22 | 0.42 | 27.70 | -2.13 | 15.45 | -1.21 | 29.70 |
| Norway | 9690 | 4.10 | 4.40 | 2.93 | 0.45 | 78.05 | -0.41 | 30.70 | -0.43 | 26.95 |
| Sweden | 9991 | 8.32 | 8.85 | 1.44 | 0.46 | 64.66 | 0.99 | 39.07 | 1.30 | 17.61 |
| Austria | 10058 | 7.57 | 8.07 | 2.46 | 0.51 | 72.77 | 0.65 | 41.19 | 0.72 | 23.72 |
| Denmark | 10129 | 5.12 | 5.28 | 2.04 | 0.19 | 73.60 | -0.54 | 33.70 | 0.31 | 18.37 |
| France | 10559 | 54.18 | 58.61 | 2.03 | 0.51 | 45.58 | 0.12 | 25.43 | 0.93 | 21.21 |
| Belgium | 10609 | 9.85 | 10.19 | 2.00 | 0.24 | 132.75 | 0.06 | 83.06 | 0.83 | 16.79 |
| Canada | 11453 | 24.90 | 30.29 | 2.41 | 1.27 | 49.77 | 2.53 | 28.26 | 3.12 | 21.29 |
| United States | 13541 | 229.47 | 267.64 | 2.66 | 0.97 | 18.82 | 1.64 | 9.94 | 2.63 | 19.25 |
| Switzerland | 13914 | 6.35 | 7.09 | 1.48 | 0.76 | 69.53 | 0.02 | 48.54 | 0.35 | 24.67 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Venezuela | 5849 | 15.52 | 22.78 | 2.31 | 2.43 | 42.14 | 1.21 | 11.87 | 2.36 | 21.44 |
| Singapore | 7207 | 2.32 | 3.10 | 7.41 | 1.81 | 396.09 | -1.11 | 159.82 | 1.54 | 47.38 |
| Hong Kong, China | 7591 | 5.12 | 6.50 | 5.87 | 1.29 | 184.76 | 2.57 | 128.57 | 2.41 | 31.17 |
| Israel | 8134 | 3.96 | 5.84 | 4.62 | 2.53 | 95.70 | -1.29 | 37.14 | 1.05 | 22.65 |
| Saudi Arabia | 10362 | 9.91 | 20.07 | 2.23 | 4.40 | 100.86 | -1.67 | 26.10 | -1.02 | 24.36 |
| Ethiopia | 304 | 38.77 | 59.75 | 2.28 | 2.73 | 26.45 | 2.38 | 8.62 | 4.08 | 12.88 |
| Malawi | 400 | 6.36 | 10.28 | 2.99 | 3.06 | 52.53 | 0.84 | 18.06 | 1.19 | 20.61 |
| Mali | 419 | 6.73 | 10.29 | 3.20 | 2.68 | 44.83 | 1.51 | 15.62 | -0.22 | 14.80 |
| Chad | 430 | 4.59 | 7.15 | 4.09 | 2.68 | 32.59 | 2.81 | 4.82 | 0.94 | 2.95 |
| Mozambique | 440 | 12.42 | 16.63 | 2.70 | 1.62 | 33.04 | 2.42 | 14.99 | 2.94 | 5.78 |
| Bangladesh | 446 | 88.63 | 123.63 | 4.20 | 2.09 | 22.06 | 1.77 | 7.81 | 4.77 | 21.95 |
| Nepal | 485 | 14.87 | 22.32 | 4.77 | 2.55 | 31.49 | 3.90 | 9.82 | 3.75 | 18.13 |
| China | 488 | 993.86 | 1227.18 | 9.69 | 1.36 | 16.28 | 5.80 | 10.31 | 7.08 | 33.18 |
| Burundi | 508 | 4.24 | 6.43 | 1.49 | 2.64 | 34.03 | -1.06 | 8.97 | 0.77 | 18.10 |
| Burkina Faso | 513 | 7.14 | 10.47 | 3.16 | 2.39 | 42.12 | -0.32 | 12.71 | -1.98 | 18.50 |
| Nigeria | 520 | 73.41 | 117.90 | 3.56 | 2.94 | 39.64 | 4.15 | 18.74 | -1.91 | 19.34 |
| Sierra Leone | 522 | 3.30 | 4.75 | -1.56 | 2.26 | 27.78 | 2.45 | 12.30 | 5.25 | 3.23 |
| India | 575 | 702.82 | 962.38 | 5.49 | 1.97 | 14.01 | 3.40 | 6.57 | 3.83 | 21.91 |
| Rwanda | 624 | 5.33 | 7.90 | -1.66 | 1.77 | 33.21 | -0.21 | 7.36 | -0.62 | 14.87 |
| Pakistan | 635 | 85.10 | 128.46 | 5.29 | 2.57 | 33.98 | 0.73 | 15.27 | 1.78 | 18.95 |
| Lesotho | 712 | 1.38 | 2.01 | 5.88 | 2.36 | 152.66 | -0.16 | | - - | 42.02 |
| Madagascar | 718 | 9.10 | 14.15 | 1.23 | 2.73 | 31.44 | 2.92 | 7.93 | 3.57 | 9.44 |
| Kenya | 724 | 17.25 | 28.61 | 3.35 | 3.20 | 54.56 | 1.33 | 15.73 | 2.62 | 19.80 |
| Benin | 747 | 3.57 | 5.80 | 3.14 | 3.05 | 67.68 | -0.64 | 47.13 | -4.09 | 20.20 |
| Niger | 800 | 5.78 | 9.80 | 0.72 | 3.27 | 55.05 | -1.78 | 21.05 | -1.77 | 17.81 |
| Zambia | 804 | 5.93 | 9.44 | 0.91 | 2.94 | 66.12 | 0.70 | 34.87 | 1.53 | 16.61 |
| Sudan | 812 | 19.24 | 27.74 | 2.93 | 2.22 | 33.15 | | -11.84 | -3.05 | 17.64 |
| Sri Lanka | 913 | 14.99 | 18.55 | 4.31 | 1.33 | 72.79 | 0.57 | 27.95 | 2.29 | 29.14 |
| Ghana | 939 | 11.03 | 17.98 | 4.14 | 3.09 | 9.31 | 11.55 | 16.44 | 3.77 | 3.90 |
| Gambia, The | 958 | 0.66 | 1.18 | 3.16 | 3.84 | 109.22 | -0.08 | 24.05 | 6.67 | 22.23 |
| Central African Republic | 962 | 2.37 | 3.42 | 0.61 | 2.33 | 58.54 | -1.72 | 13.62 | 0.67 | 9.08 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mongolia | 964 | 1.71 | 2.54 | 1.27 | 2.55 | 75.76 | 2.35 | | - - | 59.39 |
| Senegal | 991 | 5.70 | 8.79 | 2.37 | 2.70 | 80.86 | -0.53 | 22.33 | -1.32 | 12.59 |
| Indonesia | 995 | 151.30 | 200.39 | 6.85 | 1.76 | 51.37 | 0.30 | 13.75 | 3.66 | 27.34 |
| Congo, Rep. | 1040 | 1.72 | 2.71 | 1.22 | 2.86 | 122.53 | 0.98 | 31.08 | 1.13 | 48.78 |
| Mauritania | 1083 | 1.59 | 2.46 | 2.59 | 2.74 | 106.55 | -0.31 | 27.02 | 0.47 | 26.44 |
| Togo | 1119 | 2.69 | 4.34 | 1.42 | 3.03 | 100.08 | -1.74 | 32.32 | -0.34 | 21.92 |
| Egypt, Arab Rep. | 1141 | 41.94 | 60.35 | 4.33 | 2.29 | 71.02 | -2.39 | 26.09 | -2.70 | 29.44 |
| Haiti | 1219 | 5.45 | 7.49 | -1.11 | 1.99 | 48.08 | -1.79 | 43.12 | -5.99 | 17.33 |
| Congo, Dem. Rep. | 1298 | 27.84 | 46.71 | -2.85 | 3.25 | 30.31 | 2.92 | 12.45 | 4.57 | 9.38 |
| Zimbabwe | 1447 | 7.24 | 11.47 | 2.85 | 2.90 | 40.13 | 3.99 | 9.01 | 7.99 | 18.06 |
| Cote d'Ivoire | 1447 | 8.51 | 14.21 | 1.27 | 3.21 | 75.30 | 0.58 | 18.50 | -0.25 | 22.51 |
| Honduras | 1451 | 3.69 | 5.99 | 3.16 | 3.03 | 58.98 | 2.93 | 20.62 | 5.07 | 16.34 |
| El Salvador | 1457 | 4.64 | 5.93 | 3.16 | 1.55 | 55.30 | 0.24 | 22.24 | 0.59 | 13.17 |
| Swaziland | 1496 | 0.58 | 0.96 | 5.78 | 3.11 | 158.81 | 0.55 | | - - | 31.12 |
| Cameroon | 1526 | 8.90 | 13.94 | -0.40 | 2.80 | 63.68 | -1.94 | 15.92 | -2.07 | 25.99 |
| Morocco | 1625 | 19.82 | 27.31 | 3.37 | 2.01 | 48.36 | -0.06 | 18.27 | 1.97 | 26.11 |
| Thailand | 1630 | 47.69 | 60.60 | 8.13 | 1.52 | 49.63 | 3.54 | 21.22 | 5.60 | 28.72 |
| Syrian Arab Republic | 1852 | 9.00 | 14.89 | 3.66 | 3.15 | 42.46 | 3.07 | 14.20 | 2.92 | 23.48 |
| Jamaica | 1976 | 2.16 | 2.55 | 2.06 | 0.98 | 89.47 | 1.93 | 27.11 | 4.63 | 21.14 |
| Botswana | 2221 | 0.94 | 1.53 | 7.70 | 3.09 | 106.47 | -1.32 | | - - | 33.19 |
| Philippines | 2248 | 49.34 | 73.53 | 2.16 | 2.52 | 49.06 | 3.83 | 16.21 | 4.61 | 28.31 |
| Dominican Republic | 2304 | 5.83 | 8.11 | 3.22 | 2.08 | 37.38 | 3.43 | 10.80 | 8.41 | 21.55 |
| Jordan | 2402 | 2.27 | 4.44 | 2.87 | 4.44 | 128.49 | 0.08 | 48.45 | -0.25 | 38.63 |
| Fiji | 2404 | 0.65 | 0.81 | 2.22 | 1.37 | 95.32 | 1.19 | 25.98 | 1.79 | 27.00 |
| Tunisia | 2461 | 6.56 | 9.22 | 3.82 | 2.15 | 84.22 | 0.38 | 36.86 | 2.39 | 32.52 |
| Turkey | 2497 | 45.55 | 63.75 | 4.60 | 2.11 | 25.68 | 3.92 | 10.31 | 5.10 | 17.04 |
| Paraguay | 2518 | 3.21 | 5.09 | 3.05 | 2.92 | 31.07 | 7.24 | 10.09 | 7.61 | 26.20 |
| Malaysia | 2605 | 14.11 | 21.67 | 6.86 | 2.73 | 109.81 | 3.18 | 46.62 | 6.05 | 36.71 |
| Guatemala | 2605 | 6.99 | 10.52 | 2.71 | 2.54 | 33.90 | 1.29 | 14.47 | 2.17 | 14.08 |
| Korea, Rep. | 2741 | 38.72 | 45.99 | 8.21 | 1.03 | 72.54 | -0.63 | 43.05 | -0.23 | 29.10 |
| Mauritius | 2782 | 0.98 | 1.15 | 5.73 | 0.97 | 96.89 | 1.65 | 31.82 | 4.12 | 20.29 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ecuador | 2930 | 8.18 | 11.94 | 2.65 | 2.35 | 43.48 | 1.61 | 12.35 | 3.39 | 21.99 |
| Peru | 3045 | 17.76 | 24.37 | 1.10 | 1.96 | 37.02 | -1.52 | 14.36 | -0.88 | 30.71 |
| Algeria | 3088 | 19.26 | 29.32 | 1.15 | 2.61 | 59.69 | -0.46 | 17.33 | -0.88 | 37.25 |
| Colombia | 3162 | 29.09 | 40.04 | 3.95 | 1.99 | 26.38 | 1.51 | 12.06 | 2.16 | 22.32 |
| Namibia | 3354 | 1.06 | 1.62 | 2.50 | 2.69 | 132.93 | -0.97 | | - - | 21.66 |
| Brazil | 3650 | 124.41 | 163.69 | 2.54 | 1.71 | 18.51 | -0.47 | 6.95 | 1.44 | 20.29 |
| Costa Rica | 3691 | 2.35 | 3.46 | 3.94 | 2.48 | 83.84 | 0.44 | 33.43 | 1.91 | 25.97 |
| Chile | 4277 | 11.32 | 14.62 | 6.57 | 1.63 | 43.04 | 1.76 | 17.73 | 2.87 | 14.61 |
| Uruguay | 4908 | 2.93 | 3.27 | 2.56 | 0.67 | 38.38 | 0.65 | 13.62 | 2.49 | 18.48 |
| Trinidad and Tobago | 4971 | 1.10 | 1.31 | -0.21 | 1.01 | 75.51 | 1.63 | 28.27 | 2.81 | 27.56 |
| Mexico | 5189 | 69.19 | 94.35 | 2.00 | 1.93 | 25.80 | 5.13 | 9.28 | 9.39 | 23.68 |
| South Africa | 5436 | 28.25 | 40.60 | 1.06 | 2.27 | 52.28 | -0.61 | 20.28 | 1.32 | 23.53 |
| Gabon | 5482 | 0.71 | 1.15 | 2.18 | 3.04 | 103.40 | -0.23 | 20.31 | -3.34 | 35.52 |
| Argentina | 5525 | 28.52 | 35.68 | 2.11 | 1.39 | 14.96 | 2.16 | 8.24 | 0.98 | 21.78 |

Source: 1. World Bank, Social Indicators of Development, CD-ROM 2000.
2. Statistical Office of Canada, World Trade Analyzer, CD-ROM 2000.

## Appendix Table 3: Indices of global inequality

| Year | $G$ | $S$ | $T$ | $G_w$ | $S_w$ | $T_w$ | $G_{w81}$ | $S_{w81}$ | $T_{w81}$ |
|---|---|---|---|---|---|---|---|---|---|
| 1981 | 0.5069 | 0.4616 | 0.1845 | 0.6273 | 0.5262 | 0.3157 | 0.6273 | 0.5262 | 0.3157 |
| 1982 | 0.5068 | 0.4602 | 0.1843 | 0.6207 | 0.5159 | 0.3094 | 0.6188 | 0.5157 | 0.3068 |
| 1983 | 0.5120 | 0.4632 | 0.1887 | 0.6177 | 0.5057 | 0.3075 | 0.6139 | 0.5051 | 0.3022 |
| 1984 | 0.5166 | 0.4703 | 0.1924 | 0.6155 | 0.4991 | 0.3064 | 0.6094 | 0.4977 | 0.2985 |
| 1985 | 0.5196 | 0.4703 | 0.1948 | 0.6116 | 0.4909 | 0.3026 | 0.6036 | 0.4887 | 0.2921 |
| 1986 | 0.5213 | 0.4731 | 0.1962 | 0.6092 | 0.4866 | 0.2998 | 0.5989 | 0.4833 | 0.2866 |
| 1987 | 0.5240 | 0.4764 | 0.1989 | 0.6060 | 0.4811 | 0.2963 | 0.5933 | 0.4766 | 0.2803 |
| 1988 | 0.5259 | 0.4775 | 0.2007 | 0.6020 | 0.4742 | 0.2930 | 0.5871 | 0.4683 | 0.2742 |
| 1989 | 0.5283 | 0.4792 | 0.2029 | 0.6011 | 0.4714 | 0.2931 | 0.5843 | 0.4647 | 0.2717 |
| 1990 | 0.5315 | 0.4847 | 0.2057 | 0.5994 | 0.4677 | 0.2923 | 0.5807 | 0.4600 | 0.2684 |
| 1991 | 0.5307 | 0.4885 | 0.2047 | 0.5949 | 0.4648 | 0.2861 | 0.5739 | 0.4552 | 0.2603 |
| 1992 | 0.5328 | 0.4958 | 0.2063 | 0.5884 | 0.4593 | 0.2785 | 0.5655 | 0.4470 | 0.2510 |
| 1993 | 0.5341 | 0.4996 | 0.2073 | 0.5807 | 0.4517 | 0.2697 | 0.5563 | 0.4379 | 0.2410 |
| 1994 | 0.5368 | 0.5080 | 0.2098 | 0.5743 | 0.4482 | 0.2629 | 0.5482 | 0.4320 | 0.2326 |
| 1995 | 0.5374 | 0.5082 | 0.2107 | 0.5668 | 0.4426 | 0.2559 | 0.5389 | 0.4238 | 0.2240 |
| 1996 | 0.5376 | 0.5087 | 0.2108 | 0.5615 | 0.4391 | 0.2507 | 0.5316 | 0.4176 | 0.2172 |
| 1997 | 0.5391 | 0.5140 | 0.2122 | 0.5583 | 0.4385 | 0.2475 | 0.5264 | 0.4141 | 0.2123 |

Note: Measure of inter-country inequality:

$$G \equiv \sum_{i=1}^{n}\sum_{j=1}^{n} \left|y_i - y_j\right| / (2n^2\bar{y}_1)$$

Gini coefficient, unweighted:

$$G_w \equiv \sum_{i=1}^{n}\sum_{j=1}^{n} (\left|y_i - y_j\right|) \bullet p_i p_j / (2P^2\bar{y}_2)$$

Gini coefficient, weighted:

Standard deviation of log incomes, unweighted:

$$S \equiv \sqrt{\frac{1}{n}\sum_{i=1}^{n} (\log y_i - m_1)^2}$$

Standard deviation of log incomes, weighted:

$$S_w \equiv \sqrt{\frac{1}{P}\sum_{i=1}^{n} (\log y_i - m_2)^2 p_i}$$

Theil index, unweighted:

$$T \equiv \sum_{i=1}^{n} Y_{i1} \log(Y_{i1} / N_i)$$

Theil index, weighted:

$$T_w \equiv \sum_{i=1}^{n} Y_{i2} \log(Y_{i2} / P_i)$$

where:

$n$ = 96
$N_i$ = 1/$n$
$y_i$ = country $i$'s per capita GDP (PPP$)
$p_i$ = country $i$'s population
$P$ = 3 $p_i$, total sample population
$Y_{i1}$ = $y_i$ / 3 $y_i$
$Y_{i2}$ = $p_iy_i$ / 3 $p_iy_i$
$y_1$ = 3 $y_i$ / $n$
$y_2$ = 3 $p_iy_i$ / $P$
$\mu_1$ = 3 log$y_i$ / $n$
$\mu_2$ = 3 log$y_ip_i$/ $P$
$P_i$ = $p_i$ / $P$
Log refers to natural logarithm.

**Appendix Table 4: Indices of global inequality, trend equations**

| | Intercept | Coefficient | Adjusted R square | F |
|---|---|---|---|---|
| $G$ | -0.6780 | 0.0039 | 0.9457 | 279.56 |
| | *(-282.161)*** | *(16.720)*** | | |
| $S$ | -0.7900 | 0.0072 | 0.9730 | 577.23 |
| | *(-256.117)*** | *(24.026)*** | | |
| $T$ | -1.6874 | 0.0089 | 0.9449 | 275.51 |
| | *(-306.727)*** | *(16.598)*** | | |
| $G_w$ | -0.4549 | -0.0070 | 0.9545 | 336.27 |
| | *(-116.579)*** | *(-18.338)*** | | |
| $T_w$ | -1.1201 | -0.0148 | 0.9262 | 201.93 |
| | *(-104.820)*** | *(-14.210)*** | | |
| $S_w$ | -0.6479 | -0.0111 | 0.9833 | 945.48 |
| | *(-175.810)*** | *(-30.749)*** | | |
| $G_{w81}$ | -0.4503 | -0.0107 | 0.9791 | 750.06 |
| | *(-112.822)*** | *(-27.387)*** | | |
| $S_{w81}$ | -0.6362 | -0.0146 | 0.9951 | 3277.11 |
| | *(-244.255)*** | *(-57.246)*** | | |
| $T_{w81}$ | -1.1086 | -0.0244 | 0.9713 | 541.87 |
| | *(-103.019)*** | *(-23.278)*** | | |

Estimated equations: ln(.) = a + b$t$, where $t$ = time

Figures in the parentheses are the t-statistics

*** = statistically significant at 0.1% level

**Appendix Table 5: List of 37 countries in the 'convergence club'**

**High income countries:**

1 Australia
2 Austria
3 Belgium
4 Canada
5 Denmark
6 Finland
7 France
8 Greece
9 Hong Kong, China
10 Ireland
11 Israel
12 Italy
13 Japan
14 Netherlands
15 New Zealand
16 Norway
17 Portugal
18 Singapore
19 Spain
20 Sweden
21 Switzerland
22 United Kingdom
23 United States

**Upper middle income countries**

24 Botswana
25 Chile
26 Korea, Rep.
27 Malaysia
28 Mauritius

**Lower middle income countries:**

29 China
30 Sri Lanka
31 Swaziland
32 Thailand
33 Turkey

**Low income countries:**

34 India
35 Indonesia
36 Lesotho
37 Pakistan

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