

Accounting for the Recent Decline in Global Income Inequality¹

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Following nearly two centuries of growth, global income inequality declined in the last decades of the 20th century. To determine the causes of that historic decline, we focus on income inequality across nations and find that the major equalizing force is faster-than-world-average income growth in China and South Asia, industrializing regions where 40% of the world's people live. Apparently what matters most about economic globalization thus far is its role in the spread of industrialization throughout populous poor regions of the world. If so, then globalization most likely has reduced global income inequality. This decline is anticipated to continue over the next few decades, first, because of the continued industrialization of poor regions and, second, because most of the growth in the world's working-age population will occur in poor regions.

One of the most distressing features of today's world is massive global income inequality—the highly unequal distribution of income across the world's citizens. In addition to the unequal distribution of income within nations, there are enormous differences in average income from nation to nation (Pritchett 1997). In fact, because of the magnitude of cross-nation income differences, eliminating income inequality within all nations would reduce global income inequality by no more than one-third (Goesling 2001; Milanovic 2002a, table 19; Schultz 1998). In the preindustrial world, by

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contrast, income inequality within nations accounted for the majority of global inequality (Bourguignon and Morrisson 2002). That changed over the course of the 19th and early 20th centuries as the West industrialized and Asia and Africa lagged behind. Because of the dramatic rise in between-nation income inequality from the early 1800s to 1950—about an eightfold increase as measured by the Theil index of inequality and a ninefold increase as measured by the mean logarithmic deviation (Bourguignon and Morrisson 2002, table 2)—global income inequality is much greater today than it was 200 years ago.

Mounting evidence indicates, however, that global income inequality is *lower* today than it was two decades ago (Bhalla 2002; Firebaugh 2003, chap. 11; Goesling 2001; Melchior and Telle 2001; Sala-i-Martin 2002; Schultz 1998). Sala-i-Martin (2002, tables 1 and 2), for example, finds that global income inequality declined from 1978 to 1998, regardless of the inequality index used. The decline was 4.9% as measured by the Gini coefficient, 4.2% as measured by the squared coefficient of variation (CV^2), 9.9% as measured by the Theil index, and 12.8% as measured by the mean logarithmic deviation (MLD). Other studies report similar rates of decline in global inequality over the last decades of the 20th century.

Our objective in this article is to determine why global income inequality has declined. We already know that the decline is not due to declining within-nation inequality, since income inequality most likely has been growing, not declining, in the average nation in recent decades (Bhalla 2002, pp. 38–40; Firebaugh 2003, chap. 9; Goesling 2001; Sala-i-Martin 2002). It follows that declining inequality across nations is the source of the global decline, since global income inequality (I_G) is the sum of between-nation income inequality (I_B) and within-nation income inequality (I_W):

$$I_G = I_B + I_W, \quad (1)$$

where between-nation and within-nation inequality are weighted by population size.²

To determine the reasons for the decline in global income inequality, then, we focus on the reasons for the decline in income inequality across nations. Our analysis begins where prior studies end, with the observation that income inequality across nations is declining (Boltho and Toniolo 1999, table 4; Firebaugh 2001, 2002, 2003; Goesling 2001; Melchior and Telle 2001; Melchior, Telle, and Wiig 2000; Sala-i-Martin 2002; Schultz

² Equation (1) is similar to analysis of variance, where total variance in some variable is divided into the sum of population-weighted between-group and within-group components. Here, total inequality (a type of relative variance) is divided into population-weighted between-group and within-group components, with nations as groups.

1998). We want to know why this decline is happening. To explore the causes, we use decomposition techniques, supplemented by other types of simulation, to address two strategic questions. First, is the decline due primarily to different rates of population growth or to different rates of per capita income growth across countries and regions? Second, which countries or regions are contributing the most to the decline?

Our study is the first to our knowledge to address these two questions over the last decades of the 20th century, a period when global income inequality declined after rising for well over a century. Because this was also a period of globalization, our analysis bears on the fierce debate over globalization's effect on global inequality (e.g., Castells 1998; Dollar and Kraay 2002; Guillén 2001; Held and McGrew 2002; Sala-i-Martin 2002; Wade 2001). Why did the trend in global income inequality reverse during a period of rising global economic integration? Our findings suggest that many accounts of globalization's overall impact on the world economy exaggerate the importance of new technological regimes. Globalization in the late 20th century affected global income inequality primarily because of its role in the spread of industrial technology in Asia (reducing global inequality), not because of its role in the spread of postindustrial technology in the West (increasing global inequality).

WORLD AND REGIONAL INCOME TRENDS, 1980–98

Table 1 disaggregates estimates of average world income in 1980 and 1998 into income estimates for eight world regions and two countries. Data are from the most recent available update of the Penn World Table, a standard source of international income data (Heston, Summers, and Aten 2001). Income is measured as gross domestic product (GDP) per capita, calibrated across countries with purchasing power parity (PPP) converters and expressed in constant 1996 U.S. dollars. Countries are weighted by population size in all regional and world income estimates.

The table identifies three defining features of the world economy at the end of the 20th century. The first feature is the huge disparity in average incomes observed across world regions noted earlier. In 1998, average income in the world's richest region (the Western offshoots—Australia, Canada, and the United States) was nearly 20 times greater than that in the world's poorest region (sub-Saharan Africa). By historical standards, such huge income disparities across world regions are a relatively recent occurrence. Only 100 years ago, average incomes in the world's richest regions were perhaps nine times greater than those in the world's poorest regions, and only 200 years ago, the difference probably was less than three to one (Maddison 2001, table 3-1b). Thus interregional income dis-

TABLE 1
 WORLD AND REGIONAL INCOME TRENDS, 1980–98 (in constant 1996 U.S. dollars)

REGION	INCOME PER CAPITA		ANNUAL GROWTH RATE (%)
	1980	1998	
Western Europe	14,932	20,877	1.86
Eastern Europe and Russia	7,645	7,215	–.32
Western offshoots	20,621	29,996	2.08
Latin America and the Caribbean	6,547	6,973	.35
Middle East and North Africa	4,440	5,500	1.19
Sub-Saharan Africa	1,910	1,699	–.65
South Asia	1,233	2,346	3.57
East Asia (excluding China and Japan)	3,132	6,232	3.82
Japan	15,366	23,345	2.32
China	1,090	3,203	5.99
World	5,096	6,905	1.69

SOURCE.—Heston et al. (2001).

NOTE.—**Western Europe** (16 countries): Austria, Belgium, Switzerland, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Iceland, Italy, Luxembourg, Netherlands, Norway, Sweden. **Eastern Europe and Russia** (4 countries): Hungary, Poland, Romania, Russia. **Western offshoots** (3 countries): Australia, Canada, United States. **Latin America and the Caribbean** (28 countries): Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Grenada, Guatemala, Guyana, Honduras, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Trinidad and Tobago, Uruguay, St. Vincent and Grenadines, Venezuela. **Middle East/North Africa** (9 countries): Algeria, Egypt, Iran, Israel, Jordan, Morocco, Syria, Tunisia, Turkey. **Sub-Saharan Africa** (37 countries): Burundi, Benin, Burkina Faso, Botswana, Central African Republic, Cote d'Ivoire, Cameroon, Republic of Congo, Comoros, Cape Verde, Ethiopia, Gabon, Ghana, Guinea, The Gambia, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Chad, Togo, Tanzania, Uganda, South Africa, Zambia, Zimbabwe. **South Asia** (5 countries): Bangladesh, India, Sri Lanka, Nepal, Pakistan. **East Asia** (9 countries): Hong Kong, Indonesia, Korea, Malaysia, Philippines, Papua New Guinea, Singapore, Thailand, Taiwan. **China, Japan**.

parities were relatively small up through the early 19th century and have surged only in the past two centuries. This trend of rising interregional income disparities was the main force behind the dramatic rise in global inequality observed over the 19th and early 20th centuries (Bourguignon and Morrisson 2002; Firebaugh 2003).

A second defining feature of the world economy at the end of the 20th century is overall growth in average world income. From 1980 to 1998, average world income grew by nearly 1.7% a year, raising average world income from about \$5,000 to nearly \$7,000, in constant U.S. dollars. Such growth is actually a slowdown from the so-called golden age of world income growth that directly followed World War II (Maddison 2001, table 3-1a). Still, by historical standards, the recent growth rate is also exceptionally high and, if it persists, will double average world income in less than 50 years. It is this rate of overall income growth that led economist

Richard Easterlin (1996) to name “growth triumphant” as the salient economic trend of our time.

This record of overall growth in average world income, however, conceals the fact that not all world regions shared equally in the gains. Indeed, as is clear in table 1, regional growth rates varied widely in the 1980s and 1990s. This regional variation in growth is a third defining feature of the world economy at the end of the 20th century. The regions listed in table 1 can be roughly divided into three groups based on recent income trends. In one group are rich regions that grew even richer—in both relative and absolute terms—from 1980 to 1998. This group includes Western Europe, the Western offshoots, and Japan. In a second group are South Asia, East Asia, and China, three regions where per capita income was still lower than the world average in 1998, but where incomes had also grown rapidly over the past 20 years. Faster-than-world-average income growth in South Asia, East Asia, and especially in China caused average incomes in these regions to converge toward the world average. Finally, a third group consists of regions where average incomes grew more slowly than did the world average. This group includes Latin America, the Middle East and North Africa, Eastern Europe and Russia, and sub-Saharan Africa. Average incomes in Eastern Europe/Russia and sub-Saharan Africa were in fact *lower* in 1998 than in 1980. These trends contrast starkly with the comparatively rapid income growth found in some other world regions.

In sum, then, the world economy at the end of the 20th century was defined by huge income disparities across world regions, by overall growth in average world income, and by the highly uneven distribution of growth across regions. None of this information is new, and little is disputed. What is still not clearly understood, however, is how these trends translate into a decline in between-nation and, hence, global income inequality. Faster-than-world-average income growth in Western Europe and the Western offshoots heightened inequality by further enriching those countries already at the top of the world distribution of income. Likewise, at the other end of the income distribution, inequality was exacerbated by the Africanization of world poverty, as incomes fell in many nations in sub-Saharan Africa. Yet faster-than-world-average income growth in China, East Asia, and South Asia reduced inequality by moving average incomes in these three relatively poor regions closer to the world average. This article goes beyond earlier analyses in economics and sociology (Bhalla 2002; Firebaugh 2003; Sala-i-Martin 2002) by showing how the broad world and regional income trends documented above affected the level of inequality in the distribution of income across countries and regions and among the world’s population.

GLOBAL INCOME INEQUALITY

Income inequality exists when income is distributed disproportionately across units. A unit's disproportionality is reflected in the unit's income ratio (r)—the ratio of the unit's income to the mean income for all units. Equality occurs when $r = 1$ for all units; otherwise, there is inequality, as the quantity of interest (e.g., income) is disproportionately high ($r > 1$) in some units and disproportionately low ($r < 1$) in other units. Standard inequality indexes such as the Gini coefficient can be thought of as measures of the average distance of the income ratios from the point of equality $r = 1$ (see Firebaugh 1999). Different indices give different results because they use different disproportionality functions—the function used to measure distance of the income ratio from 1.0 (Firebaugh 1999; Reardon and Firebaugh 2002).

Multiplying everyone's income by a nonzero constant does not affect the income ratio and thus (in a fixed population) does not affect the measure of income inequality. This property of inequality measures is known as *scale invariance* (Allison 1978). It is an important property for an inequality measure because, without it, estimates of inequality would be sensitive to the currency used (e.g., the inequality estimate would be different if you used cents instead of dollars, or pesos instead of dollars) so a researcher could make the inequality figure arbitrarily large or small by switching currencies. Aside from the currency issue, scale-invariant measures are imperative in analyses of global income inequality because of the rapid growth in average world income. When incomes double for all, income differences double (e.g., when \$1,000 doubles to \$2,000 and \$1,200 doubles to \$2,400, the difference doubles to \$400) but income inequality as normally understood is unchanged. Because average world income has doubled over the past four decades, income differences have tended to grow between nations. Some writers have pointed to the growing income gaps as evidence of growing income inequality, when in fact the growing gaps are due to growing income, not to growing income inequality, since inequality is not growing across nations. This does not mean that absolute income levels and income gaps are unimportant. For example, a doubling of incomes in African nations would likely improve the lives of the region's population, even if incomes doubled in all other nations as well. But income inequality as normally understood would remain unchanged if everyone's income doubled.

Global income inequality refers to the disproportionate distribution of income over all of the world's people. If we had income data for every individual or household in the world, then with a powerful computer we could calculate an index of inequality directly from those income figures. Because individual-level data are not available, we must consider alter-

native methods for estimating global inequality, such as the use of existing income data for nations. Consider this thought experiment. Suppose we eliminated global income inequality without changing the total level of world income. In principle, we could accomplish this by taking from richer individuals and giving to poorer individuals successively until all individuals had the same income—the world mean income. Alternatively, we could redistribute world income in two steps, organized around nations. In the first step, we redistribute incomes within each nation until everyone in a given nation has the income mean for that nation. Because we have eliminated income inequality within nations, the part of the global inequality that remains is between-nation income inequality (inequality due to differences in income means across nations). Conceptually, then, global inequality is the sum of within-nation and between-nation inequality, and we could eliminate global inequality in two steps, by first eliminating inequality within nations and then by eliminating inequality across nations by moving all national income means to the overall world mean.

Continuing our thought experiment, suppose we eliminated income inequality in Comoros, a nation of roughly 700,000 people, and in China, a nation of about 1.2 billion people. Clearly the equalization of incomes in China would have a much greater effect on global income inequality than would the equalization of incomes in Comoros. Likewise, moving the average income in China up to the world average would have a much greater effect on global income inequality than would moving the average income in Comoros up to the world average. The point is that the terms I_B and I_W in equation (1) refer to population-weighted between-nation and within-nation inequality. Changes in larger nations tend to affect the global inequality trend more than do changes in smaller nations. Although we may appear to be stating the obvious, in practice the obvious is often ignored in claims about global inequality. For example, under the heading “Inequality has worsened both globally and within countries,” the United Nations *Human Development Report 1999* (pp. 38–39) infers rising *global* income inequality from the fact that the income growth rate in most poor countries has lagged behind the rate of growth in rich countries. This inference glosses over the fact that *more people* live in poor nations with faster-than-world-average income growth than in poor nations with slower-than-world-average income growth. It is the weighted—not the unweighted— I_B and I_W that bear on global income inequality.

THE TREND IN BETWEEN-NATION INCOME INEQUALITY, 1980–98

To determine the causes of the decline in global income inequality observed by Firebaugh (2002, 2003), Sala-i-Martin (2002), and others, we

begin by examining the between-nation inequality trend, since that is the source of the global decline. We measure inequality with four standard indexes: the Gini, squared coefficient of variation (CV^2), Theil, and mean logarithmic deviation (MLD). Each gives somewhat different information about the trend. All four indexes are calibrated to zero when the income ratios are all 1.0 (i.e., when every country has the same per capita income), and index values increase as countries' disproportionality—distance of their income ratios from 1.0—increases. But the indexes vary in their sensitivity to changes in different parts of the income distribution. Compared with the other indexes, the Gini coefficient is relatively sensitive to change in the middle of the distribution, the Theil index and the CV^2 are relatively sensitive to change among rich nations, and the MLD is relatively sensitive to change among large nations at the bottom of the distribution.³ Because of this, each index will yield a somewhat different estimate of the change in between-nation income inequality, depending on how the world distribution of income has changed. We feature the MLD because it is easiest to decompose (Mookherjee and Shorrocks 1982) and because it gives more weight (than the other indexes do) to income change among the poor. The CV^2 fails to conform to the welfare principle that an additional \$1 to the poor produces a greater welfare benefit than does an additional \$1 to the rich, so it is the least attractive of the four indexes. We nonetheless calculate results for the CV^2 and the other indexes to gain important clues about the source of the decline by comparing the four indexes (below) and to confirm that our essential conclusions hold regardless of the inequality measure used.

Figure 1 depicts the trend in between-nation income inequality from 1980 to 1998 as measured by the MLD. Inequality for each year is calculated from income and population data for a constant panel of 113 countries (see table 1 for a list), which together account for almost 90% of the world's total population. Data are from the Penn World Table (Heston et al. 2001). Income is measured as gross domestic product (GDP) per capita, calibrated across countries with purchasing power parity (PPP)

³ Technically, the Gini coefficient is most sensitive to the mode of the distribution (Allison 1978, p. 868). However, for most income distributions—including the distribution of income across countries—the mode is closer to the middle of the distribution than to either extreme tail, making it appropriate to associate the Gini with the middle-income range. Good introductions to the large technical literature on measuring inequality include Allison (1978), Cowell (1995), Jenkins (1991), and Schwartz and Winship (1979); also see the appendix below.

Global Income Inequality

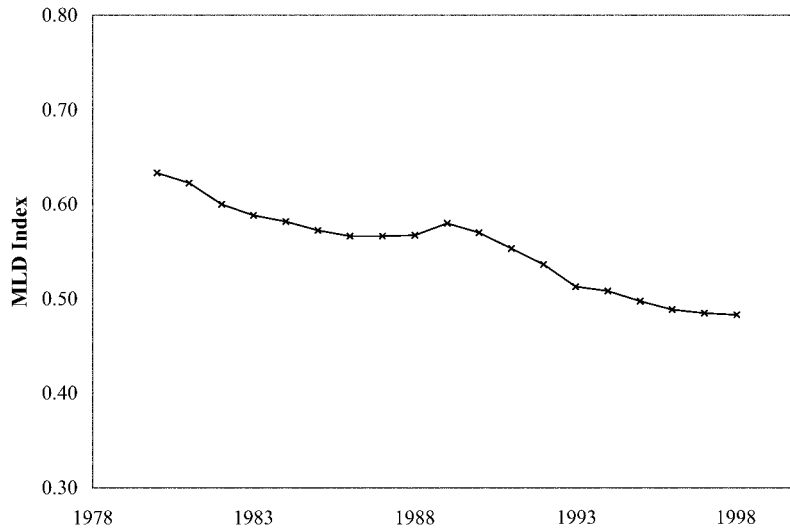


FIG. 1.—Trend in between-nation income inequality, 1980–98. MLD is a measure of inequality (see text). Trend is based on income data from 113 countries encompassing most of the world's population (data from Heston et al. 2001; see table 1 for list of countries). Income is measured as gross domestic product (GDP) per capita, calibrated across countries with purchasing power parity (PPP) converters and expressed in constant 1996 U.S. dollars.

converters and expressed in constant 1996 U.S. dollars.⁴ The figure shows that between-nation income inequality, as measured by the MLD, declined throughout most of the 1980s, increased slightly in the late 1980s, then declined steadily thereafter. Note that inequality was lower in 1998 than it was in 1980. Hence, we find that inequality has been declining across nations, in line with the findings of other recent studies including Milanovic (2002*b*, fig. 12).⁵

⁴ There is some debate among researchers about how currencies should be calibrated across countries in the study of between-nation income inequality (see Korzeniewicz and Moran 2000; Firebaugh 2000). There are two choices—purchasing power parity (PPP) converters (used here) or foreign exchange (FX) rates. The main difference is that PPP converters account for cost-of-living differences not reflected in foreign exchange rates. Each method is useful for different purposes. PPP converters are preferable when the goal is to measure living standards across countries, while FX rates are preferable when the goal is to measure command over goods and services traded in the global marketplace. We use PPP converters because we want to be able to draw conclusions about inequality in the distribution of individual living standards and well-being.

⁵ Milanovic's (2002*b*) finding of declining between-nation income inequality is noteworthy in light of his widely reported finding (Milanovic 2002*a*) of growing *global* income inequality for the five-year period of 1988–93. The discrepancy between Milanovic's finding (growing global inequality) and the finding of other researchers (de-

Table 2 presents comparable estimates for all four inequality measures. By using multiple inequality indexes, the estimates give an important first clue about the causes of the inequality decline. Although all indexes register a decline, the decline is steepest for the MLD. That the MLD reports the steepest decline (nearly 24%) suggests that the greatest inequality-reducing effects occurred near the bottom of the distribution since, as noted earlier, the MLD is most sensitive to change among the large poor nations. Presumably, then, faster-than-world-average income growth in China—and perhaps India as well—has had a substantial effect on the trend in inequality across nations. To test this and other explanations for the decline, we must decompose the trend.

DECOMPOSING THE DECLINE IN BETWEEN-NATION INCOME INEQUALITY

The results in figure 1 and table 2 show that the level of income inequality across countries declined at the end of the 20th century. It is important to know why the decline occurred. Obviously inequality would decline across nations if the income ratios of richer countries tended to move down toward 1.0 while the income ratios of poorer countries tended to move up toward 1.0, where income ratio (r_j) is defined as per capita income in country j divided by average world income. However, change in (population-weighted) between-nation income inequality is a function of change in nations' population shares as well as change in nations' income ratios (explained below). So the first thing we want to know is whether the decline in inequality was due primarily to different rates of income growth or to different rates of population growth across nations. (Income growth rate refers to rate of growth of income per capita.) Second, we want to know which countries or regions contributed the most to the trend.

Income Growth versus Population Growth

For decomposable indexes such as the MLD, change in inequality between any two time points, t and $t + 1$, can be divided into two additive components, one reflecting the effect of different rates of income growth (called an *income effect*) and the other component reflecting change in between-nation income inequality due to changing population shares, or *allocation*

clining global inequality) is likely due to the type of income measure he used (Sala-i-Martin 2002) and to the time period he used. Using national account data to measure income (GDP) and longer time intervals, we conclude that global inequality was on a downward trajectory over the last decades of the 20th century.

Global Income Inequality

TABLE 2
TREND IN BETWEEN-NATION INCOME INEQUALITY, 1980–98

YEAR	INDEX			
	Gini	Theil	MLD	CV ²
1980 .....	.512	.582	.634	1.439
1981 .....	.511	.578	.622	1.439
1982 .....	.504	.563	.600	1.401
1983 .....	.503	.560	.588	1.413
1984 .....	.504	.561	.582	1.438
1985 .....	.503	.557	.573	1.440
1986 .....	.501	.555	.566	1.440
1987 .....	.502	.557	.566	1.454
1988 .....	.503	.562	.567	1.476
1989 .....	.507	.574	.580	1.516
1990 .....	.504	.569	.570	1.514
1991 .....	.500	.555	.553	1.476
1992 .....	.496	.541	.536	1.450
1993 .....	.488	.520	.513	1.391
1994 .....	.487	.517	.508	1.394
1995 .....	.482	.509	.497	1.375
1996 .....	.479	.501	.488	1.359
1997 .....	.478	.500	.485	1.359
1998 .....	.478	.503	.483	1.387
% change, 1980–98	-6.6	-13.6	-23.8	-3.6

NOTE.— See text for description of inequality measures. Trends are based on income data from 113 countries encompassing most of the world's population (data from Heston et al. 2001; see table 1 for list of countries). Income is measured as gross domestic product (GDP) per capita, calibrated across countries with purchasing power parity (PPP) converters, and expressed in constant 1996 U.S. dollars.

effect (Litchfield 1999). The decomposition formula for the MLD is (Mookherjee and Shorrocks 1982)

$$\Delta \text{MLD} \cong \sum_j (\bar{r}_j - \overline{\ln r_j}) \Delta p_j + \sum_j (\bar{p}_j r_j - \bar{p}_j) \Delta \ln(X_j), \quad (2)$$

where r_j is country j 's income ratio, p_j (population share) is country j 's share of the total world population, X_j is per capita income for the j th country, Δ is the difference operator (e.g., $\Delta \text{MLD} = \text{MLD}(t+1) - \text{MLD}(t)$), and the overbar indicates an average of the variable across the two time points (e.g., $\bar{r}_j = [r_j(t+1) + r_j(t)]/2$). Although we use equation (2) to decompose the between-nation trend, it is important to bear in mind that the results apply to the trend in *global* income inequality, since they

are in fact components of the change in global inequality (and we will interpret them accordingly).⁶

The first term on the right-hand side of the equation is the allocation effect, and the second term on the right-hand side of the equation is the income effect. The allocation effect refers to the effect of the changing relative size of units, *independent of* the effect of differences in income growth rates. To understand how between-nation income inequality can change due to population growth independent of income growth, suppose per capita income grows at the same rate for all nations but population grows fastest in the richest and poorest nations. Then the tails of the income distribution “fatten” and inequality increases. By the same logic, inequality declines if populations grow fastest for countries in the middle of the income distribution. The allocation effect refers to change in income inequality due specifically to the changing shape of the income distribution as some units grow faster in population than other units do.

Using equation (2), we find that the income effect accounts for about 94% of the decline in the MLD, and the allocation effect accounts for only about 6% of the decline.⁷ The small size of the allocation effect is not surprising. In recent decades, population has grown faster in poor nations than in rich nations—for the 113 nations in this analysis, $r = -.64$ for 1980 per capita income and 1980–98 population growth rate. As a result, population growth rate in the middle of the income distribution has not differed greatly from the *average* growth rate in the two tails.

⁶ The decomposition of the MLD given in Mookherjee and Shorrocks (1982) and Jenkins (1995) has four additive terms—two for between-group inequality and two for within-group inequality. To simplify the presentation, we do not include the two components of the decomposition that pertain to the within-nation inequality trend. (Because the within-nation trend is upward, it cannot account for the downward trend in global inequality.) As Mookherjee and Shorrocks (1982) note, the decomposition is an approximate one.

⁷ An alternative decomposition uses change in the income ratios, Δr_j —as opposed to differential income growth, as in eq. (2)—to estimate the income effect. But Δr_j is a function of Δp_j as well as of income growth itself, since $r_j = X_j / \sum_j p_j X_j$, where X_j is per capita income for the j th country and $\sum_j p_j X_j$ is average world income. In other words, change in population shares can move the world average income, and that movement in turn changes income ratios, so an observed change in income ratios could reflect in part the effect of changing population shares. Eq. 2 avoids the problem by using income growth, $\Delta \ln(X_j)$, in place of Δr_j in estimating income effects. The earlier decomposition results of Firebaugh (1999, app. B) rely on Δr_j , which might have attenuated the estimate of the income effect. If so, the conclusion that “different rates of population growth in rich and poor nations played the predominant role in determining change in the distribution of per capita income across nations [for 1960–89]” (Firebaugh 1999, p. 1597) is an overstatement. For the 1980–98 period examined here, income growth played by far the larger *direct* role. The effect of population growth on global inequality is largely *indirect*, through its effect on age structure, as we see later.

Independent of income growth, then, population growth had little effect on global inequality in the late 20th century. The effect of population growth *through* its age-structure effect on income growth was probably greater (shown subsequently) but, by definition, that effect is not part of the allocation effect.

Income and Allocation Effects, by Region

The decomposition above divided the observed change in between-nation income inequality into an income effect and an allocation effect and showed that the income effect is much larger. But it did not—and cannot—further partition the income and allocation effects into effects for individual regions or nations (Goesling 2003, pp. 63–64). One way to do so is with a simulation exercise where the rate of income growth or population growth for a region is set equal to the world average (Bourguignon and Morrisson 2002, p. 735; see also the earlier results of Berry, Bourguignon, and Morrisson [1983]). The trend in between-nation income inequality is then recomputed under the counterfactual condition, and the difference between the actual change in between-nation inequality and the predicted change under the counterfactual condition is taken as an estimate of the income or allocation effect for the specific nation or region.

Tables 3 and 4 report results for each region in turn. Table 3 reports income effects, and table 4 reports allocation effects. The tables report the predicted percentage change in inequality under telling counterfactual conditions. The top row of table 3, for example, shows the predicted change in between-nation inequality if income growth in Western Europe had been 1.7% a year (the world average) instead of 1.9% a year (Western Europe's observed growth rate). Similarly, each row of table 4 shows the predicted change in between-nation inequality if population growth for the corresponding region had been equal to the world average.

By examining the difference between these figures and the observed percentage declines (reported in the bottom row of each table), we can determine which regions contributed the most to the trend in between-nation income inequality from 1980 to 1998. Larger differences indicate greater effects. Thus, China's income effect is very large because the predicted change in inequality (+1.8% as measured by the Gini) differs greatly from the observed change (−6.6% as measured by the Gini). Indeed, these results show that the change in income inequality across nations would have been different from 1980 to 1998—rising slightly according to the Gini and the Theil, rising more rapidly according to CV^2 , and declining slightly according to the MLD—if income growth in China had been 1.7% a year (the world average) instead of 6% a year (China's estimated growth rate). So income growth in China was critical to the

TABLE 3
 INCOME EFFECTS, BY REGION: PREDICTED % CHANGE IN BETWEEN-NATION INCOME
 INEQUALITY, 1980–98

REGION	INDEX			
	Gini	Theil	MLD	CV ²
Western Europe	-6.7	-13.9	-24.3	-3.6
Eastern Europe and Russia	-6.4	-14.4	-23.2	-6.4
Western offshoots	-8.2	-16.8	-26.1	-9.0
Latin America and the				
Caribbean	-6.6	-15.0	-23.3	-7.4
Middle East and North Africa	-6.8	-14.1	-24.0	-4.6
Sub-Saharan Africa	-8.6	-16.4	-28.5	-6.5
South Asia	-2.0	-6.4	-14.7	+3.6
East Asia (excluding China and				
Japan)	-6.1	-12.2	-23.6	-.3
Japan	-7.1	-14.6	-24.8	-4.7
China	+1.8	+3.6	-4.4	+14.8
Observed change	-6.6	-13.6	-23.8	-3.6

NOTE.—See table 2. *N* = 113 countries. Inequality change is recalculated with regional income growth rates set at the world average, for each region in turn.

trend in income inequality over this period. These results nonetheless do not support the view of “exploding income inequality” outside China. Even with China removed, the rate of growth in (weighted) average income was not greatly different in poorer and richer countries over this time period. One can also interpret this finding as demonstrating the robustness of our results to measurement error in China’s income data. To eliminate the downward trend in inequality, we must assume—contrary to all evidence—that per capita income grew no faster in China than in the rest of the world. If we assume, more reasonably, that the income estimates in the Penn World Table exaggerate China’s recent rate of income growth by one-third, or even by one-half, China’s income growth rate would still be more than twice as fast as the world average, and we would still find a trend of declining inequality across nations. This observation is important because some researchers question the accuracy of China’s income data, arguing that they exaggerate the recent pace of economic growth in that nation.⁸

⁸ Nor does the use of foreign exchange (FX) rate data support the claim of rapidly growing global income inequality that one often sees in the popular press (e.g., Wade 2001). Wade (2001) claims that, by using income estimates *not* adjusted for purchasing power parity (PPP), we discover that global income inequality is worsening rapidly. We find no evidence for that claim since in our analysis the trend in between-nation income inequality is ambiguous from 1980 to 1998—declining for MLD, rising for CV², relatively stable for Gini and Theil—when FX data are used in place of PPP data to measure average national income (Goesling 2003).

Global Income Inequality

TABLE 4
ALLOCATION EFFECTS, BY REGION: PREDICTED % CHANGE IN BETWEEN-NATION
INCOME INEQUALITY, 1980–98

REGION	INDEX			
	Gini	Theil	MLD	CV ²
Western Europe	-6.3	-14.1	-22.9	-6.4
Eastern Europe and Russia	-6.9	-14.6	-24.6	-4.8
Western offshoots	-5.7	-12.7	-22.5	-3.4
Latin America and the				
Caribbean	-6.6	-13.3	-23.5	-3.4
Middle East and North Africa	-6.5	-13.2	-23.4	-3.4
Sub-Saharan Africa	-7.9	-15.0	-25.4	-5.6
South Asia	-6.6	-14.1	-23.8	-4.9
East Asia (excluding China and				
Japan)	-6.6	-13.6	-23.7	-3.9
Japan	-6.3	-13.6	-23.2	-4.5
China	-7.3	-13.7	-24.4	-3.3
Observed change	-6.6	-13.6	-23.8	-3.6

NOTE.—See table 2. $N = 113$ countries. Inequality change is recalculated with regional population growth rates set at the world average, for each region in turn.

Two findings stand out from tables 3 and 4. First, by comparing the two tables, we see that the income effects generally overshadow the allocation effects for specific regions, consistent with our earlier findings about the overall dominance of the income effect. Second, the income effects for China and South Asia are by far the two largest effects in the tables. The income effect for South Asia is smaller than the income effect for China, but it is nonetheless quite large, and it pushes in the same direction (to reduce inequality) as does the income effect for China. Hence, if we want to know what is driving the reduction in between-nation and global inequality, we should look at the forces boosting income growth in China and South Asia.

Table 5 helps to put the results in perspective by identifying the three factors that served to depress inequality the most and the three factors that served to boost inequality the most. The income and allocation effects for specific nations are taken directly from tables 3 and 4 but are here expressed in index units instead of percentages. China's income effect alone, for example, reduced the Gini coefficient by 0.043 units, the Theil index by 0.100 units, the MLD by 0.123 units, and the CV² by 0.266 units.

The three major *equalizing* factors over the last two decades of the 20th century were (1) faster-than-world-average income growth in China, (2) faster-than-world-average income growth in South Asia, and (3) slower-than-world-average population growth in the Western offshoots. Faster-than-world-average income growth in China and South Asia depressed

TABLE 5
LEADING CONTRIBUTORS TO CHANGE IN BETWEEN-NATION INCOME
INEQUALITY, 1980–98

	Δr_j	Δp_j	Gini	Theil	MLD	CV ²
Reduced inequality the most:						
China, faster-than-world-average income growth	+ .25	. . .	-.043	-.100	-.123	-.266
South Asia, faster-than-world-average income growth	+ .10	. . .	-.024	-.042	-.058	-.104
Western offshoots, slower-than-world-average population growth .....	. . .	-.006	-.005	-.005	-.008	-.004
Increased inequality the most:						
Sub-Saharan Africa, slower-than-world-average income growth	-.13	. . .	+.010	+.016	+.029	+.041
Western offshoots, faster-than-world-average income growth	+ .30	. . .	+.008	+.019	+.015	+.077
Sub-Saharan Africa, faster-than-world-average population growth .....	. . .	+.018	+.006	+.008	+.010	+.028

SOURCE.—Tables 3 and 4.

inequality by moving average incomes in these regions from close to the bottom of the global income distribution to somewhere closer to the middle—from income ratios below 0.25 for both regions in 1980 to ratios of about 0.34 for South Asia and nearly 0.50 for China in 1998 (table 1). Because these regions are home to about 40% of the world’s people, upward movement toward the world income mean was pivotal for the trend in between-nation and hence global income inequality. The slower-than-world-average population growth in the Western offshoots also contributed to the reduction in inequality by shrinking the upper tail of the global income distribution. Average incomes in the Western offshoots are roughly four times the world average, so a decline in this region’s population share operates to depress the level of inequality across nations.

The three major *disequalizing* factors over this period were (1) slower-than-world-average income growth (actually negative growth rates) in sub-Saharan Africa, (2) faster-than-world-average income growth in the Western offshoots, and (3) faster-than-world-average population growth in sub-Saharan Africa. If not for these trends, between-nation inequality would have declined by an even greater amount than was actually observed. The Gini and the MLD identify declining income in sub-Saharan Africa as exerting the greatest upward pressure on inequality, with faster-than-world-average income growth in the Western offshoots ranked sec-

ond. The Theil index and the CV^2 (which are more sensitive to income change at the upper end of the income distribution) rank income growth in the Western offshoots first and declining income in sub-Saharan Africa second. All four indexes identify the allocation effect for sub-Saharan Africa as the third-leading contributor, as faster-than-world-average population growth in sub-Saharan Africa boosted inequality by fattening the lower tail of the global income distribution. At the same time, falling income in sub-Saharan Africa boosted inequality by pulling average incomes in the world's poorest region even further below the world average. At the other end of the income distribution, income growth in the Western offshoots was somewhat faster than the world average over this period. Thus both ends of the cross-country income distribution were stretched over the last part of the 20th century, as most nations in Africa fell further behind while the West moved further ahead.

Together these results give a richer account of change in between-nation inequality at the end of the 20th century. There are two main stories. One story is the stretching of both tails of the global income distribution due to faster-than-world-average income growth in the West and falling incomes in Africa. This stretching of the tails led to widely publicized United Nations and World Bank reports of rising global and between-nation income inequality (United Nations Development Program 1999, p. 36; World Bank 2000*b*, p. 51). Yet global and between-nation inequality in fact fell, because of the other main story—the story of rapid income growth in China and South Asia. In the end, between-nation income inequality declined in the final decades of the 20th century because the inequality-reducing effects of income growth in China and South Asia more than offset the inequality-boosting effects of continued income growth in the West and declining incomes in sub-Saharan Africa. Population *size* played a substantial role in this decline, since the effect of rapid income growth in China and South Asia trumped the tail-stretching effect of income growth patterns in the West and in Africa only because China and South Asia are so populous. Population *growth* played only a limited *direct* role in the recent inequality trend, although it most likely played a more prominent *indirect* role by affecting the age structure of nations, as we now see.

POPULATION GROWTH, WORKER RATIOS, AND INEQUALITY

National population growth can affect the trend in global income inequality in three main ways:

1. By increasing the relative size of countries with high or low levels of inequality. For example, if countries characterized by high levels

of inequality, such as Brazil, grew faster than other countries did, that would boost global income inequality.

2. By an allocation effect. In this case, the shape of the income distribution changes as nations in the middle of the income distribution experience faster population growth than do nations in the tails (or vice versa).
3. By an age structure effect where population growth affects per capita income by changing the ratio of workers to nonworkers, or what we will call the *worker ratio* (the inverse of a dependency ratio). Unlike the allocation effect—which is independent of the effect of income growth—the worker ratio effect is a type of population effect that is enmeshed in the income effect. The worker ratio effect cannot be separated from the income effect by standard decomposition methods.

It is possible—though unlikely—that the first type of population growth effect described above accounts for a good part of the recent *increase* in *within-nation* income inequality found in other studies (e.g., Firebaugh 2003; Goesling 2001; Sala-i-Martin 2002). That question is outside the scope of this study, however, since our goal here is to uncover the factors that led to *declining* global income inequality. As for the second type of population growth effect listed above, we have already found that allocation effects account for very little of the decline in between-nation and global income inequality in recent decades, so there is no need to pursue the subject further. It is useful, however, to explore the possibility that population growth could affect inequality indirectly, through its effect on the worker ratio.

Population Growth and Changing Worker Ratios

The age structure of a population moves through three stages during the demographic transition: there is a bulge of children, then there is a bulge of working-age adults, and finally there is a bulge of elderly. Rapid population growth accompanies the first bulge, while slowing growth due to declining fertility leads to the second and third bulges.

For the world as a whole, the working-age population grew faster than the total population from 1980 to 1998, so income per capita rose faster than income per worker over this period (annual rates [weighted] of 1.69% and 1.51%, respectively, for the 113 nations in our analysis). This was a period, then, of an increasing bulge in the middle of the age distribution for the world. With regard to the trend in global inequality, the issue is whether the bulge—the increase in the worker ratio—tended to grow more rapidly in richer nations or in poorer nations. Because national income

is produced by workers, increases in the worker ratio will tend to boost average income in a nation, and declines in the worker ratio will tend to reduce average income in a nation. It follows that a change in the worker ratios affects income inequality across nations when that change is related to national income level. Between-nation income inequality is boosted when a change in worker ratios is positively related to income level (i.e., worker ratios tend to rise faster, or decline more slowly, in richer nations) and between-nation inequality is reduced when a change in worker ratios is inversely related to income level.⁹

Age structures have changed significantly in the recent past and, as a result, worker ratios have changed in different directions and at different rates from country to country. In general, though, with a few notable exceptions such as China, poorer countries tended to lag well behind richer ones in the demographic transition, so poorer nations have also been lagging behind in growth of the working-age “bulge.” If our reasoning is correct, then changes in nations’ worker ratios from 1980 to 1998 boosted between-nation and global income inequality. In other words, had worker ratios remained constant within nations, income inequality would have declined even faster. Because the worker ratio effect is part of the income effect, our earlier methods do not capture the effect of changing worker ratios, so we must devise a new method. The next section describes our method and results.

Effect of Changing Worker Ratios on Between-Nation Inequality

Would the downward trend in between-nation income inequality have been even steeper—as we hypothesize—if worker ratios had remained constant within nations? To find out, we reestimated the trend under the assumption that worker ratios had remained constant within nations from 1980 to 1998.

Method.—Let Y denote income, P denote population, and prime denote growth rate. Then Y' is rate of growth of income, P' is population growth rate, and $(Y/P)'$ is rate of growth of per capita income. Annual growth rate (continuous) from year 0 to year t is defined as $[\log(X_t/X_0)]/t$ where

⁹ Our argument that changing worker ratios across nations has affected global inequality is based on the very credible assumption that output per capita increases with increases in the worker ratio, and declines with declines in the worker ratio (see Crenshaw, Ameen, and Christenson [1997] for supporting evidence). We are not assuming anything about how steep the slope is (the slope might be attenuated, e.g., if workers with more dependents to support tend to work harder than do workers with fewer dependents to support).

log is the natural logarithm function. Hence, rate of growth of per capita income from year 0 to year t is

$$\begin{aligned} (Y/P)' &= (1/t)\log[(Y_t/P_t)/(Y_0/P_0)] \\ &= (1/t)\log[(Y_t/Y_0)/(P_t/P_0)] \\ &= (1/t)[\log(Y_t/Y_0) - \log(P_t/P_0)] \\ &= Y' - P'. \end{aligned} \tag{3}$$

Note that $(Y/P)'$ can also be expressed as $Y' - P' + (W' - W')$, where W' is rate of growth of the working population. Hence,

$$\begin{aligned} (Y/P)' &= Y' - P' + W' - W' \\ &= (Y/W)' + (W' - P'), \end{aligned} \tag{4}$$

where Y/W is the income produced per worker, or worker productivity.

Equation (4) verifies the intuition that, if the working population had grown at the same rate as the total population in every nation, then the growth rate of per capita income would have been equal to the growth rate of worker productivity in every nation.¹⁰ This equivalence provides a method for testing our hypothesis that the downward trend in between-nation income inequality would have been even steeper if worker ratios had remained constant within nations. The worker ratio remains constant when and only when the total population grows at the same rate as the working population. It follows that, if we find a difference in the between-nation inequality trend using income per person and the trend using worker productivity, that difference reflects the effect of changing worker ratios. If the worker ratios had remained constant, per capita income would have grown at the same rate as worker productivity in every nation, and there would be no difference in the two inequality trends.¹¹

Results.—Inequality in worker productivity across nations has been declining faster than per capita income inequality across nations. The decline in inequality using worker productivity is steeper for the Gini (8.4% decline vs. 6.6%), the Theil (16.9% vs. 13.6%), the MLD (27.7% vs. 23.8%), and the CV² (8.6% vs. 3.6%) (compare table 6 with table 2).

¹⁰ Equation (4) also verifies the intuition that per capita income grows faster than worker productivity when the working population grows faster than the total population ($W' > P'$), and that per capita income grows more slowly than worker productivity when the total population grows faster ($P' > W'$).

¹¹ Note that we are not assuming that population growth was the same for all countries. Rather, we are assuming that the growth rate of the total population mimicked the growth rate of the working population within each country (e.g., if the working population grew at 1% annually, the total population also grew at an annual rate of 1%).

Global Income Inequality

TABLE 6
TREND IN BETWEEN-NATION INEQUALITY FOR INCOME PER WORKER, 1980–98

YEAR	INDEX			
	Gini	Theil	MLD	CV ²
1980 .....	.492	.579	.667	1.360
1981 .....	.490	.574	.657	1.355
1982 .....	.483	.558	.632	1.314
1983 .....	.480	.553	.618	1.316
1984 .....	.479	.551	.605	1.333
1985 .....	.476	.546	.593	1.328
1986 .....	.475	.545	.588	1.333
1987 .....	.476	.548	.588	1.348
1988 .....	.478	.552	.591	1.368
1989 .....	.485	.568	.612	1.412
1990 .....	.483	.565	.604	1.412
1991 .....	.475	.546	.578	1.363
1992 .....	.469	.530	.553	1.332
1993 .....	.459	.504	.521	1.268
1994 .....	.458	.500	.514	1.268
1995 .....	.454	.491	.501	1.247
1996 .....	.450	.481	.490	1.221
1997 .....	.450	.479	.487	1.217
1998 .....	.451	.481	.482	1.243
% change, 1980–98	–8.4	–16.9	–27.7	–8.6

NOTE.—See table 2. $N = 110$ countries (same as earlier analyses, without Algeria, St. Kitts & Nevis, and St. Lucia).

Although these differences are not huge, they are noteworthy because they demonstrate that population growth rates affected between-nation and, hence, global income inequality through their effect on worker ratios. And the effect is in the hypothesized direction: had total populations grown at the same rate as working populations within each nation, so that worker ratios were constant within nations, the decline in income inequality across nations would have been steeper. In short, population growth *has* mattered for global inequality, but the effect is not captured by standard decompositions since it is indirect: population growth → worker ratios → income inequality.

It is important to note the implications of this population effect for the future trend in global inequality. Population growth—more accurately, differences between rich and poor nations with regard to rate of growth of the total and the working populations—has served to brake the decline in the world’s income inequality in recent years. That population brake on declining inequality will be removed in the near future. Virtually all the growth in the world’s working population over the next few decades will occur in poorer nations (Bloom and Brender 1993). As a result, there

will be continued downward pressure on global income inequality as many poor countries collect a demographic bonus due to a growing worker ratio at the same time that many rich countries experience the opposite due to an aging population (Firebaugh 2003, chap. 11). Hence, if the decline in per worker income inequality across nations were to continue at the same rate, the decline in per capita income inequality across nations would accelerate.

DISCUSSION

Income inequality is declining globally because it is declining across nations. The decline in inequality across nations should not be surprising since in recent decades incomes have grown faster than the world average in low-income regions in Asia, the world's most populous region.

Some readers might nonetheless be surprised by our findings, since many popular accounts suggest a world of growing income inequality. There are several reasons for the popularity of the myth of growing global inequality. One reason is the confusion of growing income gaps with growing income inequality. The growth in income gaps between nations in recent decades reflects growing income, not growing income inequality. A second reason is faulty theorizing about economic globalization, which associates globalization primarily with the spread of postindustrial technology rather than with the spread of industrial technology (below). As industrialization spreads throughout the world, we expect income convergence, not divergence.

Third, there is confusion sometimes over the meaning of the term *global income inequality*. For example, the observation that income inequality within nations (within-nation inequality or I_w) has been increasing on average around the world might be described as "rising global income inequality," where the term *global* is shorthand for "throughout the world." To avoid such confusion, the term *global income inequality* should be used as we do here, to describe the degree of disproportionality in the distribution of income over all the world's people (each person weighted equally).

Global inequality in this sense consists of two components, within-nation inequality (I_w) and between-nation inequality (I_B). To make that point very clear, it is useful to think about eliminating global income inequality in two steps, as noted earlier: first, eliminate inequality within nations by moving all incomes within each nation to the national mean for that nation; then, eliminate inequality across nations by moving all national income means to the overall world mean. Most global inequality would remain after the first step, since the majority of global income

inequality lies between, not within, nations. That helps explain why income growth in China can reduce global income inequality despite rising income inequality within China. Incomes are rising for the majority of Chinese, and, with respect to global inequality, the movement of China's income mean up toward the world average more than offsets the effect of rising inequality within China. By boosting economic growth in China, globalization most likely worsens inequality within China while reducing inequality across nations by elevating China's average income. Because the latter effect is larger, the net effect is a reduction in global income inequality.

Finally, the myth of growing global income inequality persists in part because of a widespread misinterpretation of the correlation of income and income growth rate across nations. The *unweighted* cross-nation correlation is positive because sub-Saharan Africa consists largely of small poor nations with stagnant economies. As a result, the majority of poor nations have experienced lower-than-world-average income growth over recent decades, even though *many more people* live in poor nations with faster-than-world-average income growth than in poor nations with lower-than-world-average growth. When we weight nations by population—as we must if we want to draw conclusions about global inequality—we find that income inequality across nations is declining.

The finding of declining income inequality across nations is robust, with all four indexes declining from 1980 to 1998. The observed decline cannot be attributed to sampling error, since the nations in this analysis contain the vast majority of the world's people. The growth and simulation results buttress the inequality results to tell a coherent and consistent story. The central growth result is that per capita incomes in China and South Asia grew more than twice as fast as the world average from 1980 to 1998, implying a decline in inequality across nations since about 40% of the world's people live either in China or in South Asia. Of our four indexes, the between-nation MLD should be the most affected by this growth and the between-nation CV^2 the least affected, since the MLD is the most sensitive (and the CV^2 the least sensitive) to changes in the lower end of the income distribution. That is exactly the pattern we find. The simulation results further corroborate the story of declining between-nation and global income inequality driven by income growth in China and South Asia. The decline in between-nation and global inequality was blunted, however, by faster-than-world-average income growth in the West and by slower-than-world-average income growth and faster-than-world-average population growth in sub-Saharan Africa. In other words, the decline in between-nation and global inequality would have been even steeper if incomes in the West and incomes and populations in sub-Saharan Africa had grown at the world average.

The decline in between-nation income inequality was also slowed by indirect effects of population growth that the decomposition and simulation analyses do not capture. Adding people does not depress per capita income growth when the added people are workers. The addition of dependents is another matter, and the cross-country correlation of $W' - P'$ (difference in the growth rate of working and total populations) and nations' per capita income has been positive in recent decades, resulting in an age structure advantage for richer nations with respect to per capita income growth. This age structure advantage for richer nations blunts the inequality-reducing effect of the faster growth of worker productivity in poorer nations, so the decline in between-nation and global income inequality would have been greater if, within every nation, total population had grown at the same rate as had working population.

Globalization and Global Inequality

Our results also have important implications for the debate over how globalization affects global income inequality. Most agree that the last decades of the 20th century were a period of *globalization*, that is, a period marked by the increased interconnectedness of localities, particularly the deepening of economic links across countries. If so, then these decades are strategic for theories of globalization and inequality. If we want to know what happens to global inequality when the world becomes more connected economically, the recent trend in inequality is a good place to begin.

A central claim of much of the globalization literature is that, in today's world, increased world economic integration has led to increased world inequality:¹²

globalization → greater global inequality.

For classical dependency theorists such as Arghiri Emmanuel (1972), economic transactions are characterized by unequal exchange favoring richer regions. Hence, growing income inequality is the natural outgrowth of globalization: the more exchange there is, the greater the advantage for richer nations. For today's globalization writers, the globalization story is more complex and involves the rise of new forms of economic production. Robert Reich (1991), for example, argues that the industrial era is rapidly giving way to a postindustrial era, where traditional manufacturing is becoming relatively less important. A new type of economic production, one that rests increasingly on information technology (IT)

¹² See Dollar and Kraay (2002) for an opposing view, and Lindert and Williamson (2000) for a discussion of historical evidence.

rather than on the processing of raw materials, has emerged and is thought to dominate global production. For globalization writers such as Manuel Castells (1993, 1998), the implication is clear: greater global inequality. As Castells puts it (1998, p. 344; emphasis added), “inequality and polarization are *prescribed* in the dynamics of informational capitalism.” According to this view, we can expect globalization to boost global inequality as the more technologically advanced rich nations surge ahead and the poorer regions of the world fall further behind.

But our findings suggest that the spread of industrial technology, and not the spread of postindustrial technology, is the more consequential feature of recent globalization, since industrializing Asian nations, and not digitizing Western nations, constitute the most important force driving the trend in global income inequality. If postindustrial technology were the primary engine of economic growth in today’s world, we would expect to see rising global inequality (in line with Castells’s argument) fueled by especially rapid income growth in the West, since richer nations have a decided advantage in IT and other forms of postindustrial technology. What we observe instead is declining between-nation and global income inequality fueled by especially rapid income growth in large poor nations in Asia.

These findings should not be astonishing in light of evidence (1) that IT growth most likely contributes little to the growth of overall world output (Quah 1997) and (2) that industrialization has spurred rapid economic growth in some of the world’s poorer regions (Amsden 2001). With regard to the global effect of IT growth, it is important to remember that the world as a whole is barely postagricultural, much less postindustrial; until the 1980s, the majority of the world’s workers were farmers (World Bank 1997, table 4). With regard to industrialization in poorer regions, Alice Amsden (2001, pp. 1–2) writes that after World War II “a handful of countries outside the North Atlantic—*the rest*—rose to the ranks of world-class competitors in a wide range of mid-technology industries” and “the developing world became divided between those that were excluded from modern world industry and those that were redefining its terms.” To be sure, the worldwide spread and success of industrialization in the world’s poorer regions has been uneven, as Amsden notes in her observation that the developing world has become divided. For example, sub-Saharan Africa’s share of world manufacturing value-added has languished over the past two decades. The strongest growth, however, has occurred in Asia, the world’s most populous region. There is plenty of evidence to support Amsden’s claim that industrialization has been key to economic growth in many poor regions of the world, so regions that

are industrializing generally are doing better economically than those that are not.¹³

In short, our findings indicate that globalization likely affects between-nation (and thus global) income inequality, but not for the reasons generally cited. It appears that globalization bears on between-nation income inequality primarily because of its role in the spread of industrialization in Asia, not because of its role in the spread of postindustrial technology in the West.

Note, finally, that the findings here reorient the globalization and global inequality debate by demonstrating that much of the debate is based on a faulty premise. Critics of globalization often argue along the following lines: (1) World economic integration increased in the late 20th century. (2) Global income inequality increased in the late 20th century. (3) The rising global economic integration caused (or at least contributed significantly to) the rise in global income inequality. Typically the debate focuses on the third point, over whether or not the simultaneous rise in economic integration and global inequality indicates a causal link from globalization to inequality. But that debate assumes that point two is accurate. In fact, global inequality did not rise simultaneously with globalization, so the claim that globalization boosts global inequality is problematic.

It is possible, of course, that globalization boosted global inequality even if the two did not rise together, since other forces operating in the late 20th century may have offset globalization's effect. To make that case, one needs to argue that the late-20th-century declines in between-nation and global inequality would have been even steeper in the absence of increasing world economic integration. The results here reveal the decisive counterfactuals to examine. Would incomes in China and South Asia have grown even faster—implying a steeper decline in global inequality—with fewer economic ties to the rest of the world? Would incomes in the West have grown more slowly (also implying a steeper decline in global inequality) with less world economic integration? Has globalization contributed to the economic stagnation of sub-Saharan Africa? In what ways, if any, has population growth in sub-Saharan Africa been affected by globalization? We have limited evidence on these questions, probably because we have not realized their importance. By identifying these questions as critical for determining more precisely how globalization has affected global income inequality, our findings dictate an agenda for subsequent investigations of globalization and global inequality.

¹³ Across poor nations, the association between industrial growth and income growth was $r = .89$ over the period 1965–98 (Firebaugh, in press; the correlation is $r = .98$ when countries are weighted by population size). Growth across regions points to the same conclusion (World Bank 2000a, table 1.4).

APPENDIX

Measuring Income Inequality

This appendix describes the four inequality indexes used in this analysis—the Gini, the Theil, the mean logarithmic deviation (MLD), and the squared coefficient of variation (CV^2). Standard inequality indexes are functions of units' population shares and income ratios (Firebaugh 1999). In the case of between-nation inequality, the units are countries, so *population share* (denoted p_j) is defined as the share of the world's total population living in country j (that is, p_j is population of j /world population, so $\sum_j p_j = 1.0$, where \sum denotes summation). *Income ratio* (r_j) is defined as per capita income in country j divided by average world income (that is, $r_j = X_j / \sum_j p_j X_j$, where X_j is per capita income in country j).

Based on this notation, the four inequality measures are conveniently expressed as follows (Firebaugh 2003, pp. 82–83):

$$\begin{aligned} \text{Gini coefficient} &= \sum_j p_j r_j (q_j - Q_j), \\ \text{Theil index} &= \sum_j p_j r_j \log(r_j), \\ \text{MLD} &= \sum_j p_j \log(1/r_j), \\ \text{CV}^2 &= \sum_j p_j (r_j - 1)^2, \end{aligned} \tag{A1}$$

where q_j is the proportion of the world's population in countries poorer than country j , Q_j is the proportion of the world's population in countries richer than country j , and \log refers to the natural logarithm.

Note that the four equations above reduce to a single expression:

$$\text{Inequality} = \sum_j p_j f(r_j), \tag{A2}$$

where f is the functional form used to transform the income ratios (for example, the MLD uses the function $f(r_j) = \log(1/r_j)$ to transform the income ratios).¹⁴ The important point here is that the degree of income inequality across countries is determined by population shares (p_j 's) as well as by income ratios (r_j 's). Because inequality across nations is a func-

¹⁴ Firebaugh's common general formula is not the only way to conceptualize the relationship between various inequality indexes. For instance, Shorrocks (1980) shows that the Theil index, MLD, and CV^2 are all members of a "generalized entropy" family of indexes (see also Cowell 1995, p. 60). The indexes can also be derived by starting with the basic principles of social welfare theory (Atkinson 1970, 1975; Sen 1997; Schwartz and Winship 1979). Firebaugh's formula is useful here in clarifying that change in between-nation inequality could arise from changing population shares, as well as from changing income ratios.

tion of nations' population shares, as well as their income ratios, *change* in between-nation income inequality is a function of change in population shares, as well as change in income ratios. That insight suggests that the first step in determining why between-nation inequality is declining is to decompose the decline to determine whether it is caused primarily by different rates of income growth across nations or by different rates of population growth across nations, as we do per equation (2) in the text.

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