

This chapter examines the relationship between the rapid pace of trade and financial globalization and the rise in income inequality observed in most countries over the past two decades. The analysis finds that technological progress has had a greater impact than globalization on inequality within countries. The limited overall impact of globalization reflects two offsetting tendencies: whereas trade globalization is associated with a reduction in inequality, financial globalization—and foreign direct investment in particular—is associated with an increase in inequality. It should be emphasized that these findings are subject to a number of caveats related to data limitations, and it is particularly difficult to disentangle the effects of technology and financial globalization since they both work through processes that raise the demand for skilled workers. The chapter concludes that policies aimed at reducing barriers to trade and broadening access to education and credit can allow the benefits of globalization to be shared more equally.

The integration of the world economy through the progressive globalization of trade and finance has reached unprecedented levels, surpassing the pre-World War I peak. This new wave of globalization is having far-reaching implications for the economic well-being of citizens in all regions and among all income groups, and is the subject of active public debate. Previous issues of the *World Economic Outlook* have analyzed the impact of globalization on business cycle spillovers and labor markets (April 2007), on inflation (April 2006), and on external imbalances (April 2005). This chapter makes a further contribution to the study of globalization by examining the impli-

cations for inequality and the distribution of income within countries, with a focus on emerging market and developing countries (often referred to as developing economies in the remainder of the chapter).

The debate on the distributional effects of globalization is often polarized between two points of view. One school of thought argues that globalization leads to a rising tide of income, which raises all boats. Hence, even low-income groups come out as winners from globalization in absolute terms. This optimistic view has parallels with the Kuznets hypothesis from the development literature, which proposed that even though inequality might rise in the initial phases of industrial development, it eventually declined as the country's transition to industrialization was completed.¹ The opposing school argues that although globalization may improve overall incomes, the benefits are not shared equally among the citizens of a country, with clear losers in relative and possibly even absolute terms.² Moreover, widening income disparities may not only raise welfare and social concerns, but may also limit the drivers of growth because the opportunities created by the process of globalization may not be fully exploited.³ The sustainability of globalization will also depend on maintaining broad support across the population, which could be adversely affected by rising inequality.

Against this background, this chapter addresses the broad question of how globalization affects the distribution of income within countries and the incomes of the poorest segment of the population in particular. The main

Note: The main authors of this chapter are Subir Lall, Florence Jaumotte, Chris Papageorgiou, and Petia Topalova, with support from Stephanie Denis and Patrick Hettinger. Nancy Birdsall and Gordon Hanson provided consultancy support.

¹See Kuznets (1955) for the original formulation of this hypothesis.

²See *The Economist* (2000) and Forsyth (2000) for representative views.

³See Birdsall (2007) and World Bank (2006).

objectives are to (1) analyze the shifting patterns of globalization and income distribution over the past two decades, (2) identify the main channels through which increased trade and financial globalization affect the distribution of income within a country, and (3) offer policy suggestions in light of the evidence that would help countries take full advantage of the opportunities from globalization while also ensuring that the benefits from globalization are shared appropriately across the population.

This chapter aims to extend the considerable literature on globalization and inequality along several dimensions.⁴ Unlike previous studies, which focus largely on trade globalization, this chapter also analyzes various channels of financial globalization to offer a more comprehensive view on the overall impact of globalization. Moreover, the chapter aims to explain changes in inequality over time across a broad range of countries, rather than explain average levels of inequality across a cross section of countries at a common point in time. The analysis also uses a new high-quality data set recently developed by the World Bank, applying a more consistent methodology than do most other studies that rely on multiple data sources of uneven quality. However, data issues remain a concern in any cross-country analysis of inequality, and the results of the estimations in all such analyses must be interpreted with some caution.

To anticipate the main conclusions, the available evidence does suggest that income inequality has risen across most countries and regions over the past two decades, although the data are subject to substantial limitations. Nevertheless, at the same time, average real incomes of the poorest segments of the population have increased across all regions and income groups. The analysis finds that increasing trade and financial globalization have had separately identifiable and opposite effects on income distribution. Trade liberalization and export growth

are found to be associated with lower income inequality, whereas increased financial openness is associated with higher inequality. However, their combined contribution to rising inequality has been much lower than that of technological change, especially in developing countries. The spread of technology is, of course, itself related to increased globalization, but technological progress is nevertheless seen to have a separately identifiable effect on inequality.⁵ The disequalizing impact of financial openness—mainly felt through foreign direct investment (FDI)—and technological progress appear to be working through similar channels by increasing the premium on higher skills, rather than limiting opportunities for economic advancement. Consistent with this, increased access to education is associated with more equal income distributions on average.

The next section reviews the evidence on both globalization and inequality over the past two decades, and how they have evolved across regions and income groups. The following section discusses the channels through which trade and financial globalization may be expected to influence inequality within countries and analyzes the empirical evidence to identify the main factors explaining changes in inequality. The concluding section offers some policy suggestions. Box 4.1 discusses in more detail the analytical and measurement issues arising from different methodologies used to collect and summarize inequality data across countries and regions. Box 4.2 looks in more detail at what might be learned from more in-depth analyses of individual country experiences and discusses how the conclusions of such studies do not easily lend themselves to generalization across countries.⁶

⁴See Goldberg and Pavcnik (2007) for a survey of theoretical and empirical research on the distributional effects of globalization in developing countries.

⁵Although much of the existing economic literature on globalization treats technological change as an exogenous variable, technological progress can also be viewed as potentially an additional channel through which globalization operates.

⁶See also Fishlow and Parker (1999) for a detailed analysis of the link between globalization and inequality in the United States.

Recent Trends in Inequality and Globalization

How Has Globalization Evolved?

World trade has grown five times in real terms since 1980, and its share of world GDP has risen from 36 percent to 55 percent over this period (Figure 4.1).⁷ Trade integration accelerated in the 1990s, as former Eastern bloc countries integrated into the global trading system and as developing Asia—one of the most closed regions to trade in 1980—progressively dismantled barriers to trade. However, it is noteworthy that all groups of emerging market and developing countries, when aggregated by income group or by region, have been catching up with or surpassing high-income countries in their trade openness, reflecting the widespread convergence of low- and middle-income countries’ trade systems toward the traditionally more open trading regimes in place in advanced economies.⁸

Financial globalization has also proceeded at a very rapid pace over the past two decades.⁹ Total cross-border financial assets have more than doubled, from 58 percent of global GDP in 1990 to 131 percent in 2004. The advanced economies continue to be the most financially integrated, but other regions of the world have progressively increased their cross-border asset and liability positions (Figure 4.2). However, de jure measures of capital account openness present a mixed picture, with the newly industrialized Asian economies (NIEs) and developing economies showing little evidence of convergence to the more open capital account regimes in advanced economies,

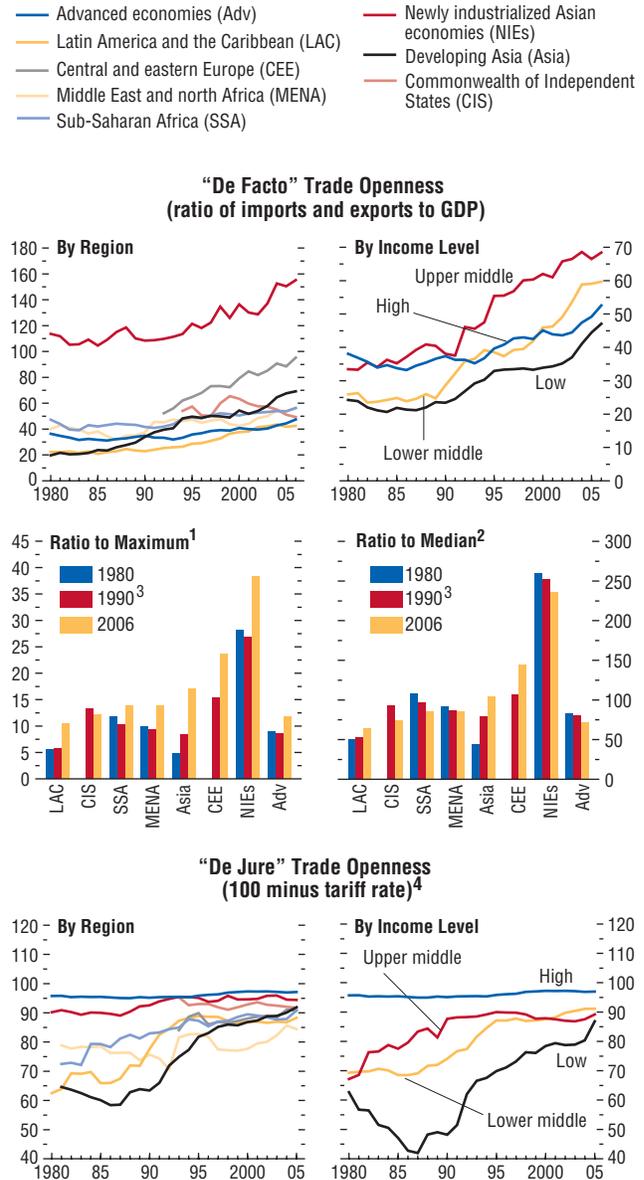
⁷Oil exports and imports are excluded from the trade measures but not from overall GDP. The charts in the top panel of Figure 4.1 use GDP-weighted averages, but the trends over time are similar when using simple averages.

⁸Country compositions of the regional and income groups are documented in Appendix 4.1.

⁹For a comprehensive discussion of financial globalization and its implications, see IMF (2007).

Figure 4.1. Trade Globalization
(GDP-weighted average)

Trade globalization accelerated in the 1990s as countries of the former Eastern bloc integrated into the global trading system and developing Asia progressively dismantled barriers to trade.



Source: IMF staff calculations.

¹Maximum is the highest value in 2006 (Singapore).

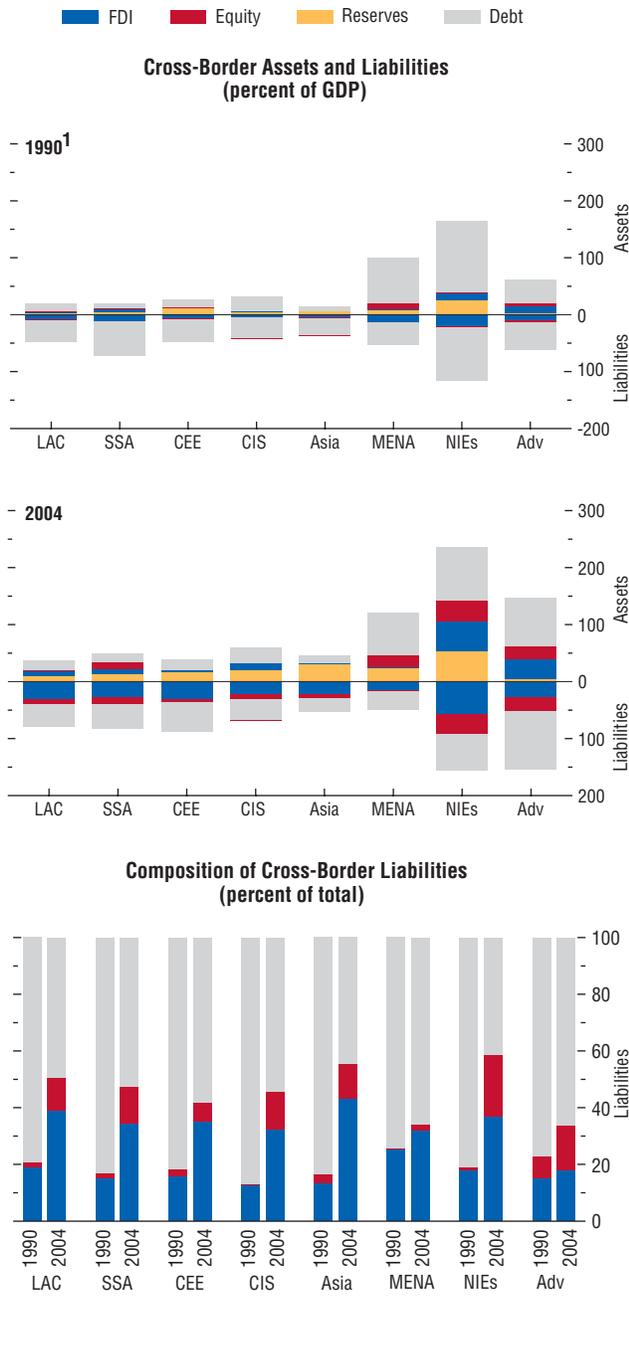
²Median across countries for each year.

³Data series begin in 1994 for central and eastern Europe and the Commonwealth of Independent States.

⁴Tariff rate calculated as an average of the effective tariff rate (ratio of tariff revenue to import value) and of the average unweighted tariff rates.

Figure 4.2. Financial Globalization
(GDP-weighted average)

The advanced economies (including the NIEs) continue to have the largest amount of cross-border financial assets and liabilities, but other regions of the world have also progressively increased their cross-border asset and liability positions.



which have continued to liberalize further.¹⁰ Of note, the share of FDI in total liabilities has risen across all emerging markets—from 17 percent of their total liabilities in 1990 to 38 percent in 2004—and far exceeds the share of portfolio equity liabilities, which rose from 2 percent to 11 percent of total liabilities over the same period. Reduced government borrowing needs have also contributed to changing liability structures, with the share of debt in total liabilities falling across all emerging market and developing country regions. Not surprisingly, the share of international reserves in cross-border assets has also risen, reflecting the accumulation of reserves among many emerging market and developing countries in recent years.

Has Income Distribution Within Countries Become Less Equal?

Cross-country comparisons of inequality are generally plagued by problems of poor reliability, lack of coverage, and inconsistent methodology.¹¹ Some of these issues are discussed in more detail in Box 4.1. This chapter relies on inequality data from the latest World Bank Povcal database constructed by Chen and Ravallion (2004, 2007) for a large number of developing countries. This database uses a more rigorous approach to filtering the individual income and consumption data for differences in quality than other commonly used databases, which rely on more mechanical approaches

¹⁰Both de facto and de jure measures have advantages and disadvantages, and are typically seen as complements rather than substitutes in empirical studies. See Kose and others (2006) for a discussion.

¹¹Taking an alternative approach, Milanovic (2005b, 2006) and World Bank (2007) review patterns of global income inequality, that is, income inequality across the world's citizens, and their relation to globalization. Such studies typically conclude that global income inequality has declined with the increase in per capita incomes in developing countries that globalization has fostered. Policy implications within countries of such analysis are less clear. A related branch of research on cross-country income inequality focuses on the impact of globalization on growth.

to combine data from multiple sources.¹² The Povcal database has been supplemented with data from the Luxembourg Income Study (LIS) database, which provides high-quality coverage for advanced economies, and the resulting full sample allows for more accurate within- and cross-country comparisons than are available elsewhere. Given limitations of data availability, the analysis in this chapter uses inequality data based on both income and expenditure surveys. Mixing these two concepts makes a comparison of levels of inequality across countries and regions potentially misleading.¹³ Given the difficulty in comparing inequality levels across countries, this section discusses them briefly and focuses instead on changes, whereas the empirical analysis relies solely on changes in inequality to avoid the biases inherent in level estimations.

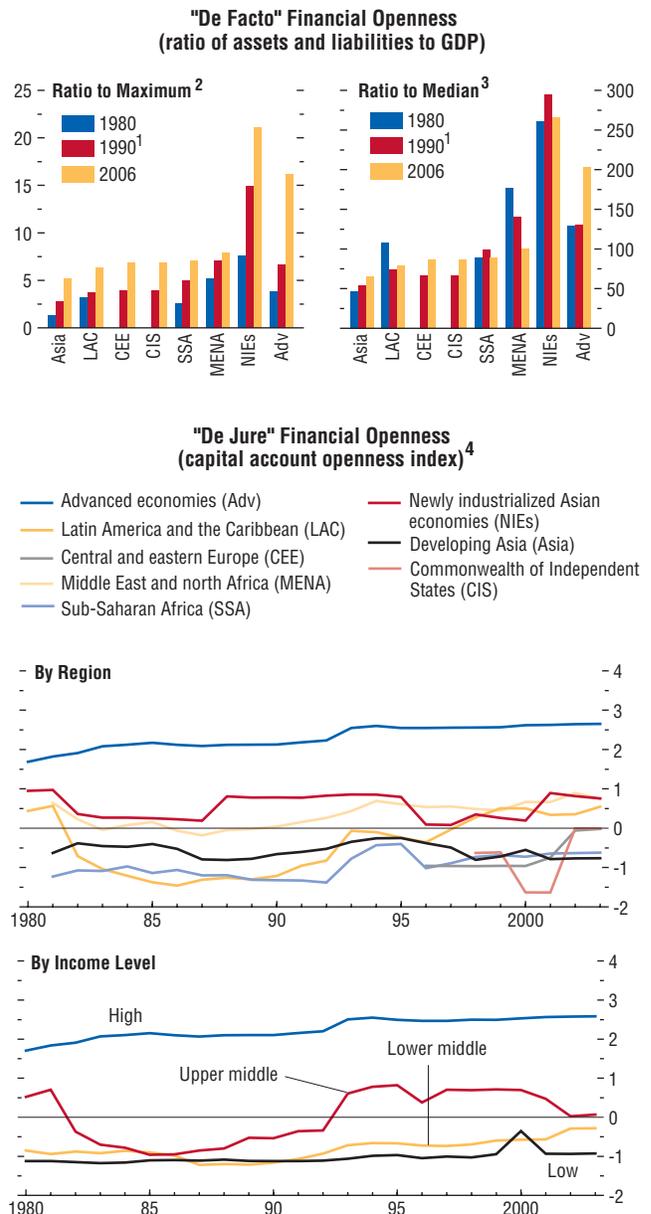
Based on observed movements in Gini coefficients (the most widely used summary measure of inequality), inequality has risen in all but the low-income country aggregates over the past two decades, although there are significant regional and country differences (Figure 4.3).¹⁴ While inequality has risen in developing Asia, emerging Europe, Latin America, the NIEs, and the advanced economies over the past two decades, it has declined in sub-Saharan Africa and the

¹²This database is available via the Internet at iresearch.worldbank.org/PovcalNet. Other databases include, for example, Deininger and Squire (1998) and the World Income Inequality Database (2005), which includes an update of the Deininger-Squire database; the Luxembourg Income Study; and a large number of data series from central statistical offices and research studies.

¹³See Deaton and Zaidi (2002) and Atkinson and Bourguignon (2000). Most advanced and Latin American economies construct inequality indices from income data, whereas most African and developing Asian countries use consumption data. World Bank (2006) illustrates how consumption-based Gini coefficients tend to show less inequality, in part because of government spending programs.

¹⁴The Gini coefficient is computed as the average difference between all pairs of incomes in a country, normalized by the mean (see Box 4.1). Other measures of inequality include decile and quintile ratios, the Atkinson index, and Theil's entropy measure.

Figure 4.2 (concluded)



Sources: Chinn and Ito (2006); Lane and Milesi-Ferretti (2006); and IMF staff calculations.

¹Data series begin in 1995 for central and eastern Europe and the Commonwealth of Independent States.

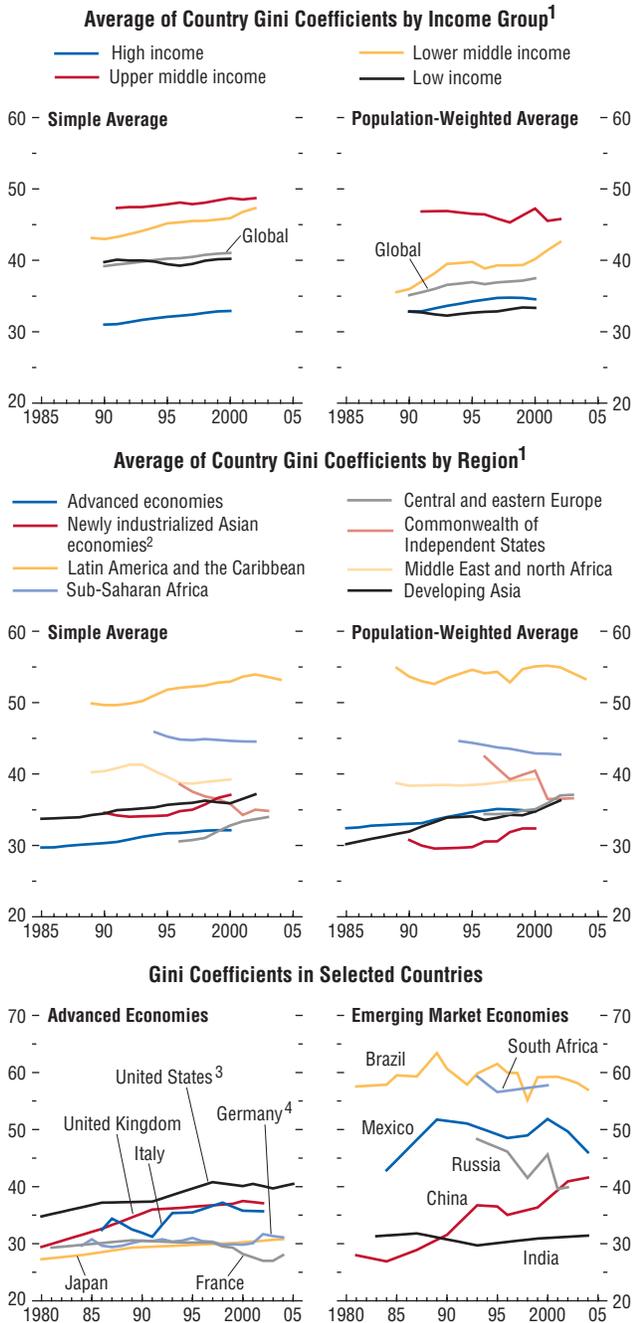
²Maximum is the highest value in 2004 (Ireland).

³Median across countries for each year.

⁴Index measuring a country's degree of capital account openness based on principal components extracted from disaggregated capital and current account restriction measures.

Figure 4.3. Cross-Country Trends in Inequality
(Gini coefficient)

Inequality has risen in developing Asia, central and eastern Europe, the NIEs, and the advanced economies, while falling in the Commonwealth of Independent States and, to a lesser extent, in sub-Saharan Africa.



Sources: Choi (2006); Povcal database; WIDER database; and IMF staff calculations.
¹Country coverage and years shown are limited to maintain constant country coverage. See Appendix 4.1.
²Excludes Hong Kong SAR due to data unavailability.
³Trends after 2000 are based on earnings data for full-time, year-round workers.
⁴Trends for pre-1992 are based on data for West Germany.

Commonwealth of Independent States (CIS).¹⁵ This pattern remains broadly unchanged using population-weighted averages, except for emerging market countries in Latin America, as a result of the recent declines in inequality in Brazil and Mexico. Among the largest advanced economies, inequality appears to have declined only in France, whereas among the major emerging market countries, trends are more diverse, with sharply rising inequality in China, little change in India, and falling inequality in Brazil, Mexico, and Russia.¹⁶ These overall measures of inequality do not, however, capture all country-specific characteristics of inequality within countries. As Box 4.2 illustrates, a different method of aggregation of rural and urban inequality in China leads to a substantially less sharp increase in overall inequality, whereas in India there is substantial variation in the experience of individual rural and urban districts despite the relatively small changes at the national level.

A more detailed picture of inequality is revealed by examining income shares for different country groups (Figure 4.4). Overall, changes in income shares by quintile (successive subsets with each containing 20 percent of the population) across regions and income levels mirror the evidence on inequality from Gini coefficients. However, the data show that rising Gini coefficients are explained largely by the increasing share of the richer quintiles

¹⁵Among the CIS countries, available evidence suggests that the sharp drop in inequality is partly a result of the reversal of the abrupt deterioration in income distribution during the initial stages of transition. See World Bank (2000), which suggests that inequality was substantially higher in the early 1990s in these countries.

¹⁶In a previous phase of (mainly trade) globalization, the East Asian economies grew rapidly during 1965–89, while income distribution either improved or did not worsen. In addition to active government policies and reforms such as land reforms, public housing, investments in health and rural infrastructure, and a manufacturing export-oriented growth strategy, investment in education is cited as an important factor explaining low average inequality (see Birdsall, Ross, and Sabot, 1995). However, data on inequality during this phase are highly tentative.

at the expense of middle quintiles, whereas the income share of the poorest quintile (1) changes little. Looking at average income levels across quintiles, per capita incomes have risen across virtually all regions for even the poorest quintiles (Figures 4.5 and 4.6). The exception is Latin America, where there was a small overall decline, driven mainly by the adverse impact of economic and financial crises on the poor in several countries. However, incomes have since recovered from post-crisis lows. In fact, consistent with the evidence from the Gini coefficients, the incomes of the poorest quintile have risen faster than those of other segments of the population in sub-Saharan Africa and the CIS countries, although from a very low base. Across all regions, the evidence therefore suggests that in an absolute sense the poor are no worse off (except in a few post-crisis economies), and in most cases significantly better off, during the most recent phase of globalization.

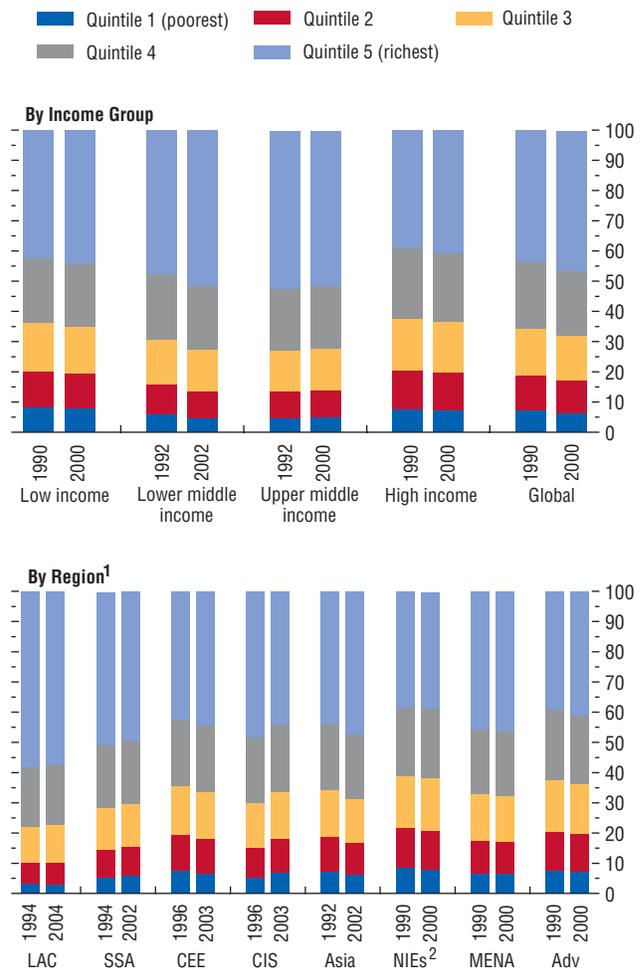
In summary, two broad facts emerge from the evidence. First, over the past two decades, income growth has been positive for all quintiles in virtually all regions and all income groups during the recent period of globalization. At the same time, however, income inequality has increased mainly in middle- and high-income countries, and less so in low-income countries. This recent experience seems to be a clear change in course from the general decline in inequality in the first half of the twentieth century, and the perception that East Asia's rapid growth during the 1960s and 1970s was achieved while maintaining inequality at relatively low levels. It must be emphasized, however, that comparison of inequality data across decades is fraught with difficulty, in view of numerous caveats about data accuracy and methodological comparability.

What Is the Impact of Globalization on Inequality?

Against this background, it is natural to ask how much of the rise in inequality seen in middle- and high-income countries in recent

Figure 4.4. Income Shares by Quintile
(Share of total income, population-weighted average)

Increasing inequality is largely explained by the increasing income share of the richest quintile at the expense of the middle quintiles, while there has been little change in the poorest quintile.



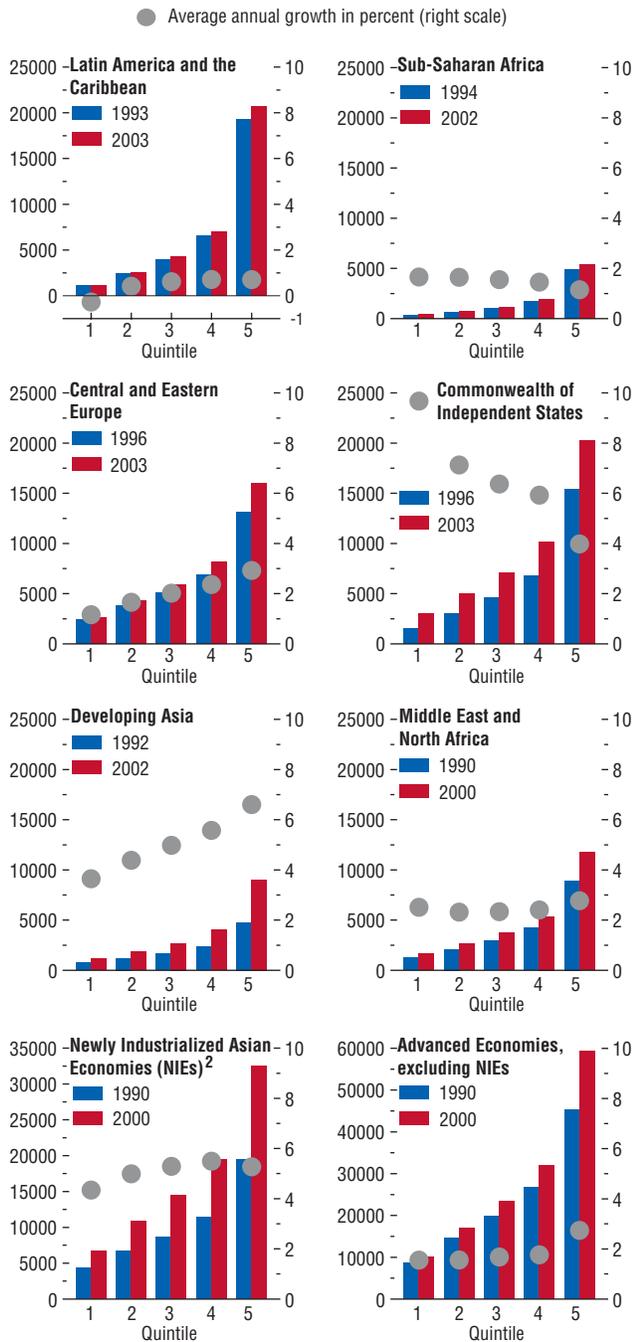
Sources: Choi (2006); Japanese Statistics Bureau; Povcal database; WIDER database; and IMF staff calculations.

¹ Data cover advanced economies (Adv), newly industrialized Asian economies (NIEs), developing Asia (Asia), Latin America and the Caribbean (LAC), sub-Saharan Africa (SSA), Middle East and north Africa (MENA), central and eastern Europe (CEE), and the Commonwealth of Independent States (CIS).

² Includes only Korea and Taiwan Province of China.

Figure 4.5. Per Capita Income by Quintile¹
(2000 international dollars, population-weighted average)

Incomes have risen for all quintiles across all regions except for the poorest quintile in Latin America, related in part to the aftereffects of crises.



Sources: Choi (2006); Heston, Summers, and Aten (2006); Japanese Statistics Bureau; Povcal database; WIDER database; and IMF staff calculations.

¹ Income or consumption share data are applied to real GDP per capita levels from Penn World Tables to calculate per capita income by quintile. See Appendix 4.1.

² Includes only Korea and Taiwan Province of China.

decades can be attributed to increased globalization, and how much to other factors, such as the spread of technology and domestic constraints on equality of opportunity. This section first discusses the channels through which the globalization of trade and finance could affect the distribution of incomes within a country, setting the stage for the empirical analysis that follows.

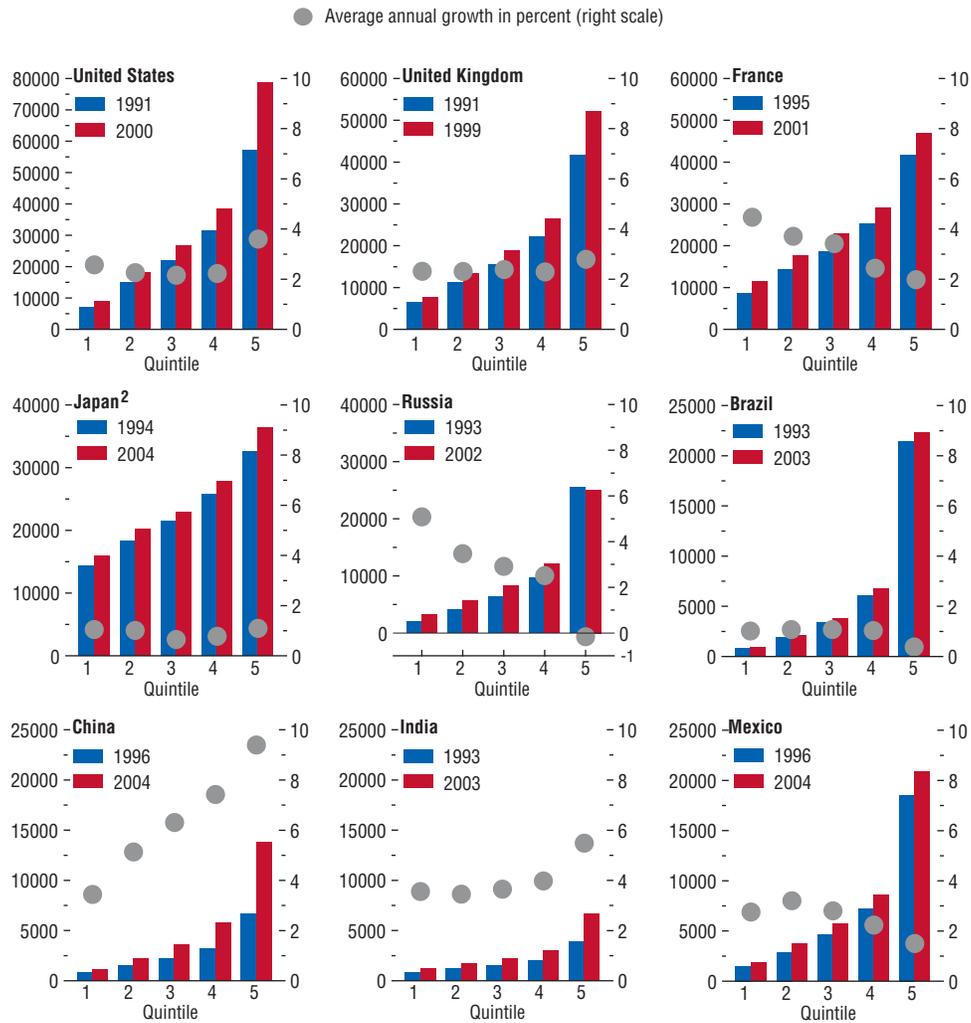
Channels Through Which Globalization Affects Inequality

The principal analytical link between trade liberalization and income inequality provided by economic theory is derived from the Stolper-Samuelson theorem: it implies that in a two-country two-factor framework, increased trade openness (through tariff reduction) in a developing country where low-skilled labor is abundant would result in an increase in the wages of low-skilled workers and a reduction in the compensation of high-skilled workers, leading to a reduction in income inequality (see Stolper and Samuelson, 1941). After tariffs on imports are reduced, the price of the (importable) high-skill-intensive product declines and so does the compensation of the scarce high-skilled workers, whereas the price of the (exportable) low-skill-intensive good for which the country has relatively abundant factors increases and so does the compensation of low-skilled workers. For an advanced economy in which high-skill factors are relatively abundant, the reverse would hold, with an increase in openness leading to higher inequality.

An important extension of the basic model that weakens the dichotomy between advanced and developing economies in terms of distributional effects is the inclusion of “noncompeting” traded goods, that is, goods that are not produced in a country and are imported only as a result, for example, of very large differences in endowments across countries. Tariff reductions would reduce the prices of these goods—and therefore increase the effective real income of households—without affecting wages and prices

Figure 4.6. Per Capita Income by Quintile in Selected Countries¹
(2000 international dollars)

Despite overall increases in inequality in middle- and high-income countries, there is substantial variation in the experience of individual countries.



Sources: Heston, Summers, and Aten (2006); Japanese Statistics Bureau; Povcal database; WIDER database; and IMF staff calculations.
¹ Calculations are based on income share data except for India, Japan, Mexico, and Russia, where consumption share data are used. The income or consumption share data are applied to real GDP per capita levels from Penn World Tables to calculate per capita income by quintile. See Appendix 4.1.
² Based on household income share data.

Box 4.1. Measuring Inequality: Conceptual, Methodological, and Measurement Issues

Researchers on inequality employ several different measures, guided by the availability of underlying data and the focus of the research.¹ Of these, the Gini index is a commonly used summary measure of the income distribution of a country.² The Gini index captures the range between a perfectly egalitarian distribution in which all income is shared equally (a Gini coefficient of 0) and one where a single person has all the income (a coefficient of 1). Gini coefficients typically range from 0.20 to 0.65.

Despite the Gini index's widespread use, numerous conceptual, methodological, and definitional issues make it difficult to compare Gini indices across countries and over time.³ One major source of variation is that some Gini indices are based on surveys of household consumption expenditure, whereas others are based on income surveys—a difference that can change a country's observed Gini index on the order of 0.15 point. In general, consumption-based Gini indices tend to show lower inequality and are more commonly used in developing countries in which higher rates of self-employment in business or agriculture (where income fluctuates throughout the year) make measurement of incomes difficult.⁴ Consumption-based Gini indices are more common in Asia, sub-Saharan

Africa, and, more recently, in central and emerging Europe and the Commonwealth of Independent States, whereas income Ginis are commonly used in advanced economies and Latin America.⁵ Differences in definitions and survey methodologies further complicate the use of both consumption- and income-based Gini indices. Comparability of Gini indices based on consumption survey data can be limited as a result of differences in definitions of consumption; variation in the number of consumption items that are separately distinguished in surveys; whether survey participants record their consumption or are asked to recall their consumption in an interview; changes in the length of the recall period during which survey participants are asked to report their consumption; different methods used to impute housing, durables, and home production consumption; inconsistencies in the treatment of seasonality and the timing of surveys; underreporting or misleading reports of consumption of some items; and variation in respondents within a household. Income inequality data can also vary depending on whether the income is pre- or post-tax; whether and how in-kind income, imputed rents, and home production are included; and whether all income—including remittances, other transfers, and property income—or only wage earnings are captured.⁶

More general concerns with both types of Gini indices are that some surveys are not nationally representative and exclude rural populations, the military, students, or populations living in areas that are expensive or dangerous to survey. In addition, survey nonresponse and underreporting of income—which occurs more often in the high-income groups in a country—can skew income distributions, thereby underreporting inequality. Also, whether and how

Note: The main author of this box is Patrick Hettinger.

¹Measures of inequality include, in addition to the Gini index, ratios of the average income of the richest to poorest segments of the population, the Atkinson index, the Theil entropy measure, and the mean logarithmic deviation of income.

²The Gini index is defined as $\frac{1}{2n^2\mu} \sum_{i=1}^n \sum_{j=1}^n |y_i - y_j|$, where μ is the mean income, y_i and y_j are the individually observed incomes, and n is the number of observed incomes.

³A general discussion of the difficulties in using the Gini index and data based on household surveys can be found in Deaton (2003); Ravallion (2003); and World Bank (2006).

⁴Among other causes, lower measures of consumption-based inequality can result from consumption smoothing across time and greater measurement error for incomes. See, for example, Ravallion and Chen (1996); and Meyer and Sullivan (2006).

⁵See, for example, Chen and Ravallion (2004).

⁶For most advanced economies in this study, post-tax income is used, although the components of income vary across countries. See Luxembourg Income Study data as provided in the World Income Inequality Database.

a survey adjusts for price-level differences between urban and rural areas can significantly alter distribution data.

Finally, there are differences between indicators of household and individual inequality. Household inequality measures, which were much more common before 1980, may show changing inequality over time merely as a result of changes in household size and composition. Adjusting inequality indicators to a per capita unit of analysis helps avoid this bias, and various methods have been adopted for making this adjustment.⁷

Although survey guidelines exist, they are not consistently applied over time and across countries, so that different surveys and even different survey rounds can produce different results.⁸

⁷For several examples of how measures are adjusted, see World Income Inequality Database (2005).

⁸See Canberra Group (2001); and Deaton and Zaidi (2002).

When comparing Gini indices, meticulous attention to concepts, definitions, and the details of survey methodology is required to improve comparability, and the World Bank's Povcal database goes further than other databases in doing this.⁹ The database was created using primary data from nationally representative surveys with sufficiently comprehensive definitions of income or consumption. Attempts were made to ensure survey comparability over time within countries, although cross-country and within-country comparisons are still impaired because in many cases it was not possible to correct for differences in survey methods. Finally, measures are calculated consistently and on a per capita basis. For the econometric analysis in this study, using changes over time in Gini indices from this database rather than levels can address some of the major concerns regarding comparability of indices across countries.

⁹See Chen and Ravallion (2004).

of other traded goods.¹⁷ If this noncompeting good is a large share of the consumption basket of poorer segments of society, a reduction in the tariff on the noncompeting good would reduce inequality in that country. More generally, in both advanced and developing economies, if tariffs are reduced for noncompeting goods that are not produced in a country but are consumed particularly by the poor, it would lead to lower inequality in both advanced and developing economies.

The implications of the Stolper-Samuelson theorem, in particular the ameliorating effects of trade liberalization on income inequality in developing countries, have generally not been verified in economy-wide studies.¹⁸ A particular

¹⁷See, for example, Davis and Mishra (2007) for an overview of analytical and empirical approaches to the relationship between trade, inequality, and poverty.

¹⁸See Milanovic (2005a) for a survey of recent papers linking trade globalization to inequality, which notes that

challenge has been to explain the increase in skill premium between skilled and unskilled workers observed in most developing countries. This has led to various alternative analytical approaches, including the introduction of (1) multiple countries where poor countries may also import low-skill-intensive goods from other poor countries and rich countries may similarly import high-skill-intensive goods from other rich countries; (2) a continuum of goods, implying that what is low-skill intensive in the advanced economy will be relatively high-skill intensive in a less-developed country (see Feenstra and Hanson, 1996); and (3) intermediate imported goods used for the skill-intensive product. However, these extensions have themselves presented additional challenges for empirical testing, and

most papers find either no statistically significant relationship or a negative relationship between globalization and inequality.

Box 4.2. What Do Country Studies of the Impact of Globalization on Inequality Tell Us? Examples from Mexico, China, and India

A complementary approach to the cross-country analysis of the impact of globalization on inequality used in this chapter is to look in detail at particular country experiences (see Goldberg and Pavcnik, 2007). The advantage of country studies is that they focus on more detailed measures of inequality (that is, wage inequality) and at a finer level of disaggregation geographically or by sector. In addition, they also use more detailed data for other variables, such as tariffs and social policies. Given that globalization may affect inequality through different channels and at different speeds in different countries, country studies can provide important insights that cannot be gained in cross-country work and in which policies and outcomes can be more closely related.¹ The following overview of recent studies on Mexico, China, and India illustrates the usefulness as well as the limitations of country studies.²

Mexico

Mexico undertook far-reaching reforms between 1985 and 1994 that opened its economy to trade and capital flows. Over the same period, the earnings gap between high- and low-skilled workers began to widen, generating a substantial body of literature that examined whether this increasing gap was caused by the process of

Note: The main author of this box is Chris Pappa-georgiou, with contributions by Gordon Hanson and Petia Topalova.

¹A limitation of most of these country studies is that they do not control explicitly for technological progress and, in some cases, for financial globalization, both of which were found in this chapter to play a key role. Another limitation is the use of a difference-in-difference methodology that does not capture the countrywide effect of globalization on inequality. While liberalization may have an overall effect of increasing or lowering inequality, this methodology tests whether this overall effect was unequal, and whether certain industries or regions benefited more from globalization than others.

²Studies that focus on the experiences of Colombia, Argentina, Brazil, Chile, and Hong Kong SAR are summarized in Goldberg and Pavcnik (2007).

opening up.³ In broad terms, researchers have found that the patterns of trade liberalization may have contributed to increasing the earnings gap. Hanson and Harrison (1999) find that trade protection was initially higher in less-skill-intensive sectors, and was reduced by more in these sectors during reform. If these tariff changes were passed through to changes in prices of goods, then the logic of the Stolper-Samuelson theorem would imply that the relative wage of skilled labor would have risen. Robertson (2004) finds evidence in support of this conclusion, with the relative price of skill-intensive goods in Mexico rising during 1987–94 and raising the relative wages of white-collar labor.

Other studies with a slightly different focus find that although globalization may have contributed to widening earnings inequality in Mexico, low-skilled workers have benefited in absolute terms as a result of the policy changes. Nicita (2004) shows that during the 1990s, tariff changes raised disposable income for all households, with richer households enjoying a 6 percent increase and poorer households enjoying a 2 percent increase, leading to a 3 percent reduction in the number of households in poverty. In a related work, Hanson (2007) finds that during the 1990s, individuals in regions more exposed to globalization enjoyed a 10 percent gain in labor income relative to individuals in regions less exposed to globalization, resulting in a reduction in poverty rates in high-exposure regions of 7 percent relative to low-exposure regions.

China

The dramatic increase in trade liberalization in China has been accompanied by a large fall in poverty rates, but also an increase in income inequality, with the overall Gini coefficient rising sharply from 0.28 in 1981 to 0.42 in 2004. The observed increase in overall inequality

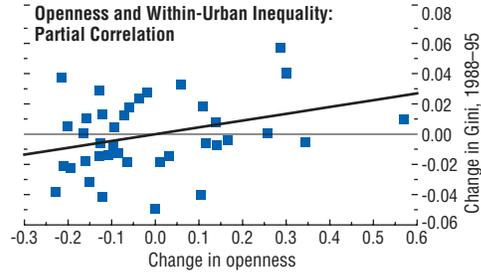
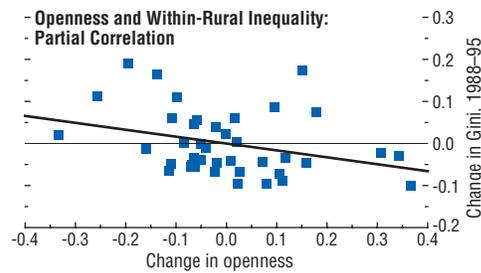
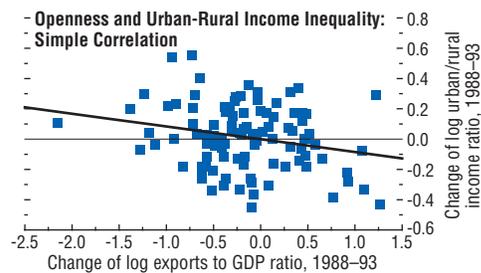
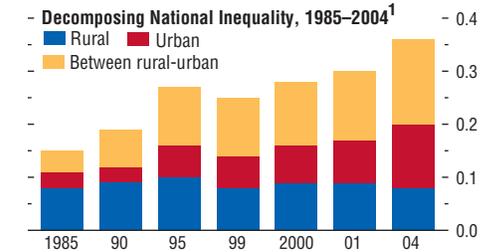
³In 1988, urban workers at the 90th percentile had labor earnings that were 3.6 times those of workers at the 10th percentile. By 2004, the ratio had grown to 4.7 times, with large fluctuations in relative earnings around the Mexican peso crisis in 1994–95.

is mostly attributed to growing differences between rural and urban household incomes and uneven growth in incomes among urban households (see top panel of the figure, from Lin, Zhuang, and Yarcia, forthcoming). Focusing on inequality between 1988 and 1995, Wei and Wu (2007) also find that the aggregate inequality numbers may obscure a more subtle pattern of underlying changes. These authors examine the effect of trade globalization on Chinese income inequality using new methods and two unique data sets on 39 urban and 40 rural Chinese regions. The first data set allows examination of urban-rural income inequality and the second allows the examination of within-urban and within-rural inequality.⁴ The authors employ a decomposition of the Theil index that combines the urban-rural, intra-urban, and intra-rural inequalities into an overall measure of income inequality, arguing that their Theil decomposition approach more accurately captures the unequal effects of the different components of overall inequality.⁵

⁴The first data set comes from the *Urban Statistical Yearbook of China* and *Fifty Years of the Cities in New China: 1949–98*, both published by China’s State Statistics Bureau. The second data set consists of two surveys of households conducted in 1988 and 1995 by international economists and the Economics Institute of the Chinese Academy of Social Sciences. The study relies on data from urban areas and rural counties administered by cities—an administrative arrangement specific to China—but not rural counties administered directly by prefectures.

⁵The Theil index is an alternative to the Gini coefficient. One of the advantages of the Theil index is that because it is the weighted sum of inequality within subgroups, it is easier to decompose. The particular decomposition of the Theil index used in Wei and Wu (2007, pp. 25–26) was proposed by Shorrocks (1980) and Mookherjee and Shorrocks (1982). More specifically, overall inequality is given by $I = V_r \lambda_r I_r + V_u \lambda_u I_u + V_r \lambda_r \log \lambda_r + V_u \lambda_u \log \lambda_u$, where V_r and V_u are the proportions of population living in rural and urban areas, respectively; λ_r and λ_u are the ratios of rural and urban average incomes to the overall national average income, respectively; and I_r and I_u are within-rural and within-urban Theil indices, respectively. The World Bank (1997) estimates that 75 percent of the change in the overall inequality is explained by urban-rural inequality during the period 1984–95.

China: Openness and Inequality in Urban and Rural Areas



Sources: Lin, Zhuang, and Yarcia (forthcoming); and Wei and Wu (2007).
¹Inequality is measured in terms of the Theil index and ranges from 0 to 1.

Box 4.2 (concluded)

Illustrating the importance of the method of aggregation, the bottom three panels in the figure present correlations between trade openness and urban-rural inequality, within-rural inequality, and within-urban inequality. The authors' formal econometric analysis, consistent with the correlations in the figure, reveals that trade liberalization reduces urban-rural income inequality, leads to a relatively small increase in intra-urban inequality, and decreases intra-rural inequality. More important, summing up the three components of inequality, the authors estimate that increased openness modestly reduces overall inequality.⁶

This finding contrasts with the more widespread perception that trade liberalization has contributed to the rise in income inequality in China. A key lesson from this exercise is that the appropriate decomposition and measurement of income inequality across different regions can modify the observed effect of openness on income inequality in China.

The Chinese experience does not necessarily imply that the effect of trade liberalization on income inequality suggested by this methodology would be the same in other countries, given the diverse mechanisms through which globalization operates. Moreover, data limitations in many countries typically do not allow for the application of such a methodology.

India

India intensified reforms aimed at opening up its economy in the early 1990s, through reduction in tariffs and nontariff barriers, lowered barriers to foreign direct investment, and liberalization of restrictive domestic regulations. Kumar and Mishra (forthcoming) evaluate empirically the impact of the 1991 trade liberalization in India on industry wages.⁷ The paper

uses variations in industry wage premiums and trade policy across industries and over time. Industry wage premiums are defined as the portion of individual wages that accrues to the worker's industry affiliation after controlling for worker characteristics. Since different industries employ different proportions of skilled workers, changes in wage premiums translate into changes in the relative incomes of skilled and unskilled workers (see Pavcnik and others, 2004; and Goldberg and Pavcnik, 2005). The results suggest that reductions in tariffs were associated with increased wages within an industry, likely reflecting productivity increases. In addition, the study finds evidence that trade liberalization has led to decreased wage inequality between skilled and unskilled workers. This is consistent with the larger tariff reductions in sectors with a higher proportion of unskilled workers.

Other studies focus on the effect of tariff changes on income inequality at the district level. Topalova (2007) relates post-liberalization variations in industrial composition across districts to the degree of opening to foreign trade and FDI across industries.⁸ Additional research applies a difference-in-difference methodology to investigate how consumption across the entire income distribution varied with the district's exposure to a decline in protection and the liberalization of FDI. Results from this work suggest that trade liberalization led to an increase in inequality, especially in urban districts, where the incomes of the richest and those with higher education rose substantially faster relative to households at the bottom of the income distribution. Although the estimates for the rural sample are not statistically significant, across all measures of inequality the point estimates imply that a decline in tariffs is associated with an increase in inequality. Moreover, there does not seem to be any relationship

⁶In related work using household survey data for 29 Chinese provinces for 1988–2001, Zhang and Wan (2006) find that trade liberalization increases the income share of the poor living in urban households.

⁷The data set combines microlevel data from the National Sample Survey Organisation with data on international trade protection for the years 1980–2000.

⁸This study uses consumption-based data from 360 districts (those in the 15–16 largest states in India) and for two time periods, 1987 and 1999. For a detailed explanation of the data and estimation method used, see Topalova (2007).

between FDI and inequality within a district in either the rural or the urban samples.

Conclusion

This box demonstrates how country studies can take advantage of more disaggregated and more detailed data to study the effects of globalization on inequality. However, no study can capture all aspects of this relationship, and each study focuses instead on some parameters of particular interest. In the case of Mexico, wage, rather than income, inequality was used to capture distributional disparities across regions. In the China example, decom-

position between urban and rural inequality was shown to be fundamental in the estimation of the globalization-inequality relationship. In the India study, detailed import-tariff data across industries and districts were used as the measure of trade openness. The results from these case studies reveal a more intricate picture of the globalization-inequality interrelationship that cannot be captured in cross-country studies. The evidence broadly suggests that the mechanisms through which globalization affects inequality are country- and time-specific, reflecting the great heterogeneity of countries and the nature and timing of their trade reforms.

none has been consistently established.¹⁹ This has led to explanations for rising skill premiums based on the notion that technological change is inherently skill biased, attributing the observed increases in inequality (including in advanced economies) to exogenous technology shocks. Any empirical estimation of the overall effects of globalization therefore needs to account explicitly for changes in technology in countries, in addition to standard trade-related variables.

An additional important qualification to the implications deriving from the Stolper-Samuelson theorem relates to its assumption that labor and capital are mobile within a country but not internationally. If capital can travel across borders, the implications of the theorem weaken substantially. This channel would appear to be most evident for FDI, which is often directed at high-skill sectors in the host economy.²⁰ Moreover, what appears to be relatively high-skill-intensive inward FDI for a less-

developed country may appear to be relatively low-skill-intensive outward FDI for the advanced economy. An increase in FDI from advanced economies to developing economies could thus increase the relative demand for skilled labor in both countries, increasing inequality in both the advanced and the developing economy. The empirical evidence on these channels has provided mixed support for this view, with the impact of FDI seen as either negative, at least in the short run, or inconclusive.²¹

In addition to foreign direct investment, there are other important channels through which capital flows across borders, including cross-border bank lending, portfolio debt, and equity flows. Within this broader context, some have argued that greater capital account liberalization may increase access to financial resources for the poor, whereas others have suggested that by increasing the likelihood of financial crises, greater financial openness may disproportionately hurt the poor.²² Some recent research has

¹⁹The level of aggregation of tariff data does not, for example, allow for clear identification of noncompeting imports in general and noncompeting intermediate goods in particular. Furthermore, in a multicountry setting with more than one low-skill-abundant country, it is unclear which goods are exportable and which are importable.

²⁰See Cragg and Epelbaum (1996); and Behrman, Birdsall, and Székely (2003).

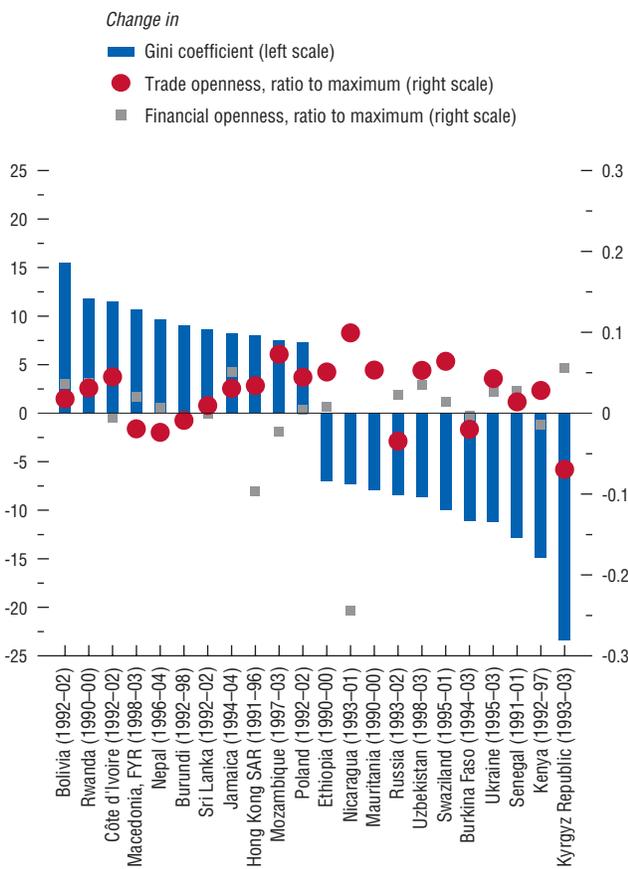
²¹See Behrman, Birdsall, and Székely (2003), who find negative effects in the short term in Latin America, and Milanovic (2005a), who suggests that the evidence from a wide sample of countries is inconclusive.

²²See Agénor (2002) for a discussion of the channels through which financial integration may hurt the poor, and Fallon and Lucas (2002), who find that the evidence on the distributional effects of crises is not uniform.

Figure 4.7. Inequality Versus Globalization: Selected Countries¹

(Change in indicators over last available 10 years; years indicated)

Changes in inequality do not have an obvious association with changes in trade or financial openness.



Sources: Lane and Milesi-Ferretti (2006); Povcal database; WIDER database; and IMF staff calculations.

¹Sample includes the 11 countries with the greatest increase in Gini coefficient over the period, and the 11 countries with the greatest decrease.

found that the strength of institutions plays a crucial role: in the context of strong institutions, financial globalization may allow better consumption smoothing and lower volatility for the poor, but where institutions are weak, financial access is biased in favor of those with higher incomes and assets and the increase in finance from tapping global and not just domestic savings may further exacerbate inequality.²³ Thus, the composition of financial flows may matter, and the net impact may also be influenced by other factors, such as the quality of financial sector institutions.

In summary, analytical considerations suggest that any empirical analysis of the distributional consequences of globalization must take into account both trade and the various channels through which financial globalization operates, and also account for the separate impact of technological change. Moreover, against the background of real-world patterns of trade and financial flows, theory does not provide clear guidance on whether globalization affects inequality in advanced and developing economies differently.

An Empirical Investigation of Globalization and Inequality

Despite common perceptions, casual observation does not suggest an obvious association between changes in inequality across countries and changes in the degree to which countries have globalized over the same period (Figure 4.7). But this is perhaps not surprising, given the multiple channels through which such a relationship would operate and the variety of other factors that are also relevant. This chapter thus looks closely at cross-country data, relating changes in inequality to a broad set of variables that may affect income distribution,

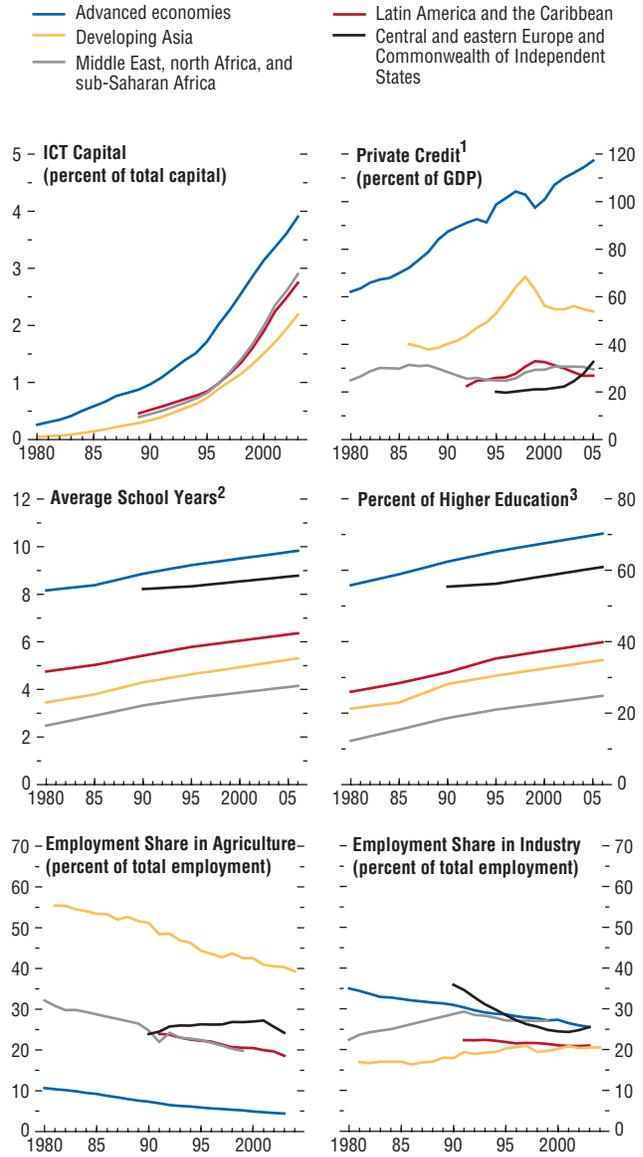
²³See Prasad and others (2007) for a discussion of lower volatility from financial globalization. While Demirgüç-Kunt and Levine (2007) argue that financial development is more positive for the poorest segment of the population, primarily through its positive effect on overall growth, Claessens and Perotti (forthcoming) find that the outcome can be different as most of the benefits of financial reforms are captured by a small elite.

including both variables that capture different aspects of globalization and other factors that can be important in determining how inequality changes in countries over time.

- One key factor is the role of technology. To the extent that technological change favors those with higher skills and exacerbates the “skills gap,” it could adversely affect the distribution of income in both developing and advanced economies by reducing the demand for lower-skill activities and increasing the premium for higher-skill activities and returns on capital (see, for example, Birdsall, 2005; and the April 2007 issue of the *World Economic Outlook*). Technological development is measured in this study by the share of information and communications technology (ICT) capital in the total capital stock, which has risen rapidly over the past 20 years across all regions (Figure 4.8).
- A second important variable is access to education. For a given level of technology, greater access to education would be expected to reduce income inequality by allowing a greater share of the population to be engaged in high-skill activities. Educational opportunities have tended to increase across all regions, but with considerable cross-country variation.
- A third factor affecting income distribution is the sectoral share of employment. In developing countries, a move away from the agricultural sector to industry could be expected to improve the distribution of income by increasing the income of low-earning groups.²⁴ In this context, greater flexibility in labor markets that facilitates a move away from low-return occupations to those where opportunities are better can also be expected to improve the distribution of income (see Topalova, 2007).
- Another important variable that affects inequality is financial development, measured as the ratio of private credit to GDP. As discussed in the previous section, even though

Figure 4.8. Information and Communications Technology (ICT) Capital, Private Credit, Education, and Sectoral Employment Shares

Globalization is only one of the factors that have affected inequality. Rapid technological change, financial deepening, improvements in education, and the shift of employment away from agriculture are other significant developments with potentially important implications for inequality.



Sources: Barro and Lee (2000); Beck, Demirgüç-Kunt, and Levine (2000); Jorgenson and Vu (2005); and IMF staff calculations.

¹Credit to the private sector by deposit money banks and other financial institutions.

²Average schooling years in total population 15 years and older.

³Percent of secondary school and higher education attained in total population 15 years and older.

²⁴Similarly, increases in the relative productivity of agriculture might be expected to reduce income disparities by increasing the income of those employed in this sector.

Table 4.1. Determinants of the Gini Coefficient, Full Sample*(Dependent variable: natural logarithm of Gini)*

	Summary Model (a)	Benchmark Model (b)	Sectoral Exports (c)	Sectoral Productivity (d)	Excluding Sectoral Employment Shares (e)
Trade globalization					
Ratio of exports and imports to GDP	-0.047 (1.50)				
Exports-to-GDP ratio		-0.057 (2.56)**		-0.048 (2.15)**	-0.056 (2.41)**
Agricultural exports			-0.03 (2.49)**		
Manufacturing exports			-0.002 (0.10)		
Service exports			-0.006 (0.38)		
100 minus tariff rate	-0.002 (2.27)**	-0.002 (2.52)**	-0.003 (2.71)***	-0.002 (2.61)***	-0.003 (2.50)**
Financial globalization					
Ratio of cross-border assets and liabilities to GDP	0.022 (1.24)				
Ratio of inward FDI stock to GDP		0.04 (3.01)***	0.038 (3.06)***	0.035 (2.57)**	0.039 (2.96)***
Capital account openness index	0.002 (0.36)				
Control variables					
Share of ICT in total capital stock	0.047 (2.79)***	0.031 (1.98)**	0.027 (1.62)	0.030 (2.03)**	0.033 (2.01)**
Credit to private sector (percent of GDP)	0.06 (3.74)***	0.051 (3.49)***	0.049 (3.81)***	0.050 (3.54)***	0.042 (3.06)***
Population share with at least a secondary education	0.005 (2.02)**	0.003 (1.47)	0.002 (0.77)	0.004 (1.82)*	0.004 (2.08)**
Average years of education	-0.355 (1.91)*	-0.216 (1.20)	-0.182 (1.00)	-0.328 (1.84)*	-0.359 (1.91)*
Agriculture employment share	0.04 (1.67)*	0.05 (2.05)**	0.052 (2.21)**		
Industry employment share	-0.091 (2.40)**	-0.095 (2.78)***	-0.098 (2.26)**		
Relative labor productivity of agriculture				-0.037 (1.67)*	
Relative labor productivity of industry				0.128 (3.03)***	
Observations	288	288	284	279	288
Adjusted <i>R</i> -squared (within)	0.26	0.3	0.31	0.32	0.27

Source: IMF staff calculations.

Note: See Appendix 4.1. Heteroscedasticity-robust *t*-statistics are in parentheses; * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level. All explanatory variables are in natural logarithm, except the tariff measure, the capital account openness index, and the population share with at least a secondary education. The left- and right-hand-side variables are de-measured using country-specific means (equivalent to doing a panel estimation with country fixed effects), and the equations include time dummies. The equations are estimated by ordinary least squares. FDI = foreign direct investment; ICT = information and communications technology.

financial development may reduce income inequality by increasing access to capital for the poor, this depends on the quality of institutions in a given country. In the context of weak institutions, the benefits of financial deepening may accrue disproportionately to

the rich, further exacerbating initial inequality in access to finance.

The first stage of the empirical investigation looks at the relationship between summary measures of trade and financial openness and income inequality. This is followed by a

more disaggregated analysis of the relationship between various components of trade and financial openness and inequality. Other explanatory variables included in the estimations are the share of ICT in a country's total capital stock, credit to the private sector, the average number of years of education and its distribution, and the share of employment in agriculture and industry. The analysis focuses on changes in inequality over time and controls for differences in levels across countries, using country fixed effects.²⁵ The model is estimated on a panel of 51 countries (of which 31 are emerging market and developing countries) over the period 1981–2003, with additional tests that split the sample between advanced and developing economies.²⁶

The results indicate that the main factor driving the recent increase in inequality across countries has been technological progress. Based on the benchmark model, which is described in more detail in Appendix 4.1, technological progress alone explains most of the 0.45 percent average annual increase in the Gini coefficient from the early 1980s (Table 4.1, column b; and Figure 4.9).²⁷ Trade and financial globalization and financial deepening

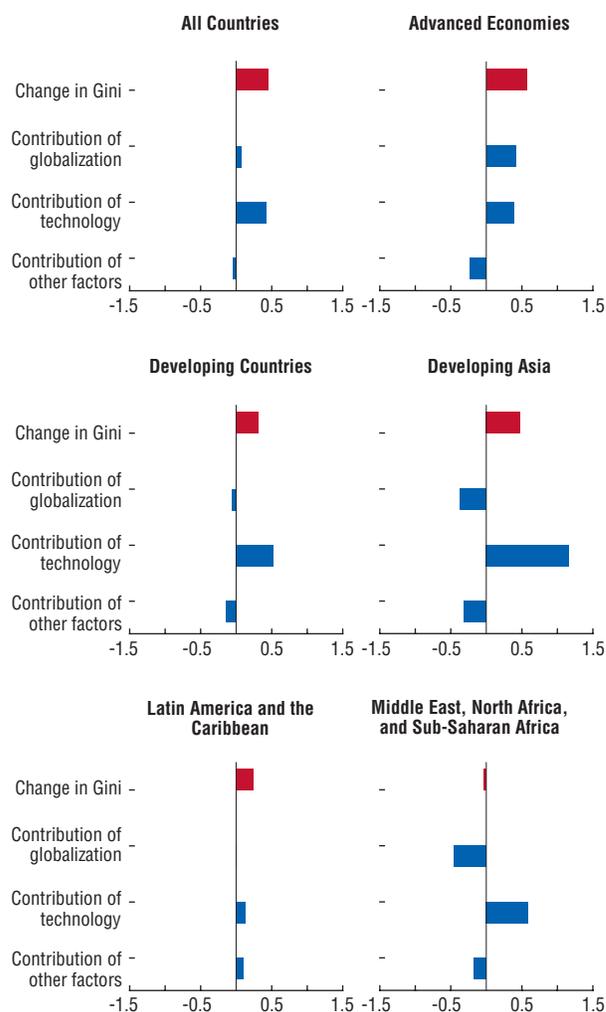
²⁵An additional advantage of focusing on within-country variation is to reduce the risk of omitted variable bias. The impact of common global shocks such as business cycles or growth spurts is excluded using time dummies.

²⁶Since income and consumption surveys are not conducted annually, the estimations use an unbalanced panel with observations included only for years for which actual data are available. Moreover, given the smaller size of the samples for advanced and developing economies, the results on these subgroups are more tentative.

²⁷The results are robust to including changes in GDP per capita as an explanatory variable. However, this variable was excluded in the reported estimations in order to estimate the full effects of the variables of interest, including their effect through higher overall growth. Other possible explanatory variables (democracy, constraints on the executive, flexibility of regulations, real exchange rate, and terms of trade) were initially included, but their effects were not robustly estimated. Comprehensive data on government social spending and transfers, migration, and remittances were not available across all countries, although these channels may potentially have important additional effects on the observed inequality outcomes.

Figure 4.9. Explaining Gini Coefficient Changes^{1,2}
(Average annual percent change)

The disequalizing effect of globalization was larger in advanced economies, in part because of outward foreign direct investment, while in developing countries, and especially in developing Asia, technological change was the main contributor to the rise in inequality.



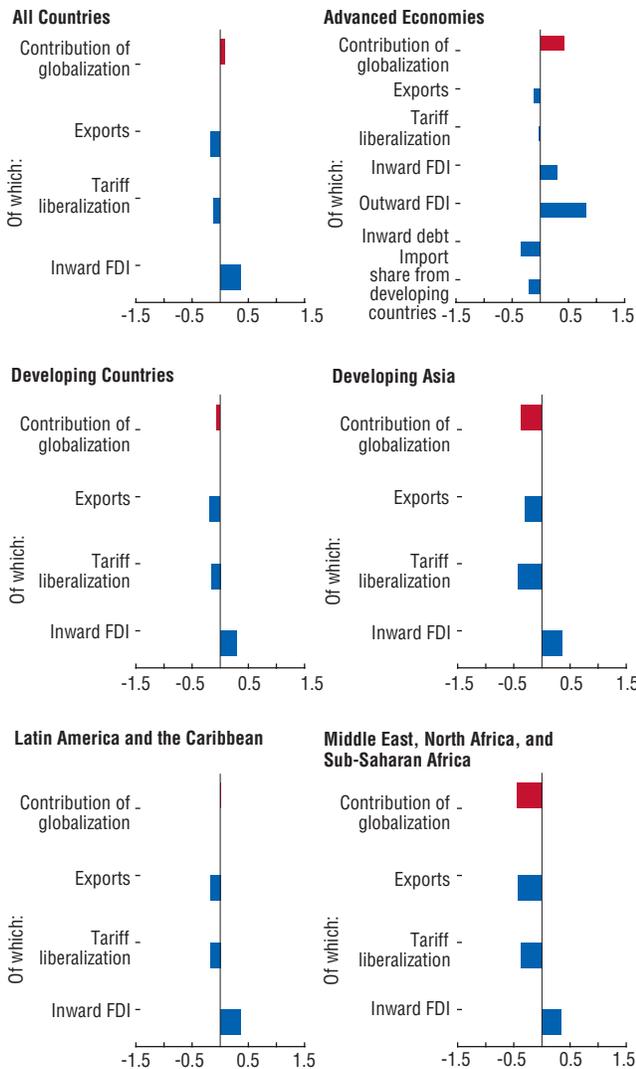
Source: IMF staff calculations.

¹1981–2003 or longest subperiod for which all variables used in the regression are available. The contribution of each variable is computed as the average annual change in the variable times the regression coefficient on the variable (see Appendix 4.1). For the “All countries” panel, regression coefficients are taken from the full sample estimation in column (b) of Table 4.1. For the country group panels, regression coefficients are taken from Table 4.3, which provides group-specific estimates of the coefficients.

²See Figure 4.10 for the composition of the contribution of globalization. The contribution of other factors is the sum of the contributions of the ratio of credit to private sector to GDP, the education variables, the sectoral employment shares, and the residual.

Figure 4.10. Decomposition of Globalization Effects on Inequality¹
(Average annual percent change)

Trade globalization has exerted an equalizing impact, while financial globalization, and foreign direct investment (FDI) in particular, has been associated with widening income disparities.



Source: IMF staff calculations.
¹1981–2003 or longest subperiod for which all variables used in the regression are available. The contribution of each variable is computed as the average annual change in the variable times the regression coefficient on the variable (see Appendix 4.1). For the “All countries” panel, regression coefficients are taken from the full sample estimation in column (b) of Table 4.1. For the country group panels, regression coefficients are taken from Table 4.3, which provides group-specific estimates of the coefficients.

contributed a further 0.1 percent a year each to raising the Gini coefficient, offset by almost equivalent reductions in the Gini coefficient from increased access to education and a shift of employment away from agriculture.²⁸ The small net negative impact of globalization on inequality is a result of the opposing influences of different components of globalization: trade globalization has exerted an equalizing impact, whereas financial globalization (and FDI in particular) has been associated with widening income disparities over the period examined in this study (Figure 4.10).²⁹

An analysis using more disaggregated data and estimating the regression coefficients for advanced and developing economies separately suggests that the impact of globalization on inequality varies across country groups. Among advanced economies, globalization has contributed somewhat more than technology to the 0.6 percent average annual increase in the Gini coefficient over the past two decades. Among developing countries, however, technology has been the main driving factor in the 0.3 percent annual average increase in the Gini coefficient; by contrast, globalization provided a small counterweight. These differences can be explained by changes in the channels of globalization across these two groups, with financial globaliza-

²⁸The regression coefficient on education is imprecisely estimated in the benchmark model, a common problem in macroeconomic studies on the effect of education. However, microeconomic studies have generally been more successful in establishing the returns from investment in education, particularly for countries with lower per capita income and for primary education (see Psacharopoulos and Patrinos, 2004). The education variables applied in the regressions are from Barro and Lee (2000), as explained in Appendix 4.1.

²⁹The reported results were confirmed for robustness in several ways. In order to address concerns that inequality may itself influence globalization variables, the export-to-GDP ratio and the ratio of the inward stock of FDI to GDP were instrumented using their lagged value, the export-weighted real GDP of trade partners (a measure of the demand for the country’s exports), and an (inverse) distance-weighted sum of advanced economies’ FDI assets (a measure of the supply of FDI). The results proved robust to endogeneity as well as to dropping one country at a time from the sample.

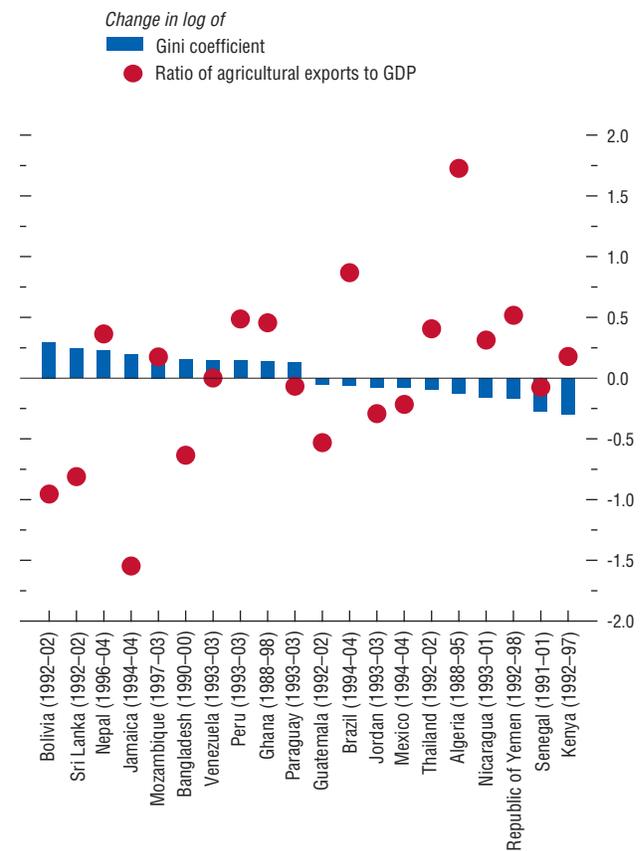
tion having expanded much more rapidly in advanced economies, and trade globalization having expanded more rapidly in developing economies.

Looking at the results in more detail, the positive effect of trade on reducing income inequality is particularly noticeable for agricultural exports, especially in developing countries where agriculture still employs a large share of the workforce (Table 4.1, column c).³⁰ Algeria, Brazil, Nicaragua, and Thailand are examples of countries where rising agricultural export shares have been associated with declining inequality—whereas the reverse has occurred in Bangladesh, Bolivia, Jamaica, and Sri Lanka (Figure 4.11). This conclusion is supported by evidence (see Table 4.1, column d) indicating that a rise in the relative productivity of agriculture is also associated with a reduction in inequality. A shift of underemployed agricultural workers away from agriculture to industry and services—which would raise the agricultural sector’s productivity relative to the average of the economy—also tends to reduce inequality. The net impact of tariff reduction is also found to be positive in reducing income inequality.

For advanced economies, imports from developing countries are associated with a reduction in inequality.³¹ This would be explained through the substitution of lower-paying low-end manufacturing jobs in advanced economies with higher-paying service sector jobs such as in retail.³² A second channel could be that as noncompeting imported goods become more easily available at a lower price, the effective income of the poorer segment of the population in advanced economies rises if such goods are a

Figure 4.11. Inequality Versus Exports in Agriculture
(Change in log of indicators over last available 10 years; years indicated)

Growth in agricultural exports has contributed to reducing inequality in developing countries where agriculture still employs a large share of the workforce.



Sources: Povcal database; WIDER database; World Bank, World Development Indicators database (2007); and IMF staff calculations.

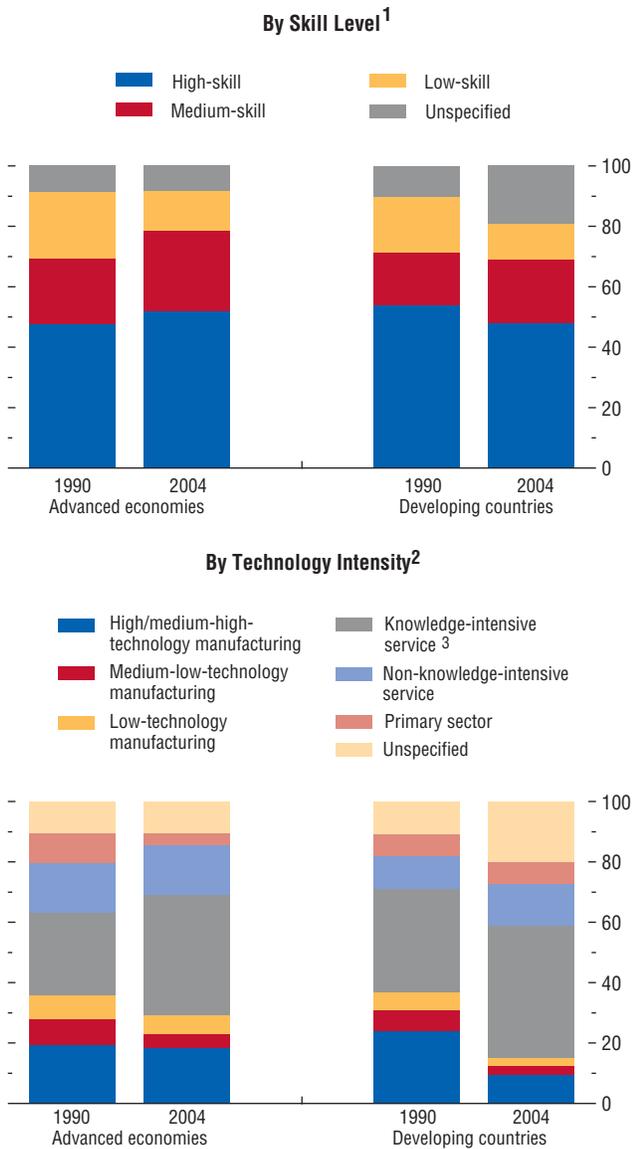
³⁰The effects of agriculture, manufacturing, and service exports are statistically not significantly different from one another, but agricultural exports have the largest coefficient and are statistically significant.

³¹See Table 4.3 in Appendix 4.1 for econometric estimations.

³²See Overholt (2003) for a discussion of substitution between manufacturing and service sector jobs in the United States.

Figure 4.12. Foreign Direct Investment Stock by Sector
(Share of total inward foreign direct investment stock)

The composition of inward foreign direct investment in both advanced economies and developing countries has been more concentrated in the high-skill sectors, including high/medium-high-technology manufacturing and the knowledge-intensive service sector.



Sources: UNCTAD, *World Investment Report 2006*; and IMF staff calculations.
¹Skill level as defined in Appendix 5.1 in the *World Economic Outlook* (April 2007).
²Technology intensity as defined by the Organization for Economic Cooperation and Development.
³Includes finance; business activities; education; health and social services; and transport, storage, and communications.

greater share of their consumption than for the richer segment.³³

Financial globalization, and especially FDI, appears to be associated with higher inequality. While it is inward FDI that exacerbates inequality in developing countries, in advanced economies there is an additional negative effect from outward FDI. This finding is consistent with evidence that FDI tends to take place in more skill- and technology-intensive sectors (from the point of view of the host country), increasing the relative demand for skilled workers in both advanced and developing economies (Figure 4.12). This is, however, an average effect over the sample period. The impact of FDI can be expected to vary by sector and dissipate over time as workers acquire skills and education.

The finding that investment in technological advances has a disequalizing impact is consistent with the view that new technology, in both advanced and developing economies, increases the premium on skills and automates relatively low-skill inputs (see Birdsall, 2007). Just as FDI increases the rewards for higher-value-added activities, technological progress also creates greater demands for those with higher skills. In advanced economies, the use of technology is widespread in both manufacturing and services, raising the skills premium in a substantial portion of the economy. Among developing countries, the effect of technological progress is stronger in Asia than in Latin America, possibly reflecting the greater share of technology-intensive manufacturing in Asia (Figure 4.13). Despite the distinct and separate effect of technology on inequality that is found in the data, it remains important to keep in mind that the spread of technology and increasing globalization are not independent—technological advances have helped deepen trade and financial linkages between countries, while globalization has helped spread the use of technology.

³³Income-based Gini coefficients often do not use different price deflators for rich and poor segments and are thus typically not able to capture this effect.

The evidence that domestic financial deepening adversely affects inequality is consistent with the notion that although overall financial depth is associated with higher growth, a disproportionately larger share of financial flows accrues to those with higher endowments and income that can serve as collateral.³⁴ As a result, the already better-off segments of the population are better able to invest in human and physical capital and increase their income.

To gain further insight into the impact of globalization on inequality, the empirical model was also estimated using the income shares of the five quintiles of the population as dependent variables (Table 4.2). Most of the results from the preceding analysis are confirmed, although the estimates at the quintile level are less precise for tariff liberalization and technological progress. In line with the changes observed in the income shares of quintiles (see Figure 4.4), the effects on the bottom four quintiles are qualitatively similar and in the opposite direction from that on the richest quintile.

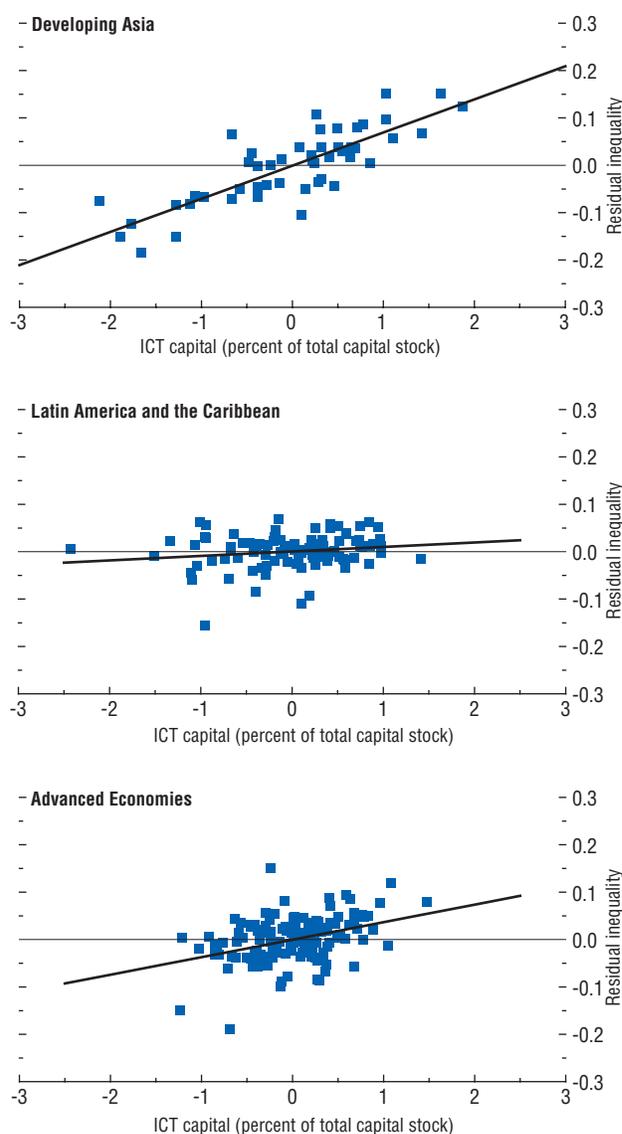
Export growth is associated with a rise in the income shares of the bottom four quintiles and a decrease in the share of the fifth (that is, the richest) quintile. Similarly, a reduction in the share of agricultural employment (which raises the sector's productivity of labor) is also associated with a rise in the income share of the bottom four quintiles, whereas it has the opposite effect on the income share of the richest quintile. The benefits of tariff reduction are mostly concentrated in the income shares of the three bottom quintiles, offset by a decrease in the income share of the top quintile. In contrast, financial globalization, technological progress, and greater financial deepening benefit mainly the income share of the richest 20 percent of the population.

Across the whole sample of countries, technological progress is seen to be the main driver

³⁴There was no evidence of a threshold effect by income level for this result, suggesting that the type of financial system—that is, based on relationship or arm's-length transaction—may be a more important determinant of equality of access to finance (see the September 2006 issue of the *World Economic Outlook*).

Figure 4.13. Inequality and Technology, 1981–2003¹

Partial correlations by country group suggest that the disequalizing impact of technology was particularly strong in Asia, and was less powerful in Latin America and the Caribbean.



Source: IMF staff calculations.

¹Correlation between information and communications technology (ICT) capital and residual inequality (i.e., inequality not explained by other regressors), based on the regression in column (b) of Table 4.3, allowing a specific coefficient on this variable for each country group (see Appendix 4.1).

Table 4.2. Estimation of the Benchmark Model Using Quintiles' Income Shares, Full Sample
(Dependent variable: income share of the quintile)

	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Test All Coefficients Equal to Zero (p -value)
Exports-to-GDP ratio	0.439 (2.47)**	0.631 (3.52)***	0.690 (3.68)***	0.492 (2.58)***	-2.220 (3.57)***	0.02**
100 minus tariff rate	0.021 (2.16)**	0.020 (2.04)**	0.017 (1.67)*	0.013 (1.32)	-0.070 (2.12)**	0.28
Ratio of inward FDI stock to GDP	-0.400 (3.91)***	-0.385 (3.74)***	-0.326 (3.02)***	-0.163 (1.48)	1.241 (3.47)***	0***
Share of ICT in total capital stock	-0.177 (1.32)	-0.223 (1.65)*	-0.218 (1.54)	-0.207 (1.44)	0.830 (1.77)*	0.59
Credit to private sector (percent of GDP)	-0.373 (3.30)***	-0.625 (5.47)***	-0.709 (5.94)***	-0.437 (3.59)***	2.136 (5.39)***	0***
Population share with at least a secondary education	-0.035 (1.76)*	-0.025 (1.26)	-0.028 (1.31)	-0.003 (0.16)	0.094 (1.35)	0.14
Average years of education	1.844 (1.11)	1.041 (0.62)	1.020 (0.58)	0.128 (0.07)	-3.99 (0.69)	0.80
Agriculture employment share	-0.460 (1.76)*	-0.789 (2.98)***	-0.981 (3.55)***	-0.568 (2.02)**	2.777 (3.02)***	0***
Industry employment share	1.081 (3.07)***	0.866 (2.43)**	0.603 (1.62)	0.084 (0.22)	-2.623 (2.12)**	0.09*
Observations	271	271	271	271	271	
R-squared (within)	0.34	0.36	0.33	0.18	0.35	

Source: IMF staff calculations.

Note: See Appendix 4.1. t -statistics are in parentheses; * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level. All explanatory variables are in natural logarithm, except the tariff measure and the population share with at least a secondary education. The left- and right-hand-side variables are de-measured using country-specific means (equivalent to doing a panel estimation with country fixed effects), and the equations include time dummies. The equations are estimated jointly using the seemingly unrelated regressions estimator. FDI = foreign direct investment; ICT = information and communications technology.

of the fall in the income share of the bottom quintile and the rise of the income share of the top quintile (Figure 4.14). Globalization has contributed only moderately to net changes in income shares because the beneficial effects of export growth and tariff reductions for all but the richest quintile have substantially offset the disequalizing impact of inward FDI. Although the income shares of the four bottom quintiles have declined overall, it is important to note that the average levels of income within these quintiles have been rising, as technological progress, financial deepening, and globalization have been important drivers of overall growth (see Figures 4.5 and 4.6).³⁵ Average income levels in

the bottom four quintiles have, however, grown at a lower rate than in the top quintile. The important exceptions to this general pattern are sub-Saharan Africa and the Commonwealth of Independent States.³⁶ In these regions, income levels in the lower quintiles have grown faster than for the top quintile.

Conclusions and Policy Implications

Inequality has been rising in countries across all income levels, except those classified as low income. Underlying these trends, the income share of the richest quintile has risen, whereas

³⁵See IMF (2007) for an analysis of the positive effects of financial globalization on growth, and Levine (2004) for a survey of research concluding that financial deepening has a positive impact on growth.

³⁶Available evidence suggests that rising exports and tariff liberalization have been the major factor contributing to the reduction in inequality observed in sub-Saharan Africa, offset partially by the effect of technology and, to a lesser extent, FDI (see Figures 4.9 and 4.10).

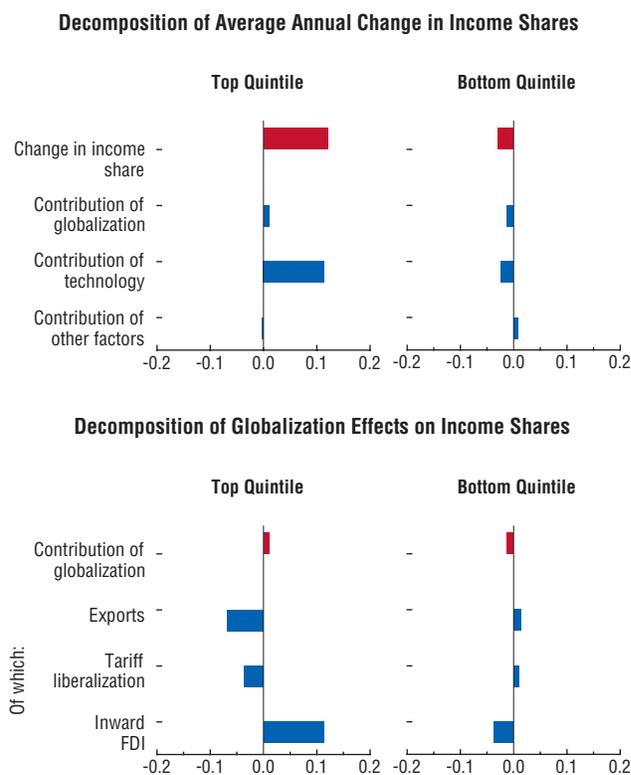
the shares of the remaining quintiles have declined. This chapter finds that, subject to the limitations imposed by the availability of data, technological progress has made the biggest contribution to rising income inequality over the past two decades. Globalization has had a much smaller disequalizing impact overall, reflecting the offsetting positive impact of trade globalization and a negative impact from FDI. In advanced economies, rising imports from developing countries are associated with declining income inequality, whereas in developing economies, both rising agricultural exports and tariff liberalization have contributed to improving income distribution. Foreign direct investment has on average had a disequalizing impact on the distribution of income over the sample period, as higher FDI inflows have increased the demand for skilled labor, whereas outward FDI in advanced economies has reduced the demand for relatively lower-skilled workers in these countries. Among other factors, financial deepening has also had a moderately negative impact on income distribution, whereas greater access to education and a shift in employment from agriculture to industry and services have supported improved distribution of income.

Thus, contrary to popular concerns, trade globalization is not found to have a negative impact on income distribution in either developing or advanced economies. Moreover, the positive role found for agricultural exports in improving distributional outcomes suggests the importance of reforms in developing countries to support growth of this sector. At the same time, greater liberalization of access for agricultural exports from developing countries to advanced economies' markets would support a more equal distribution of income in both developing and advanced economies.

Although FDI is associated with greater income inequality over the period of this study, it is associated with higher growth overall, and the result basically reflects an increase in the returns from acquiring higher skills. The impact of FDI may also vary by sector. Nevertheless, it might be expected that over a longer time

Figure 4.14. Explaining the Change in Income Share of Top and Bottom Quintiles^{1,2}
(Average annual change, in percentage points)

Across all countries, technological progress is the main driver of the fall in the income share of the bottom quintile and of the rise in the income share of the top quintile.



Source: IMF staff calculations.

¹1981–2003 or longest subperiod for which all variables used in the regression are available. The contribution of each variable is computed as the average annual change in the variable times the regression coefficient on the variable (see Appendix 4.1). Regression coefficients are taken from Table 4.2.

²The contribution of globalization is the sum of the contributions of the export-to-GDP ratio, the tariff rate, and the ratio of inward FDI stock to GDP. The contribution of other factors is the sum of the contributions of the ratio of credit to private sector to GDP, the education variables, the sectoral employment shares, and the residual.

horizon, the disequalizing effects of FDI will dissipate as the increased demand for education and skills is met with improved supply.³⁷ The appropriate policy response is therefore not to suppress FDI or technological change, but to make increased access to education a priority. This would allow less-skilled and low-income groups to capitalize on the opportunities from both technological progress and the ongoing process of globalization, thereby shortening the length of time over which FDI has a disequalizing impact.

Finally, financial deepening in and of itself increases growth, but appears to have a disequalizing impact because of the unequal access to finance between rich and poor segments of the population. Policy reforms aimed at broadening access to finance, such as by improving institutions that promote pro-poor lending, could help improve the overall distribution of income, even as finance broadly continues to support overall growth.

The analysis presented in this chapter suggests that there are some common factors that can explain the broad patterns of inequality across countries and regions. However, individual country circumstances vary. The substantial literature analyzing inequality in individual countries underscores the need to understand the regional and sectoral dimensions of inequality and its relationship with globalization, and individual country circumstances with respect to the structure of the economy. Policies will therefore need to be calibrated to specific country circumstances to ensure that the maximum benefits of globalization for growth and poverty reduction can be realized.

Appendix 4.1. Data Sources and Methods

The main authors of this appendix are Florence Jaumotte, Stephanie Denis, and Patrick Hettinger.

³⁷Evidence for the temporary nature of the disequalizing effects of FDI for Latin America is presented in Behrman, Birdsall, and Székely (2003).

Variable Definitions and Data Sources

This section provides further details on the construction of the variables and the data sources used in this chapter. The data cover 143 countries during 1980–2006, with the number of observations varying by country and variable.

Gini Index and Quintile Income Shares

The primary source for the Gini index (also known as the Gini coefficient) and income share data (referring to individual inequality, unless mentioned otherwise) is the World Bank Povcal database. For Mexico and Poland, the consumption-based Gini indices and quintile income shares were extrapolated historically for the period prior to 1992—for which only income-based measures are available—by assuming that the changes in consumption-based measures are identical to the observed changes in income-based measures that are available for that period. A similar process was applied to Peru's data prior to 1990, applying the changes in the observed consumption-based measures for earlier years to the income-based Gini index available from 1990 onward. For Argentina and Uruguay, the data cover only urban areas because of the high rate of urbanization in these two countries. For China and India, data with full country coverage (combining urban and rural data from the World Bank Povcal database) were provided by Shaohua Chen of the World Bank.³⁸

When Povcal data were not available (mainly for advanced economies), the data from the Luxembourg Income Study were used, as provided in the World Income Inequality Database, Version 2.0b, May 2007 (WIDER). These data are mostly available only until 2000. The following other sources were also used to increase coverage for advanced economies: data for Australia are from the Australian Bureau of Statistics; data for Germany are from the Deutsches Institut für

³⁸The Gini indices for China and India account for the difference in cost of living between rural and urban areas, whereas the income shares for these two countries do not.

Wirtschaftsforschung; data for France are from the European Commission; household inequality data for Hong Kong SAR are from the Hong Kong Census and Statistics; household inequality data for Singapore are from Ong Whee Sze (2002); household Gini index data for Japan are from Shirahase (2001); income share data for Japan measuring household consumption inequality and excluding agricultural households are from the Family Income and Expenditure Survey provided by the Japanese Statistics Bureau (all included in WIDER); and household inequality data for Korea were provided by Professor Kyungsoo Choi of the Korea Development Institute.

These data were interpolated to create regional and income group averages in the figures, and the regressions used only actual observations.³⁹

Per Capita Income per Quintile

Average income for quintiles is calculated using the quintile income-share data and real GDP per capita (in 2000 international dollars, chain-series) from the Penn World Tables Version 6.2, by Heston, Summers, and Aten (2006). Quintile income shares are multiplied by the GDP per capita variable and multiplied by 5 to arrive at the average income per quintile, as follows:

$$\frac{Y_1}{Pop_1} = \left(\frac{Y_1}{Y} \right) \left(\frac{Y}{Pop} \right) \left(\frac{1}{0.2} \right),$$

where Y_1 denotes the total income of quintile 1, Pop_1 is population in quintile 1, Y is

³⁹The data for some advanced economies were extended for the purpose of the charts. For Germany, the Gini index was extended prior to 1992 using trends in West German data. For France, the Gini index was extended prior to 1994 using trends from LIS data. For the United States, trends after 2000 were based on earnings data from the Current Population Survey for full-time, year-round workers. For Great Britain, trends after 1999 were extended using data from the Institute for Fiscal Studies. For Italy, trends after 2000 were extended using data from Brandolini (2004). For Japan, a longer Gini index series was used from the National Survey of Family Income and Expenditure.

economy-wide income, and Pop is economy-wide population.

Trade Globalization

De facto trade openness is calculated as the sum of imports and exports of (non-oil) goods and services over GDP. The data are from the World Economic Outlook database (April 2007). Sectoral trade data on agriculture, manufacturing, and services are from the World Bank's World Development Indicators database (April 2007).

De jure trade openness is calculated as 100 minus the tariff rate, which is an average of the effective tariff rate (tariff revenue/import value) and of the average unweighted tariff rate. The data are from a database prepared by IMF staff. Each component of the implied 100 minus tariff rate is interpolated linearly for countries with data gaps less than or equal to seven missing observations between 1980 and 2004. When data for either component (the effective tariff rate or the average unweighted tariff rate) are shorter than for the other, the shorter series is extrapolated using the growth rate of the longer series.⁴⁰ Finally, for countries with only one of the two components, only the available one is used.

Financial Globalization

De facto financial openness is calculated as the sum of total cross-border assets and liabilities over GDP. Data on financial globalization are from the "External Wealth of Nations Mark II" created by Lane and Milesi-Ferretti (2006). The components of de facto financial openness in percent of GDP include (for both assets and liabilities) (1) FDI, (2) portfolio equity, (3) debt, (4) financial derivatives, and (5) total reserves minus gold (assets only).

De jure financial openness refers to the capital account openness index (KAOPEN) from

⁴⁰For some countries, longer data were available for the ratio of trade revenue to trade value (which covaried closely with the other two measures), and these were used to extend the effective tariff rate and/or the average unweighted tariff rate.

Chinn and Ito (2006). The index is based on principal components extracted from disaggregated capital and current account restriction measures in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.

Capital Stock and ICT Capital

Fajnzylber and Lederman (1999) is the source of the capital stock series for the entire economy. This data set extends the capital stock series estimated by Nehru and Dhareshwar (1993) by adding the annual flow of gross fixed capital formation and assuming a 4 percent depreciation rate of the preexisting stock of capital. Fajnzylber and Lederman (1999) was further updated to recent years using the same methodology.

Jorgensen and Vu (2005) provides series on IT investment using national expenditure data for computer hardware, software, and telecommunications equipment. A perpetual inventory method applies varying depreciation rates to estimate the IT capital stock. This method assumes a geometric depreciation rate of 31.5 percent and a service life of seven years for computer hardware, 31.5 percent and five years for software, and 11 percent and 11 years for telecommunications equipment.

Private Credit

Each country's financial depth is estimated by its ratio of credit to the private sector by deposit money banks and other financial institutions to GDP. The source is the Financial Structure database prepared by Beck, Demirgüç-Kunt, and Levine (2000) and revised in March 2007. Data for China are based on IMF staff calculations.

Education

Data on educational attainment of the population ages 15 and older are from the Barro-Lee (2000) data set. The series used are the average schooling years in the population, and the share of the population with secondary and/or higher education. For the years between 1980 and 2000, the data (available every five years) are interpolated linearly for

each country, and for the years 2001–06, the data are extrapolated linearly.

Sectoral Employment

Data on employment shares in agriculture and industry are from the World Bank's World Development Indicators database (April 2006). The shares are interpolated linearly for countries with data gaps of seven or fewer missing observations between 1980 and 2005. For Bolivia, data are from the International Labor Organization's LABORSTA database for 1988–2001 and from the Instituto Nacional de Estadística for 2002–05. For Ecuador, data for 1988–2005 are from the International Labor Organization's LABORSTA database. For Morocco, data for 1999–2002 are from the Direction de la Politique Economique Générale. For Paraguay, data for 1991–2005 are from the Departamento de Cuentas Nacionales y Mercado Interno, Gerencia de Estudios Económicos. For China, data for 1980–2004 are from the National Bureau of Statistics. For India, data for 1980–2004 are taken from the National Sample Survey Organisation. For Taiwan Province of China, data for 1980–2005 are from the CEIC database.

Aggregations by Region and Income Level

Charts showing aggregates by region and income level use the following:

- the *World Economic Outlook* analytical classification, as listed in Table F of the Statistical Appendix; and
- the classification by income from the World Bank's World Development Indicators database (April 2007). The economies are divided among income groups according to 2005 gross national income per capita, calculated using the World Bank Atlas method. The groups are low income, \$875 or less; lower-middle income, \$876–\$3,465; upper-middle income, \$3,466–\$10,725; and high income, \$10,726 or more. Taiwan Province of China is included in the high-income group. In regional and income group averages, a maximum number of countries was included in

each group, subject to data availability and to the constraint that country coverage is uniform throughout the period.⁴¹ Countries with fewer than 1 million people in 2006 were dropped from the sample.

In Figures 4.1 and 4.2 relative trade and financial openness are measured by taking the ratio to the median across all countries for each year and the ratio to maximum across all countries in 2004 for financial openness and 2006 for trade openness. To avoid discontinuity in country coverage over time, it is assumed in the calculation of the median that in the 1980s and early 1990s, trade openness for countries in the former Soviet Union equaled Russia's trade openness, and that these countries were financially closed.

Econometric Methodology

The model relates the Gini index to measures of globalization and a number of control variables, chosen based on a review of the literature in this area. The following equation is adopted as the basic specification for the analysis:

$$\begin{aligned} \ln(GINI) = & \alpha_1 + \alpha_2 \ln\left(\frac{X+M}{Y}\right) + \alpha_3(100 - TARIFF) \\ & + \alpha_4 \ln\left(\frac{A+L}{Y}\right) + \alpha_5 KAOPEN \\ & + \alpha_6 \ln\left(\frac{K_{ICT}}{K}\right) + \alpha_7 \ln\left(\frac{CREDIT}{Y}\right) \end{aligned}$$

⁴¹For example, in the inequality charts, the approximate population represented for each region is 93 percent in advanced economies excluding NIEs (77 percent for income share and income per capita charts); 92 percent in NIEs (87 percent for income share and income per capita charts); 94 percent in Latin America and the Caribbean; 63 percent in sub-Saharan Africa; 90 percent in central and eastern Europe; 92 percent in the Commonwealth of Independent States; 57 percent in the Middle East and North Africa; and 94 percent in developing Asia. The approximate population represented in each income group is as follows: 91 percent in the high-income group (84 percent for income share and income per capita charts); 82 percent in the upper-middle-income group; 87 percent in the lower-middle-income group; and 79 percent in the low-income group. For the global indicator, approximately 82 percent of the world population is represented.

$$\begin{aligned} & + \alpha_8 POPSH + \alpha_9 \ln H + \alpha_{10} \ln\left(\frac{E_{AGR}}{E}\right) \\ & + \alpha_{11} \ln\left(\frac{E_{IND}}{E}\right) + \varepsilon, \end{aligned}$$

where X and M are non-oil exports and imports, Y is GDP, $TARIFF$ is the average tariff rate, A and L are cross-border financial assets and liabilities, $KAOPEN$ is the capital account openness index, K_{ICT} is ICT capital, K is capital, $CREDIT$ is credit to the private sector by deposit money banks and other financial institutions, $POPSH$ is the share of population ages 15 and older with secondary or higher education, H is average years of education in the population ages 15 and older, E_{AGR} and E_{IND} are employment in agriculture and industry, and E is total employment. This summary model is then augmented by disaggregating into finer components the summary measures of de facto trade and financial globalization. The component model makes a distinction between non-oil exports and imports for trade globalization, while allowing different effects of various categories of financial liabilities (FDI, portfolio equity, and debt) and of the stock of FDI assets. The latter, which is closely associated with offshore outsourcing, may be particularly relevant to measure the impact of globalization on inequality in advanced economies, whereas its value is minimal for most emerging market and developing countries.

For the estimation, the left- and right-hand-side variables are de-meaned using country-specific means in order to focus on within-country changes instead of cross-country-level differences (this is equivalent to doing a panel estimation with fixed country effects). Time dummies are also introduced to capture common global shocks. The model is estimated using ordinary least squares (OLS) with heteroscedasticity-consistent standard errors. Using the logarithm of the Gini index (rather than the Gini index itself) makes this bounded variable behave more like a normally distributed variable and hence makes it more amenable to OLS estimation. The robustness of the results

Table 4.3. Determinants of the Gini Coefficient, Regional Heterogeneity*(Dependent variable: natural logarithm of Gini)*

	Advanced Versus Developing Economies (a)	Regional Technology Effect (b)
Common model		
Exports-to-GDP ratio	-0.063 (2.23)**	-0.071 (3.17)***
100 minus tariff rate	-0.002 (2.24)**	-0.004 (3.53)***
Ratio of inward FDI stock to GDP	0.031 (2.28)**	0.041 (3.03)***
Share of ICT in total capital stock	0.035 (2.12)**	0.037 (2.11)**
Credit to private sector (percent of GDP)	0.058 (3.94)***	0.041 (3.29)***
Population share with at least a secondary education	0.001 (0.35)	0.002 (0.82)
Average years of education	-0.1 (0.54)	-0.124 (0.65)
Agriculture employment share	0.074 (2.59)**	0.052 (2.31)**
Industry employment share	-0.09 (2.23)**	-0.139 (3.96)***
Additional variables for advanced economies		
Share of imports from developing economies	0.018 (0.57)	
Share of imports from developing economies * dummy for advanced economies	-0.104 (2.20)**	
Ratio of inward debt stock to GDP	0.014 (0.78)	
Ratio of inward debt stock to GDP * dummy for advanced economies	-0.083 (2.65)***	
Ratio of outward FDI stock to GDP	0 (0.31)	
Ratio of outward FDI stock to GDP * dummy for advanced economies	0.069 (2.68)***	
Different regional technology effect		
Share of ICT in total capital stock * dummy for developing Asia		0.033 (1.99)**
Share of ICT in total capital stock * dummy for Latin America and the Caribbean		-0.028 (1.91)*
Observations	282	282
Adjusted <i>R</i> -squared (within)	0.32	0.35

Source: IMF staff calculations.

Note: Heteroscedasticity-robust *t*-statistics are in parentheses; * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level. All explanatory variables are in natural logarithm, except the tariff measure and the population share with at least a secondary education. The left- and right-hand-side variables are demeaned using country-specific means (equivalent to doing a panel estimation with country fixed effects), and the equations include time dummies. The equations are estimated by ordinary least squares. FDI = foreign direct investment; ICT = information and communications technology.

was also tested using a logistic transformation of the Gini index (making the variable completely unbounded). The sample of countries for which all variables used in the regressions were available consists of 51 countries, of which 20 are advanced economies and 31 are developing economies. Based on data availability, the following countries are included:

- advanced economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Korea, the Netherlands, Norway, Singapore, Spain, Sweden, the United Kingdom, and the United States; and
- developing economies: Argentina, Bangladesh, Bolivia, Brazil, Chile, China, Costa Rica, Ecuador, Egypt, El Salvador, Ghana, Guatemala, Honduras, India, Indonesia, the Islamic Republic of Iran, Kenya, Malaysia, Mexico, Pakistan, Panama, Paraguay, Peru, the Philippines, Sri Lanka, Thailand, Turkey, Uganda, Uruguay, Venezuela, and Zambia.

The results of the estimation using the full sample of advanced and developing economies are reported in the text. Three globalization variables have statistically significant effects on inequality: the ratio of non-oil exports to GDP, the indicator of tariff liberalization, and the ratio of FDI liabilities to GDP. The model, including these three variables as well as all the controls, is referred to as the benchmark model. As described in footnote 29 of the main text, the robustness of this specification was tested in various ways, including by instrumenting for the ratio of non-oil exports to GDP and the ratio of FDI liabilities to GDP.

Additional Results: Heterogeneity Across Country Groups

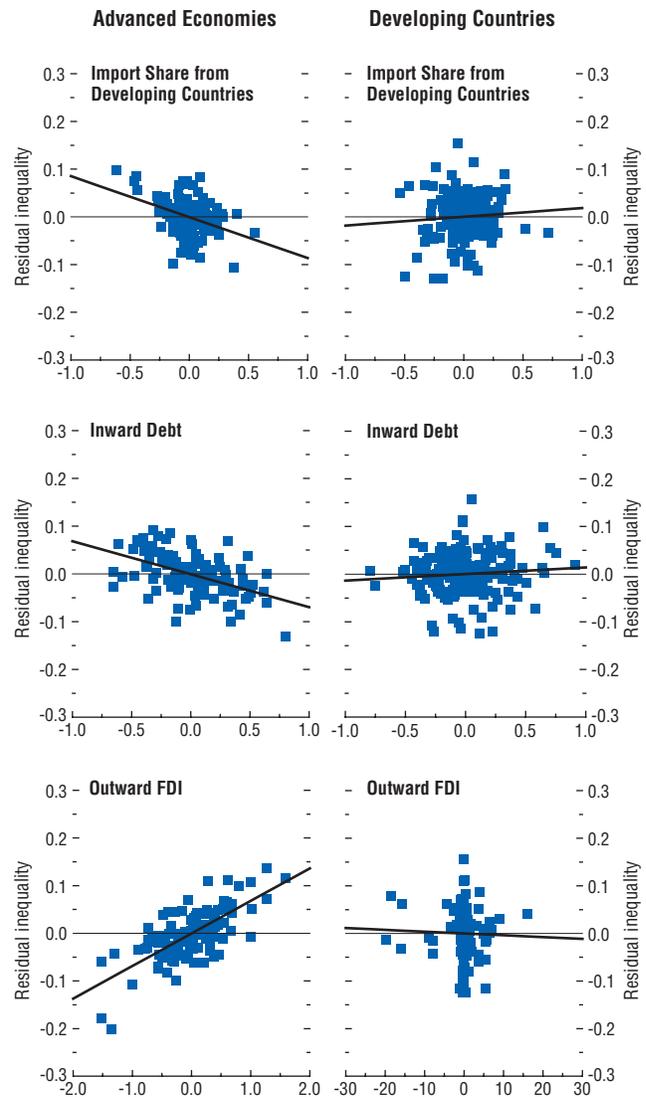
The analysis in this section explores the possibility of heterogeneous effects of globalization, technological progress, and other variables across country groups; the results are, however, more tentative, because the number of observations used for identification of group-specific effects is much smaller. The first obvious

distinction of interest is between advanced and developing economies, as defined in the *World Economic Outlook*. The starting model is the component model, described earlier, with an additional complexity: two additional variables are included that measure the share of exports destined for developing countries and the share of imports originating in these countries (this variable was not significant when the full sample was used). While maintaining common time dummies, interaction terms between the other regressors and a dummy for advanced economies are included to measure the difference between the effects for advanced economies and the estimated average effect for the full sample. A joint test that all the differences are zero is rejected, mostly as a result of different effects (for advanced and developing economies) of the ratio of FDI assets to GDP and, to a lesser extent, of the ratio of debt liabilities to GDP and the share of imports originating in developing countries (Table 4.3).⁴² While these three variables are insignificant for the full sample (and particularly for developing countries), they are significantly different from zero for advanced economies. The estimation indicates that FDI assets increase inequality in advanced economies, while debt and the share of imports from developing countries contribute to reduce it (Figure 4.15).

Another distinction of interest is between different developing regions: the two main developing regions represented in the sample are developing Asia and Latin America (only a few African and Middle Eastern countries are included because of data limitations). Due to the even smaller sample sizes involved for these subgroups, the estimation starts from the benchmark model and allows a differential impact by developing region (developing Asia, Latin America, and other) only for the globalization

⁴²The effects of exports, tariffs, and FDI liabilities on inequality are statistically insignificant for advanced economies; however, the hypothesis that these coefficients are not statistically significantly different from those for the full sample cannot be rejected.

Figure 4.15. Inequality, Import Share from Developing Countries, Inward Debt, and Outward Foreign Direct Investment (FDI), 1981–2003¹



Source: IMF staff calculations.

¹Correlation between the variable of interest (the share of imports from developing countries, inward debt, or outward FDI) and residual inequality (i.e., inequality not explained by other regressors), based on the regression in column (a) of Table 4.3, allowing a specific coefficient on these variables for each country group.

and technological progress variables. A joint test that all differences are zero is rejected, because of the different effect of technological progress in developing Asia and Latin America. The disequalizing effect of technological progress is stronger in Asia than on average in the full sample and weaker in Latin America (actually insignificantly different from zero) (see Table 4.3). This may reflect the greater share of technology-intensive manufacturing in Asia than in Latin America.

Partial Correlations and Decompositions of Gini Index Changes

The partial correlation between the Gini index and a variable X is the simple correlation between the variable X and residual inequality (that is, inequality not explained by other regressors, or the sum of the regression residual and the product of the variable X and its coefficient).

The contributions of the various factors to the change in the Gini index shown in the main text are calculated as the average annual change in the respective variable multiplied by the corresponding coefficient estimate. The averages across country groups are weighted by the number of years covered for each country, so that countries with a longer period of observation receive more weight in these averages.

Contributions for the full sample of countries (“All countries” panel of Figures 4.9 and 4.10) are based on the estimation of the benchmark model for the full sample of countries as reported in Table 4.1. Partial correlations and contributions for country groups use the estimates allowing coefficient heterogeneity across country groups as reported in Table 4.3.

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