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# Financial Globalization, Growth, and Volatility in Developing Countries

Eswar S. Prasad, Kenneth Rogoff, Shang-Jin Wei,  
and M. Ayhan Kose

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## 11.1 Introduction and Overview

The wave of financial globalization since the mid-1980s has been marked by a surge in capital flows among industrial countries and, more notably, between industrial and developing countries. While these capital flows have been associated with high growth rates in some developing countries, a number of countries have experienced episodic collapses in growth rates and significant financial crises over the same period, crises that have exacted a serious toll in macroeconomic and social costs. As a result, an intense debate has emerged in both academic and policy circles about the effects of financial integration on developing economies. But much of the debate has been based on only casual and limited empirical evidence.

The objective of this paper is to provide an assessment of empirical evidence on the effects of financial globalization for developing economies. The paper will focus on a couple of related questions: (a) does financial

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globalization promote economic growth in developing countries, and (b) what is its impact on macroeconomic volatility in these countries?

While this paper does not deal directly with poverty issues, its main subject—the effects of financial globalization on economic growth and volatility—has important indirect effects. First, as documented by several empirical studies, economic growth has been the most reliable source of poverty reduction. Moreover, in theory, there are several channels through which increased financial flows could help reduce poverty. As discussed later in the chapter, some of these channels are related to the growth-enhancing effects of increased financial flows. For example, augmentation of domestic savings, reduction in the cost of capital, increase in productivity through transfer of technological know-how, and stimulation of domestic financial-sector development could all provide direct growth benefits, which in turn should help reduce poverty.

Second, an increase in macroeconomic volatility tends to reduce the well-being of poor households. Recent empirical research finds that volatility has a significantly negative and causal impact on poverty (Laurson and Mahajan 2005). Why does macroeconomic volatility appear to be especially harmful for the poor? First, the poor have the least access to financial markets, making it difficult for them to diversify the risk associated with their income, which is often based on a narrow set of sources, including mainly labor earnings and government transfers. Second, since the poor rely heavily on various public services, including education and health, they are directly affected by changes in government spending. Given that fiscal policy is procyclical in most developing countries, this magnifies the negative impact of volatility on poverty, especially during financial crises. Moreover, the poor often lack necessary education and skill levels, which limits their ability to move across sectors in order to adjust to changes in economic conditions. As we discuss later in the chapter, in theory, increased trade and financial flows could help reduce macroeconomic volatility, which also could have beneficial effects for the poor (Aizenman and Pinto 2005).

The principal conclusions that emerge from our analysis of the macroeconomic effects of financial globalization are sobering but in many ways informative from a policy perspective. It is true that many developing economies with a high degree of financial integration have experienced higher growth rates. It is also true that, in theory, there are many channels by which financial openness could enhance growth. However, a systematic examination of the evidence suggests that it is difficult to establish a robust causal relationship between the degree of financial integration and output growth performance. Furthermore, from the perspective of macroeconomic stability, consumption is regarded as a better measure of well-being than output; fluctuations in consumption are therefore regarded as having a negative impact on economic welfare. There is little evidence that finan-

cial integration has helped developing countries to better stabilize fluctuations in consumption growth, notwithstanding the theoretically large benefits that could accrue to developing countries in this respect. In fact, new evidence presented in this paper suggests that low to moderate levels of financial integration may have made some countries subject to even greater volatility of consumption relative to that of output. Thus, while there is no proof in the data that financial globalization has benefited growth, there is evidence that some developing countries may have experienced greater consumption volatility as a result.

One must be careful, however, not to draw the inference from these results that financial globalization is inherently too risky and that developing countries should retreat into stronger forms of capital controls. First, as we discuss in an earlier, extended version of this paper (Prasad et al. 2003), empirical evidence supports the view that countries are considerably more likely to benefit from financial globalization when they take simultaneous steps—sometimes even modest ones—to improve governance, transparency, and financial-sector regulation. Second, it is almost surely the case that excessive reliance on fixed exchange rate regimes has been a major contributory factor to financial crises in emerging-market countries over the past fifteen years. Moving to more flexible exchange rate regimes is therefore likely to considerably alleviate some of the risks countries must endure as they become more financially globalized (for countries that are not financially globalized, fixed exchange rate regimes may be a perfectly good choice, as the empirical results in Rogoff et al. 2004 suggest). Third, countries that consistently face problems associated with government debt (referred to as “serial defaulters” by Reinhart and Rogoff 2004), are more likely to benefit from financial globalization if their governments simultaneously take measures to avoid an excessive buildup of debt.

It is also important to note that much of the analysis in this paper focuses on *de facto* rather than *de jure* financial globalization. This makes sense in an empirical paper since capital controls come in so many flavors, and enforcement varies so widely across countries, that cross-country empirical comparisons based on measures of *de jure* capital controls are extremely difficult to interpret. By contrast, *de facto* financial integration is not a variable that a country’s government can easily regulate. Although many countries have tight capital controls on paper, their degree of *de facto* financial globalization is nevertheless high because these controls can be easily evaded in practice. This problem is almost surely exacerbated by the kind of domestic financial liberalizations that many countries have chosen to undergo over the past two decades in an effort to channel savings more efficiently and thereby spur growth. At the same time, some poor countries have few impediments to capital flows, but their level of *de facto* financial globalization is still very low, even when measured relative to national income.

As noted earlier, this paper does not look directly at how financial globalization affects absolute or relative measures of poverty. Based on the results from our analysis, the effects could easily go in opposite directions.<sup>1</sup> On the one hand, sustained high growth is the most consistently successful policy for alleviating absolute poverty, as China and India have succeeded in doing over the past two decades. On the other hand, periods of high growth are often associated with higher income inequality, and, therefore, relative measures of poverty may easily rise. Increased macroeconomic volatility, however, probably increases both absolute and relative measures of poverty, particularly in the case of financial crises that lead to sharp rises in unemployment. The evidence presented in this paper suggests that a detailed study of the link between financial globalization and poverty is likely to yield ambiguous results for emerging-market countries, albeit with the same caveats: countries that work simultaneously to improve institutions, and ones that avoid overly fixed exchange rate regimes, have a much better chance of seeing financial globalization lead to poverty reduction, at least by absolute measures.

The remainder of this section provides an overview of the structure of the paper. In brief, section 11.2 begins with documentation of some salient features of global financial integration from the perspective of developing countries. Sections 11.3 and 11.4 analyze the evidence on the effects of financial globalization on growth and volatility, respectively, in developing countries. Section 11.5 concludes.

### 11.1.1 Definitions and Basic Stylized Facts

Financial globalization and financial integration are, in principle, different concepts. Financial globalization is an aggregate concept that refers to rising global linkages through cross-border financial flows. Financial integration refers to an individual country's linkages to international capital markets. Clearly, these concepts are closely related. For instance, increasing financial globalization is perforce associated with rising financial integration on average. In this paper, the two terms are used interchangeably.

Of more relevance for the purposes of this paper is the distinction between *de jure* financial integration, which is associated with policies on capital account liberalization, and actual capital flows. For example, indicator measures of the extent of government restrictions on capital flows across national borders have been used extensively in the literature. By this

1. Since it is difficult to measure poverty and to isolate the impact of globalization on poverty from various other factors, recent studies do not reach an unambiguous conclusion on this issue. While Easterly (chap. 3 in this volume) documents that neither financial nor trade flows have any significant impact on poverty, Harrison (introduction to this volume) notes that "there is certainly no evidence in the aggregate data that trade reforms are bad for the poor." Winters, McCulloch, and McKay (2004) also argue that the empirical evidence often suggests that trade liberalization helps reduce poverty in the long run and note that "it lends no support to the position that trade liberalization generally has an adverse impact."

measure, many countries in Latin America would be considered closed to financial flows. On the other hand, the volume of capital actually crossing the borders of these countries has been large relative to the average volume of flows across all developing countries. Therefore, on a *de facto* basis, these countries are quite open to global financial flows. By contrast, some countries in Africa have few formal restrictions on capital account transactions but have not experienced significant capital flows. The analysis in this paper will focus largely on *de facto* measures of financial integration, as it is virtually impossible to compare the efficacy of various complex restrictions across countries. In the end, what matters most is the actual degree of openness. However, the paper will also consider the relationship between *de jure* and *de facto* measures.

As will be discussed in section 11.2, a few salient features of global capital flows are relevant for the central themes of the paper. First, the volume of cross-border capital flows has risen substantially in the last decade. Not only has there been a much greater volume of flows among industrial countries, but there has also been a surge in flows between industrial and developing countries. Second, this surge in international capital flows to developing countries is the outcome of both “pull” and “push” factors. Pull factors arise from changes in policies and other aspects of opening up by developing countries. These include liberalization of capital accounts and domestic stock markets, and large-scale privatization programs. Push factors include business cycle conditions and macroeconomic policy changes in industrial countries. From a longer-term perspective, this latter set of factors includes the rise in the importance of institutional investors in industrial countries and demographic changes (e.g., relative aging of the population in industrial countries). The importance of these factors suggests that, notwithstanding temporary interruptions in crisis periods or during global business cycle downturns, the past twenty years have been characterized by secular pressures for rising global capital flows to the developing world.

Another important feature of international capital flows is that the components of these flows differ markedly in terms of volatility. In particular, bank borrowing and portfolio flows are substantially more volatile than foreign direct investment. In spite of a caveat that accurate classification of capital flows is not easy, evidence suggests that the composition of capital flows can have a significant influence on a country’s vulnerability to financial crises.

### 11.1.2 Does Financial Globalization Promote Growth in Developing Countries?

Section 11.3 will summarize the theoretical benefits of financial globalization for economic growth and then review the empirical evidence. Financial globalization could, in principle, help to raise the growth rate in de-

veloping countries through a number of channels. Some of these directly affect the determinants of economic growth (augmentation of domestic savings, reduction in the cost of capital, transfer of technology from advanced to developing countries, and development of domestic financial sectors). Indirect channels, which in some cases could be even more important than the direct ones, include increased production specialization due to better risk management, and improvements in both macroeconomic policies and institutions induced by the competitive pressures or the “discipline effect” of globalization.

How many of the advertised benefits for economic growth have actually materialized in the developing world? As documented in this paper, the average income per capita for the group of more financially open (developing) economies does grow at a more favorable rate than that of the group of less financially open economies. However, whether this actually reflects a causal relationship and whether this correlation is robust to controlling for other factors remain unresolved questions. The literature on this subject, voluminous as it is, does not present a conclusive picture. A few papers find a positive effect of financial integration on growth. However, the majority find no effect or at best a mixed effect. Thus, an objective reading of the vast research effort to date suggests that there is no strong, robust, and uniform support for the theoretical argument that financial globalization per se delivers a higher rate of economic growth.

Perhaps this is not surprising. As noted by several authors, most of the cross-country differences in per capita incomes stem not from differences in the capital-labor ratio but from differences in total factor productivity, which could be explained by “soft” factors like governance and rule of law. In this case, although embracing financial globalization may result in higher capital inflows, it is unlikely to cause faster growth by itself. In addition, some of the countries with capital account liberalization have experienced output collapses related to costly banking or currency crises. This is elaborated below. An alternative possibility, as noted earlier, is that financial globalization fosters better institutions and domestic policies but that these indirect channels cannot be captured in standard regression frameworks.

In short, while financial globalization can, in theory, help to promote economic growth through various channels, there is as yet no robust empirical evidence that this causal relationship is quantitatively very important. This points to an interesting contrast between financial openness and trade openness, since an overwhelming majority of research papers have found a positive effect of the latter on economic growth.

### 11.1.3 What Is the Impact of Financial Globalization on Macroeconomic Volatility?

In theory, financial globalization can help developing countries to better manage output and consumption volatility. Indeed, a variety of theories

implies that the volatility of consumption relative to that of output should go down as the degree of financial integration increases; the essence of global financial diversification is that a country is able to offload some of its income risk in world markets. Since most developing countries are rather specialized in their output and factor endowment structures, they can, in theory, obtain even bigger gains than developed countries through international consumption risk sharing—that is, by effectively selling off a stake in their domestic output in return for a stake in global output.

How much of the potential benefit in terms of better management of consumption volatility has actually been realized? This question is particularly relevant in terms of understanding whether, despite the output volatility experienced by developing countries that have undergone financial crises, financial integration has protected them from consumption volatility. New research presented in section 11.4 paints a troubling picture. Specifically, while the volatility of output growth declined, on average, in the 1990s relative to the three earlier decades, the volatility of consumption growth relative to that of income growth *increased* on average for the emerging-market economies in the 1990s, which was precisely the period of a rapid increase in financial globalization. In other words, as argued in more detail later in the paper, procyclical access to international capital markets appears to have had a perverse effect on the relative volatility of consumption for financially integrated developing economies.

Interestingly, a more nuanced look at the data suggests the possible presence of a threshold effect. At low levels of financial integration, an increase in financial integration is associated with an increase in the relative volatility of consumption. However, once the level of financial integration crosses a threshold, the association becomes negative. In other words, for countries that are sufficiently open financially, relative consumption volatility starts to decline. This finding is potentially consistent with the view that international financial integration can help to promote domestic financial-sector development, which in turn can help to moderate domestic macroeconomic volatility. However, thus far these benefits of financial integration appear to have accrued primarily to industrial countries.

In this vein, the proliferation of financial and currency crises among developing economies is often viewed as a natural consequence of the growing pains associated with financial globalization. These can take various forms. First, international investors have a tendency to engage in momentum trading and herding, which can be destabilizing for developing economies. Second, international investors (together with domestic residents) may engage in speculative attacks on developing countries currencies, thereby causing instability that is not warranted based on the economic and policy fundamentals of these countries. Third, the risk of contagion presents a major threat to otherwise healthy countries since international investors could withdraw capital from these countries for reasons unre-



lated to domestic factors. Fourth, a government, even if democratically elected, may not give sufficient weight to the interests of future generations. This becomes a problem when the interests of future and current generations diverge, causing the government to incur excessive amounts of debt. Financial globalization, by making it easier for governments to incur debt, might aggravate this overborrowing problem. These four hypotheses are not necessarily independent, and can reinforce each other.

There is some empirical support for these hypothesized effects. For example, there is evidence that international investors do engage in herding and momentum trading in emerging markets, more so than in developed countries. Recent research also suggests the presence of contagion in international financial markets. In addition, some developing countries that open their capital markets do appear to accumulate unsustainably high levels of external debt.

To summarize, one of the theoretical benefits of financial globalization, other than to enhance growth, is to allow developing countries to better manage macroeconomic volatility, especially by reducing consumption volatility relative to output volatility. The evidence suggests that, instead, countries that are in the early stages of financial integration have been exposed to significant risks in terms of higher volatility of both output and consumption.

#### 11.1.4 The Role of Institutions and Governance in the Effects of Globalization

While it is difficult to find a simple relationship between financial globalization and growth or consumption volatility, there is some evidence of nonlinearities or threshold effects in the relationship. That is, financial globalization, in combination with good macroeconomic policies and good domestic governance, appears to be conducive to growth (see Prasad et al. 2003). For example, countries with good human capital and governance tend to do better at attracting foreign direct investment (FDI), which is especially conducive to growth. More specifically, recent research shows that corruption has a strongly negative effect on FDI inflows. Similarly, transparency of government operations, which is another dimension of good governance, has a strong positive effect on investment inflows from international mutual funds.

The vulnerability of a developing country to the risk factors associated with financial globalization is also not independent from the quality of macroeconomic policies and domestic governance. For example, research has demonstrated that an overvalued exchange rate and an overextended domestic lending boom often precede a currency crisis. In addition, lack of transparency has been shown to be associated with more herding behavior by international investors that can destabilize a developing country's financial markets. Finally, evidence shows that a high degree of corruption

may affect the composition of a country's capital inflows in a manner that makes it more vulnerable to the risks of speculative attacks and contagion effects.

Thus, the ability of a developing country to derive benefits from financial globalization and its relative vulnerability to the volatility of international capital flows can be significantly affected by the quality of both its macroeconomic framework and its institutions.

### 11.1.5 Summary

The objective of the paper is not so much to derive new policy propositions as it is to inform the debate on the potential and actual benefit-risk trade-offs associated with financial globalization by reviewing the available empirical evidence and country experiences. The main conclusions are that, so far, it has proven difficult to find robust evidence in support of the proposition that financial integration helps developing countries to improve growth and to reduce macroeconomic volatility.

Of course, the absence of robust evidence on these dimensions does not necessarily mean that financial globalization has no benefits and carries only great risks. Indeed, most countries that have initiated financial integration have continued along this path, despite temporary setbacks. This observation is consistent with the notion that the indirect benefits of financial integration, which may be difficult to pick up in regression analysis, could be quite important. Also, the long-run gains, in some cases yet unrealized, may far offset the short-term costs. For instance, the European Monetary Union experienced severe and costly crises in the early 1990s as part of the transition to a single currency throughout much of Europe today.

Although it is difficult to distill new and innovative policy messages from the review of the evidence, there appears to be empirical support for some general propositions. Empirically, good institutions and quality of governance are important not only in their own right but also in helping developing countries derive the benefits of globalization. Similarly, macroeconomic stability appears to be an important prerequisite for ensuring that financial integration is beneficial for developing countries. These points may already be generally accepted; the contribution of this paper is to show that there is some systematic empirical evidence to support them. In addition, the analysis suggests that financial globalization should be approached cautiously and with good institutions and macroeconomic frameworks viewed as preconditions.

## 11.2 Basic Stylized Facts

De jure restrictions on capital flows and actual capital flows across national borders are two ways of measuring the extent of a country's finan-

cial integration with the global economy. The differences between these two measures are important for understanding the effects of financial integration. By either measure, developing countries' financial linkages with the global economy have risen in recent years.<sup>2</sup> However, a relatively small group of developing countries has garnered the lion's share of private capital flows from industrial to developing countries, which surged in the 1990s. Structural factors, including demographic shifts in industrial countries, are likely to provide an impetus to these North-South flows over the medium and long term.

### 11.2.1 Measuring Financial Integration

Capital account liberalization is typically considered an important precursor to financial integration. Most formal empirical work analyzing the effects of capital account liberalization has used a measure based on the official restrictions on capital flows as reported to the International Monetary Fund (IMF) by national authorities. However, this binary indicator directly measures capital controls but does not capture differences in the intensity of these controls.<sup>3</sup> A more direct measure of financial openness is based on the estimated gross stocks of foreign assets and liabilities as a share of gross domestic product (GDP). The stock data constitute a better indication of integration, for our purposes, than the underlying flows since they are less volatile from year to year and are less prone to measurement error (assuming that such errors are not correlated over time).<sup>4</sup>

Although these two measures of financial integration are related, they denote two distinct aspects. The capital account restrictions measure reflects the existence of *de jure* restrictions on capital flows, while the financial openness measure captures *de facto* financial integration in terms of realized capital flows. This distinction is of considerable importance for the analysis in this paper and implies a  $2 \times 2$  set of combinations of these two aspects of integration. Many industrial countries have attained a high degree of financial integration in terms of both measures. Some developing countries with capital account restrictions have found these restrictions ineffective in controlling actual capital flows. Episodes of capital flight from

2. Bordo and Eichengreen (2002), Obstfeld and Taylor (2002), and Mauro, Sussman, and Yafeh (2002) examine historical roots of international financial integration.

3. The restriction measure is available until 1995, when a new and more refined measure—not backward compatible—was introduced. The earlier data were extended through 1998 by Mody and Murshid (2002).

4. These stock data were constructed by Lane and Milesi-Ferretti (2001). Operationally, this measure involves calculating the gross levels of FDI and portfolio assets and liabilities via the accumulation of the corresponding inflows and outflows, and making relevant valuation adjustments. A similar measure using the same underlying stock data has been considered by Chanda (2006) and O'Donnell (2001). Other measures of capital market integration include saving-investment correlations and various interest parity conditions (Frankel 1992). These measures are difficult to operationalize for the extended time period and large number of countries in the data sample for this paper.

some Latin American countries in the 1970s and 1980s are examples of such involuntary *de facto* financial integration in economies that are *de jure* closed to financial flows (i.e., integration without capital account liberalization). On the other hand, some countries in Africa have few capital account restrictions but have experienced only minimal levels of capital flows (i.e., liberalization without integration).<sup>5</sup> And, of course, it is not difficult to find examples of countries with closed capital accounts that are also effectively closed in terms of capital flows.

How has financial integration evolved over time for different groups of countries based on alternative measures?<sup>6</sup> By either measure, the difference in financial openness between industrial and developing countries is quite stark. Industrial economies have had an enormous increase in financial openness, particularly in the 1990s. While this measure also increased for developing economies in that decade, the level remains far below that of industrial economies.

For industrial countries, unweighted cross-country averages of the two measures are mirror images and jointly confirm that these countries have undergone rapid financial integration since the mid-1980s (fig. 11.1).<sup>7</sup> For developing countries, the average restriction measure indicates that, after a period of liberalization in the 1970s, the trend toward openness reversed in the 1980s. Liberalization resumed in the early 1990s but at a slow pace. On the other hand, the average financial openness measure for these countries, based on actual flows, shows a modest increase in the 1980s, followed by a sharp rise in the 1990s. The increase in the financial openness measure for developing economies reflects a more rapid *de facto* integration than is captured by the relatively crude measure of capital account restrictions.

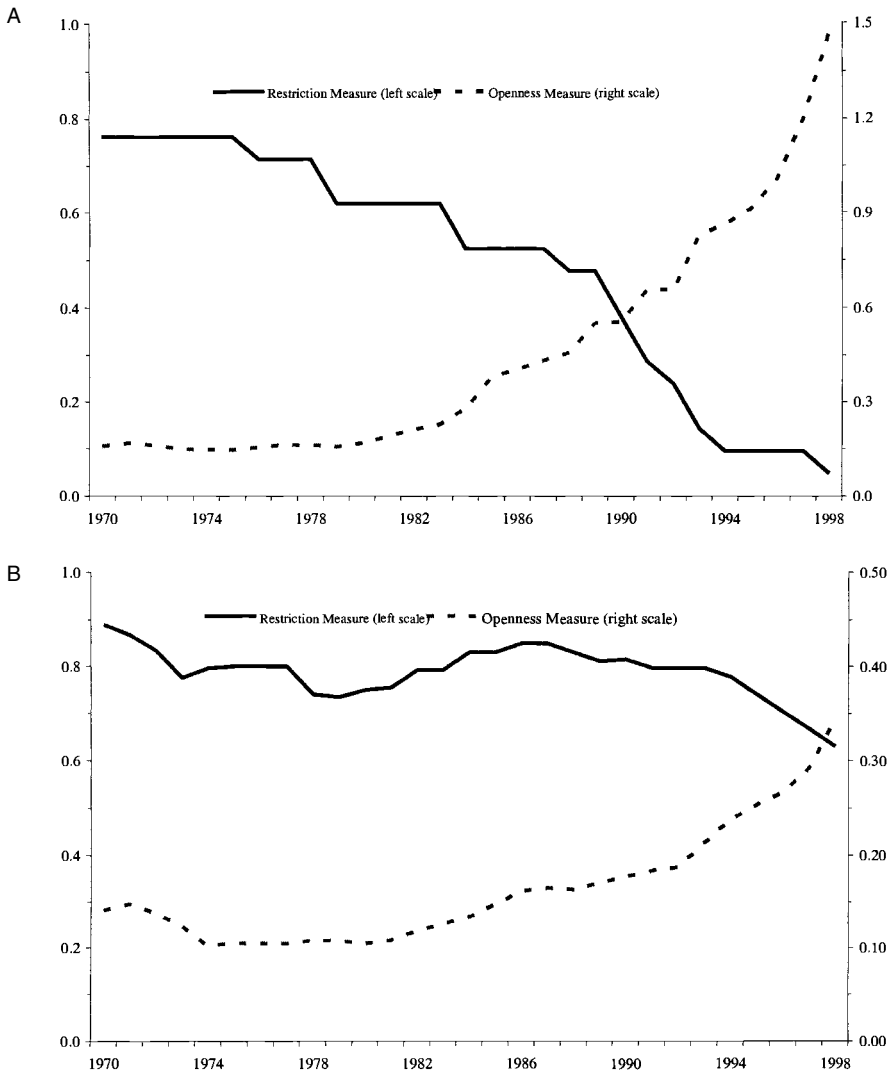
However, the effects of financial integration in terms of increased capital flows have been spread very unevenly across developing countries.<sup>8</sup> To

5. An analogy from the literature on international trade may be relevant here. Some countries, due to their remoteness from major world markets or other unfavorable geographical attributes, have low trade flows despite having minimal barriers to trade even after controlling for various other factors. Similarly, certain countries, due to their remoteness from major financial centers in either physical distance or historical relationships, may experience limited capital flows despite having relatively open capital accounts (see Loungani, Mody, and Razin 2003).

6. The data set used in this paper consists of seventy-six industrial and developing countries (except where otherwise indicated) and covers the period 1960–99. Given the long sample period, several countries currently defined as industrial (e.g., Korea and Singapore) are included in the developing-country group. The following were excluded from the data set: most of the highly indebted poor countries (which mostly receive official flows), the transition economies of Eastern Europe and the former Soviet Union (due to lack of data), very small economies (population less than 1.5 million), and oil-exporting countries in the Middle East. See appendix for a list of countries and further details on the data set.

7. A particularly rapid decline in controls occurred during the 1980s, when the members of the European Community, now the European Union, liberalized capital controls. A surge in cross-border capital flows followed.

8. Ishii et al. (2002) examine in detail the experiences of a number of developing countries.



**Fig. 11.1 Measures of financial integration: A, industrial countries; B, developing countries**

Source: IMF *World Economic Outlook*; Lane and Milesi-Ferretti (2001)

examine the extent of these disparities, it is useful to begin with a very coarse classification of the developing countries in the sample into two groups based on a ranking according to the average of the financial openness measure over the last four decades (as well as an assessment of other indicators of financial integration).

The first group, which comprises twenty-two countries, is henceforth la-

beled as the set of more financially integrated (MFI) countries, and the second group, which includes thirty-three countries, as the less financially integrated (LFI) countries.<sup>9</sup> This distinction must be interpreted with some care at this stage. In particular, it is worth repeating that the criterion is a measure of de facto integration based on actual capital flows rather than a measure of the strength of policies designed to promote financial integration. Indeed, a few of the countries in the MFI group do have relatively closed capital accounts in a de jure sense. In general, as argued below, policy choices do determine the degree and nature of financial integration. Nevertheless, for the analysis in this paper, the degree of financial openness based on actual capital flows is a more relevant measure.

It should be noted that the main conclusions of this paper are not crucially dependent on the particulars of the classification of developing countries into the MFI and LFI groups. This classification is obviously a static one and does not account for differences across countries in the timing and degree of financial integration. It is used for some of the descriptive analysis presented below, but only in order to illustrate the conclusions from the more detailed econometric studies that are surveyed in the paper. The areas where this classification yields results different from those obtained from more formal econometric analysis will be clearly highlighted in the paper. The regression results reported in this paper are based on the gross capital flows measure described earlier, which does capture differences across countries and changes over time in the degree of financial integration.

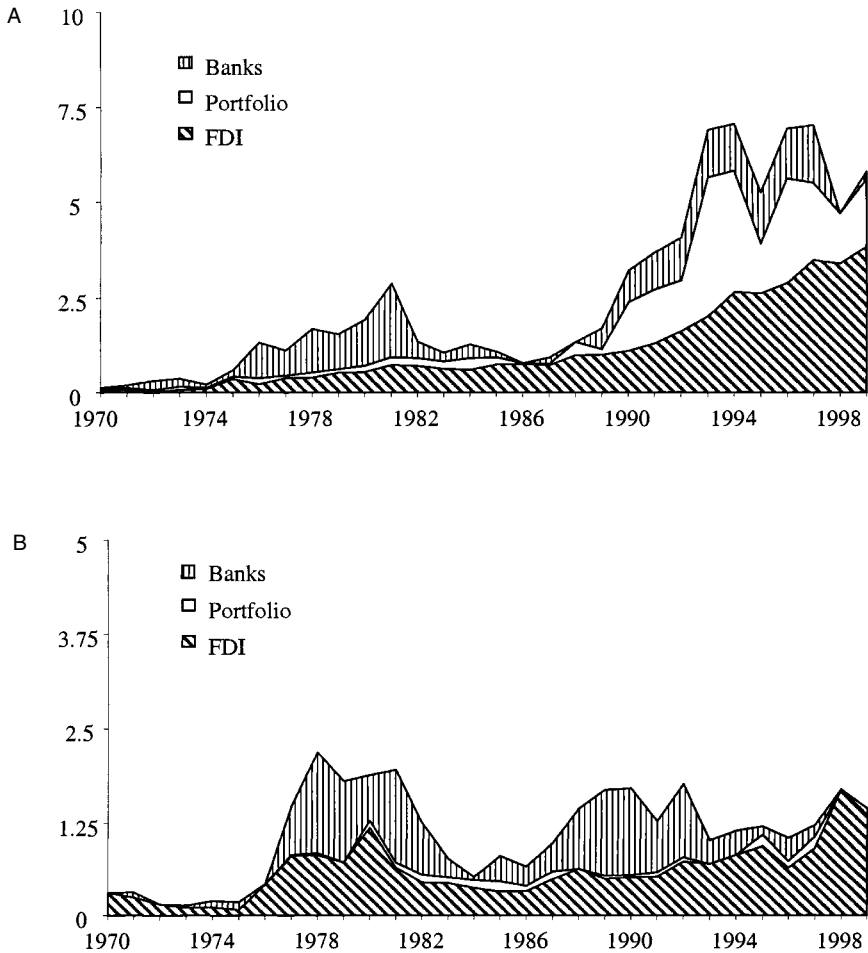
Figure 11.2 shows that the vast majority of international private gross capital flows of developing countries, especially in the 1990s, are accounted for by the relatively small group of MFI economies.<sup>10</sup> By contrast, private capital flows to and from the LFI economies have remained very small over the last decade and, for certain types of flows, have even fallen relative to the late 1970s.

### 11.2.2 North-South Capital Flows

One of the key features of global financial integration over the last decade has been the dramatic increase in net private capital flows from industrial countries (the North) to developing countries (the South). Figure 11.3 breaks down the levels of these flows into the four main constituent categories. The main increase has been in terms of FDI and portfolio flows,

9. Not surprisingly, this classification results in a set of MFI economies that roughly corresponds to those included in the Morgan Stanley Country Index (MSCI) emerging-markets stock index. The main differences are that we drop the transition economies because of limited data availability and add Hong Kong Special Administrative Region (SAR) and Singapore.

10. Note that the scale of the graph in panel A is twice as big as that of the graph in panel B.



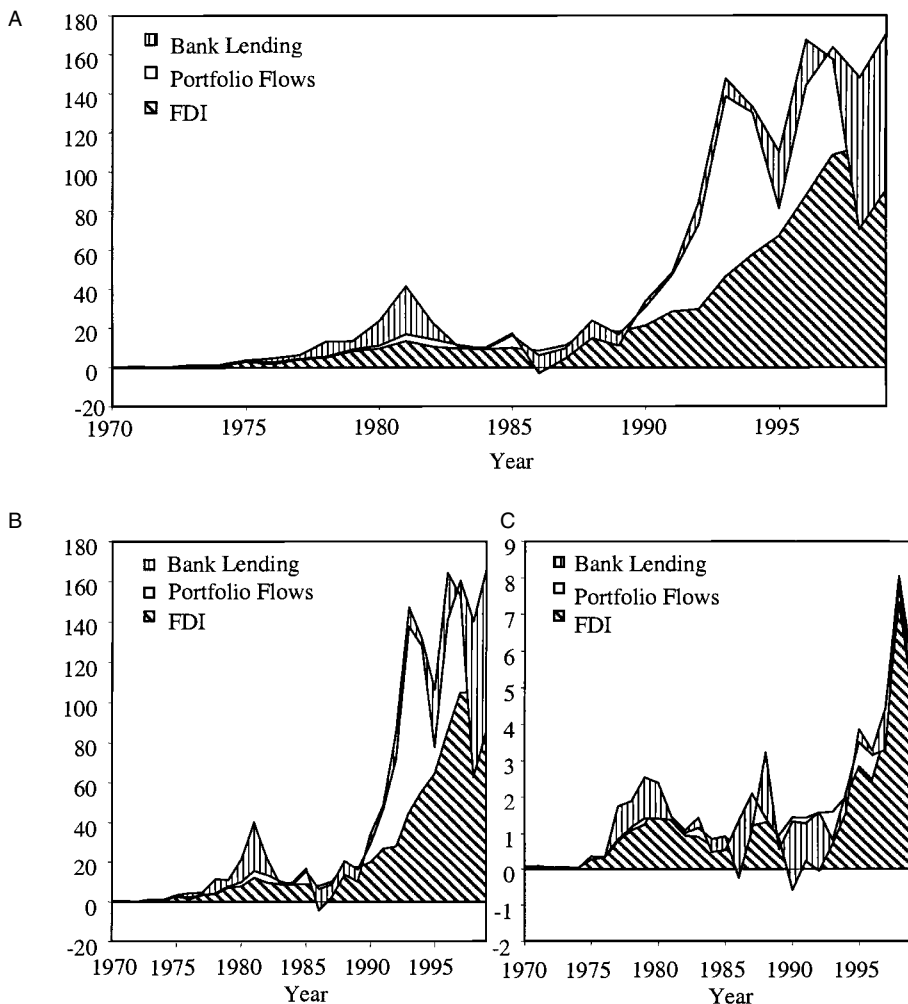
**Fig. 11.2** Gross capital flows (percent of GDP): *A*, MFI economies; *B*, LFI economies

Source: IMF *World Economic Outlook*, *International Financial Statistics*

Note: The reader should note that the left scales on the two panels are different.

while the relative importance of bank lending has declined somewhat. In fact, net bank lending turned negative for a few years during the time of the Asian crisis.

The bulk of the surge in net FDI flows from the advanced economies has gone to MFI economies, with only a small fraction going to LFI economies (figure 11.3, panels B and C). Net portfolio flows show a similar pattern, although both types of flows to MFI economies fell sharply following the



**Fig. 11.3 Net private capital flows (billions of U.S. dollars): A, all developing economies; B, MFI economies; C, LFI economies**

Source: IMF *World Economic Outlook*

Note: Bank lending to the MFI economies was negative between 1997 and 1999.

Asian crisis and have remained relatively flat since then. LFI economies have been much more dependent on bank lending (and, although not shown here, on official flows including loans and grants). There were surges in bank lending to this group of countries in the late 1970s and early 1990s.

Another important feature of these flows is that they differ substantially in volatility. Table 11.1 shows the volatility of FDI, portfolio flows, and bank lending to developing economies. Of the different categories of



**Table 11.1** Volatility of different types of capital inflows

	FDI/GDP	Loan/GDP	Portfolio/GDP
Standard deviations (median for each group)			
MFI economies	0.007	0.032	0.009
LFI economies	0.010	0.036	0.002
Coefficients of variation (median for each group)			
MFI economies	0.696	1.245	1.751
LFI economies	1.276	1.177	2.494
Coefficients of variation for selected MFI economies			
Indonesia	0.820	0.717	1.722
Korea	0.591	2.039	1.338
Malaysia	0.490	4.397	3.544
Mexico	0.452	2.048	2.088
The Philippines	0.921	0.956	1.979
Thailand	0.571	0.629	1.137

Source: Wei (2001).

Notes: Computed over the period 1980–96. Only countries with at least eight nonmissing observations during the period for all three variables and with a population greater than or equal to one million in 1995 are kept in the sample. Total inward FDI flows, total bank loans, and total inward portfolio investments are from the IMF's *Balance of Payments Statistics*, various issues.

private capital flows to developing economies, FDI flows are the least volatile, which is not surprising given their long-term and relatively fixed nature. Portfolio flows tend to be far more volatile and prone to abrupt reversals than FDI. These patterns hold when the MFI and LFI economies are examined separately. Even in the case of LFIs, the volatility of FDI flows is much lower than that of other types of flows.<sup>11</sup> This difference in the relative volatility of different categories has important implications that will be examined in more detail later.

### 11.2.3 Factors Underlying the Rise in North-South Capital Flows

The surge in net private capital flows to MFIs, as well as the shifts in the composition of these flows, can be broken down into pull and push factors (Calvo, Leiderman, and Reinhart 1993). These are related to, respectively, (a) policies and other developments in the MFIs and (b) changes in global financial markets. The first category includes factors such as stock market

11. Consistent with these results, Taylor and Sarno (1999) find that FDI flows are more persistent than other types of flows. Hausmann and Fernandez-Arias (2000) find weaker confirmation of this result and also note that, although the volatility of FDI flows has been rising over time, it remains lower than that of other types of flows. In interpreting these results, there is a valid concern about potential misclassification of the different types of capital flows. Since most of the studies cited here use similar data sources, this is not a problem that can be easily resolved by examining the conclusions of multiple studies.

liberalizations and privatization of state-owned companies that have stimulated foreign inflows. The second category includes the growing importance of depositary receipts and cross-listings and the emergence of institutional investors as key players driving international capital flows to emerging markets.

The investment opportunities afforded by stock market liberalizations, which have typically included the provision of access to foreign investors, have enhanced capital flows to MFIs. How much have restrictions on foreign investors' access to local stock markets in MFIs changed over time? To answer this question, it is useful to examine a new measure of stock market liberalization that captures restrictions on foreign ownership of domestic equities. This measure, constructed by Edison and Warnock (2001), is obviously just one component of capital controls, but it is an appropriate one for modeling equity flows. Figure 11.4 shows that stock market liberalizations in MFI economies in different regions have proceeded rapidly, in terms of both intensity and speed.<sup>12</sup>

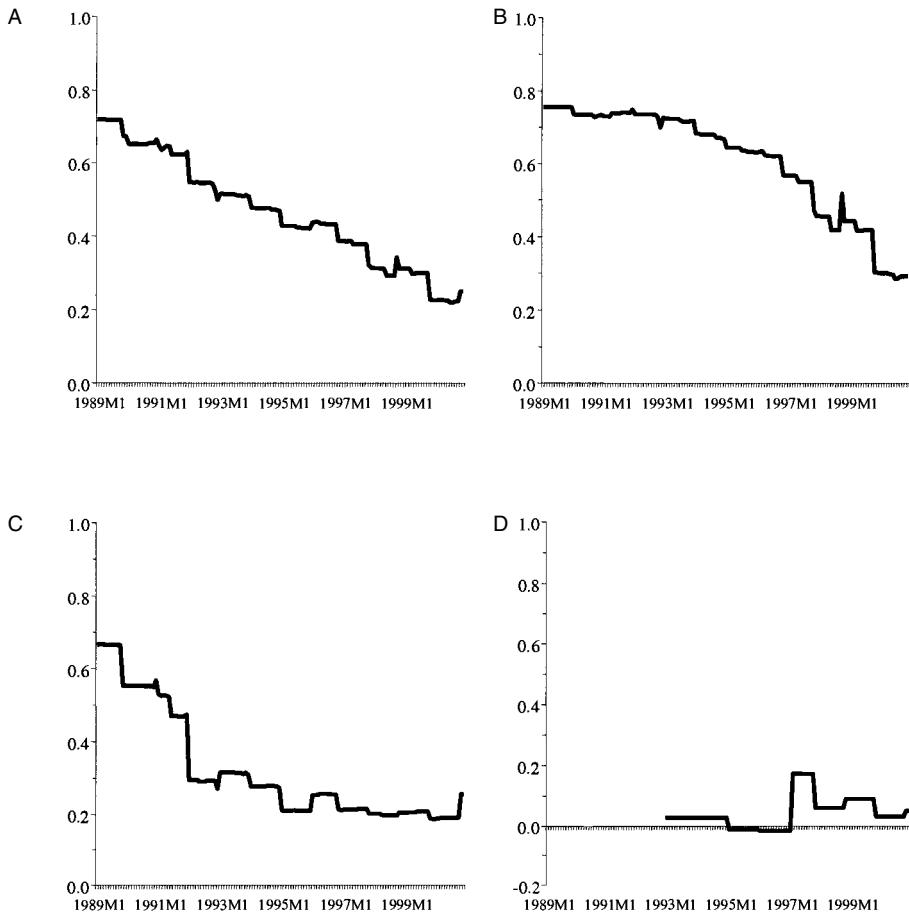
Mergers and acquisitions, especially those resulting from the privatization of state-owned companies, were an important factor underlying the increase in FDI flows to MFIs during the 1990s. The easing of restrictions on foreign participation in the financial sector in MFIs has also provided a strong impetus to this factor.<sup>13</sup>

Institutional investors in the industrial countries—including mutual funds, pension funds, hedge funds, and insurance companies—have assumed an important role in channeling capital flows from industrial to developing economies. They have helped individual investors overcome the information and transaction cost barriers that previously limited portfolio allocations to emerging markets. Mutual funds, in particular, have served as an important instrument for individuals to diversify their portfolios into

12. The stock market liberalization index is based on two indexes constructed by the International Finance Corporation (IFC) for each country—the Global Index (IFCG) and the Investable Index (IFCI). The IFCG represents the full market, while the IFCI represents the portion of the market available to foreign investors, where availability is determined by the IFC based on legal and liquidity criteria. Edison and Warnock (2001) propose using the ratio of the market capitalization of the IFCG to that of the IFCI as a measure of stock market liberalization. This ratio provides a quantitative measure of the degree of access that foreign investors have to a particular country's equity markets; one minus this ratio can be interpreted as a measure of the intensity of capital controls in this dimension.

13. The World Bank's (2001) *Global Development Finance* report notes that FDI in Latin America's financial sector has come about through the purchases of privately owned domestic banks, driving up the share of banking assets under foreign control from 8 percent in 1994 to 25 percent in 1999. In East Asia, foreign investors have purchased local banks in financial distress, leading to an increase in the share of banking assets under foreign control from 2 percent in 1994 to 6 percent in 1999.

14. The presence of mutual funds in MFIs grew substantially during the 1990s. For example, dedicated emerging-market equity funds held \$21 billion in Latin American stocks by end 1995. By end 1997, their holdings had increased to \$40 billion. While mutual funds' growth in Asia has been less pronounced, the presence of mutual funds is still important in many countries in that region. See Eichengreen, Mathieson, and Chadha (1998) for a detailed study on hedge funds.



**Fig. 11.4 Foreign ownership restrictions (MFI developing economies): A, total; B, Asia; C, Western Hemisphere; D, Africa**

Source: Edison and Warnock (2001).

Note: This index measures the intensity of restrictions on the access that foreign investors have to a particular country's equity markets.

developing-country holdings.<sup>14</sup> Although international institutional investors devote only a small fraction of their portfolios to holdings in MFIs, they have an important presence in these economies, given the relatively small size of their capital markets. Funds dedicated to emerging markets alone hold on average 5–15 percent of the Asian, Latin American, and transition economies' market capitalization.

Notwithstanding the moderation of North-South capital flows following recent emerging-market crises, certain structural forces are likely to

lead to a revival of these flows over the medium and long term. Demographic shifts, in particular, constitute an important driving force for these flows. Projected increases in old-age dependency ratios reflect the major changes in demographic profiles that are underway in industrial countries. This trend is likely to intensify further in the coming decades, fueled by both advances in medical technology that have increased average life spans and the decline in fertility rates. Financing the postretirement consumption needs of a rapidly aging population will require increases in current saving rates, both national and private, in these economies. However, if such increases in saving rates do materialize, they are likely to result in a declining rate of return on capital in advanced economies, especially relative to that in the capital-poor countries of the South. This will lead to natural tendencies for capital to flow to countries where it has a potentially higher return.

All of these forces imply that, despite the recent sharp reversals in North-South capital flows, developing countries will eventually once again face the delicate balance of opportunities and risks afforded by financial globalization. Are the benefits derived from financial integration sufficient to offset the costs of increased exposure to the vagaries of international capital flows? The paper now turns to an examination of the evidence on this question.

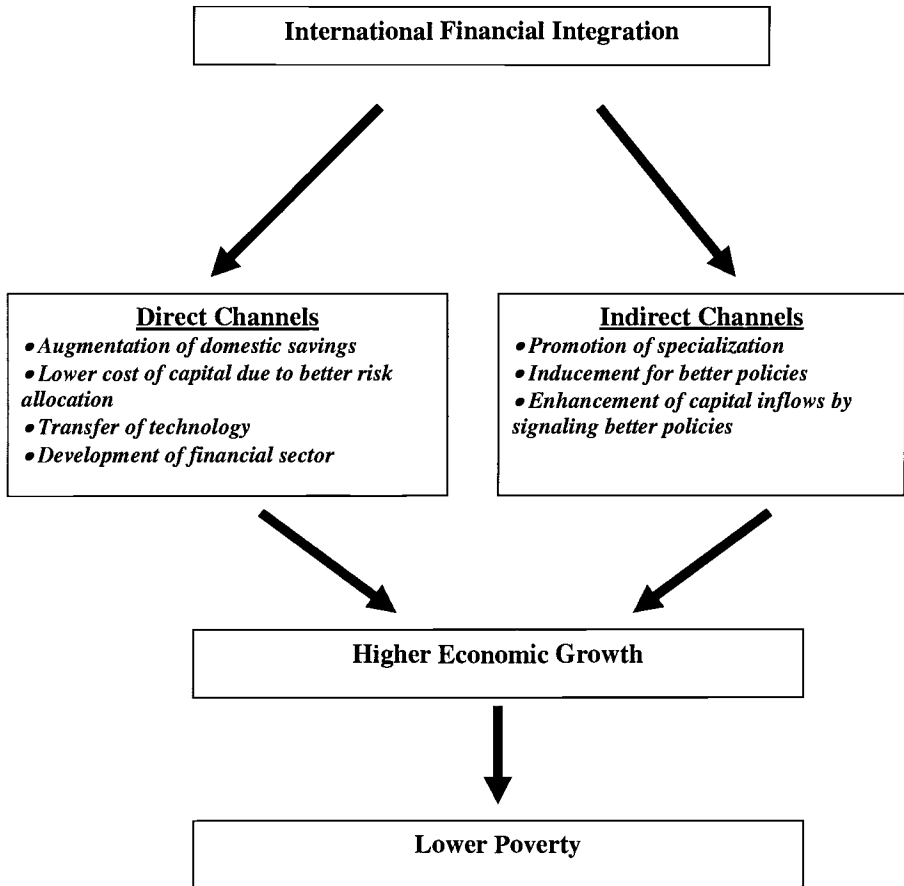
### 11.3 Financial Integration and Economic Growth

Theoretical models have identified a number of channels through which international financial integration can help to promote economic growth in the developing world. However, it has proven difficult to empirically identify a strong and robust causal relationship between financial integration and growth.

#### 11.3.1 Potential Benefits of Financial Globalization in Theory

In theory, there are a number of direct and indirect channels through which embracing financial globalization can help enhance growth in developing countries. Figure 11.5 provides a schematic summary of these possible channels. These channels are interrelated in some ways, but this delineation is useful for reviewing the empirical evidence on the quantitative importance of each channel.<sup>15</sup>

15. Some of these channels also come into play in transmitting the beneficial effects of globalization to the poor. For example, augmentation of domestic savings, reduction in the cost of capital, transfer of technological know-how, and stimulation of domestic financial-sector development could all provide direct growth benefits, which in turn help reduce poverty. Agénor (2003), Easterly (chap. 3 in this volume), and Goldberg and Pavcnik (2004) discuss various theoretical channels through which globalization affects poverty.



**Fig. 11.5** Channels through which financial integration can raise economic growth

#### *Direct Channels*

*Augmentation of domestic savings.* North-South capital flows in principle benefit both groups. They allow for increased investment in capital-poor countries while they provide a higher return on capital than is available in capital-rich countries. This effectively reduces the risk-free rate in the developing countries.

*Reduction in the cost of capital through better global allocation of risk.* International asset pricing models predict that stock market liberalization improves the allocation of risk (Henry 2000; Stulz 1999a, 1999b). First, increased risk-sharing opportunities between foreign and domestic investors might help to diversify risks. This ability to diversify in turn encourages

firms to take on more total investment, thereby enhancing growth. Third, as capital flows increase, the domestic stock market becomes more liquid, which could further reduce the equity risk premium, thereby lowering the cost of raising capital for investment.

*Transfer of technological and managerial know-how.* Financially integrated economies seem to attract a disproportionately large share of FDI inflows, which have the potential to generate technology spillovers and to serve as a conduit for passing on better management practices. These spillovers can raise aggregate productivity and, in turn, boost economic growth (Bor-senzstein, De Gregorio, and Lee 1998; Grossman and Helpman 1991a, 1991b).

*Stimulation of domestic financial-sector development.* It has already been noted that international portfolio flows can increase the liquidity of domestic stock markets. Increased foreign ownership of domestic banks can also generate a variety of other benefits (Levine 1996; Caprio and Honohan 1999). First, foreign bank participation can facilitate access to international financial markets. Second, it can help improve the regulatory and supervisory framework of the domestic banking industry. Third, foreign banks often introduce a variety of new financial instruments and techniques and also foster technological improvements in domestic markets. The entry of foreign banks tends to increase competition, which, in turn, can improve the quality of domestic financial services as well as allocative efficiency.

### *Indirect Channels*

*Promotion of specialization.* The notion that specialization in production may increase productivity and growth is intuitive. However, without any mechanism for risk management, a highly specialized production structure will produce high output volatility and, hence, high consumption volatility. Concerns about exposure to such increases in volatility may discourage countries from taking up growth-enhancing specialization activities; the higher volatility will also generally imply lower overall savings and investment rates. In principle, financial globalization could play a useful role by helping countries to engage in international risk sharing and thereby reduce consumption volatility. This point will be taken up again in the next section. Here, it should just be noted that risk sharing would indirectly encourage specialization, which in turn would raise the growth rate. This logic is explained by Brainard and Cooper (1968), Kemp and Liviatan (1973), Ruffin (1974), and Imbs and Wacziarg (2003). Among developed countries and across regions within given developed countries, there is indeed some evidence that better risk sharing is associated with higher specialization (Kalemli-Ozcan, Sørensen, and Yosha 2001).

*Commitment to better economic policies.* International financial integration could increase productivity in an economy through its impact on the government's ability to credibly commit to a future course of policies. More specifically, the disciplining role of financial integration could change the dynamics of domestic investment in an economy to the extent that it leads to a reallocation of capital toward more productive activities in response to changes in macroeconomic policies. National governments are occasionally tempted to institute predatory tax policies on physical capital. The prospect of such policies tends to discourage investment and reduce growth. Financial opening can be self-sustaining and constrains the government from engaging in such predatory policies in the future since the negative consequences of such actions are far more severe under financial integration. Gourinchas and Jeanne (2003) illustrate this point in a theoretical model.

*Signaling.* A country's willingness to undertake financial integration could be interpreted as a signal that it is going to practice more friendly policies toward foreign investment in the future. Bartolini and Drazen (1997) suggest that the removal of restrictions on capital outflows can, through its signaling role, lead to an increase in capital inflows. Many countries, including Colombia, Egypt, Italy, New Zealand, Mexico, Spain, Uruguay, and the United Kingdom, have received significant capital inflows after removing restrictions on capital outflows.<sup>16</sup>

### 11.3.2 Empirical Evidence

On the surface, there seems to be a positive association between embracing financial globalization and the level of economic development. Industrial countries in general are more financially integrated with the global economy than developing countries. So embracing globalization is apparently part of being economically advanced.

Within the developing world, it is also the case that MFI economies grew faster than LFI economies over the last three decades. From 1970 to 1999, average output per capita rose almost threefold in the group of MFI developing economies, almost six times greater than the corresponding increase for LFI economies. This pattern of higher growth for the former group applies over each of the three decades and also extends to consumption and investment growth.

However, there are two problems with deducing a positive effect of financial integration on growth from this data pattern. First, this pattern may be fragile upon closer scrutiny. Second, these observations only reflect an association between international financial integration and economic performance rather than necessarily a causal relationship. In other words, these observations do not rule out the possibility that there is reverse cau-

16. See Mathieson and Rojas-Suarez (1993) and Labán and Larrain (1997).

sation: countries that manage to enjoy robust growth may also choose to engage in financial integration even if financial globalization does not directly contribute to faster growth in a quantitatively significant way.

To provide an intuitive impression of the relationship between financial openness and growth, table 11.2 presents a list of the fastest-growing developing economies during 1980–2000 and a list of the slowest-growing (or fastest-declining) economies during the same period. Some countries have undergone financial integration during this period, especially in the latter half of the 1990s.<sup>17</sup> Therefore, any result based on total changes over this long period should be interpreted with caution. Nonetheless, several features of the table are noteworthy.

An obvious observation that can be made from the table is that financial integration is *not a necessary condition* for achieving a high growth rate. China and India have achieved high growth rates despite somewhat limited and selective capital account liberalization. For example, while China became substantially more open to FDI, it was not particularly open to most other types of cross-border capital flows. Mauritius and Botswana have managed to achieve very strong growth rates during the period, although they are relatively closed to financial flows.

The second observation that can be made is that financial integration is *not a sufficient condition* for a fast economic growth rate either. For example, Jordan and Peru had become relatively open to foreign capital flows during the period, yet their economies suffered a decline rather than enjoying positive growth during the period. On the other hand, table 11.2 also suggests that declining economies are more likely to be financially closed, although the direction of causality is not clear, as explained before.

This way of looking at country cases with extreme growth performance is only informative up to a point; it needs to be supplemented by a comprehensive examination of the experience of a broader set of countries using a more systematic approach to measuring financial openness. To illustrate this relationship more broadly, figure 11.6 presents a scatter plot of the growth rate of real per capita GDP against the increase in financial integration over 1982–97. There is essentially no association between these variables. Figure 11.7 presents a scatter plot of these two variables after taking into account the effects of a country's initial income, initial schooling, average investment-GDP ratio, political instability, and regional location. Again, the figure does not suggest a positive association between financial integration and economic growth. In fact, this finding is not unique to the particular choice of the time period or the country coverage, as reflected in a broad survey of other research papers on the subject.

17. Table 11.2 reports the growth rates of real per capita GDP in constant local currency units. The exact growth rates and country rankings may change if different measures are used, such as per capita GDP in dollar terms or on a PPP basis.

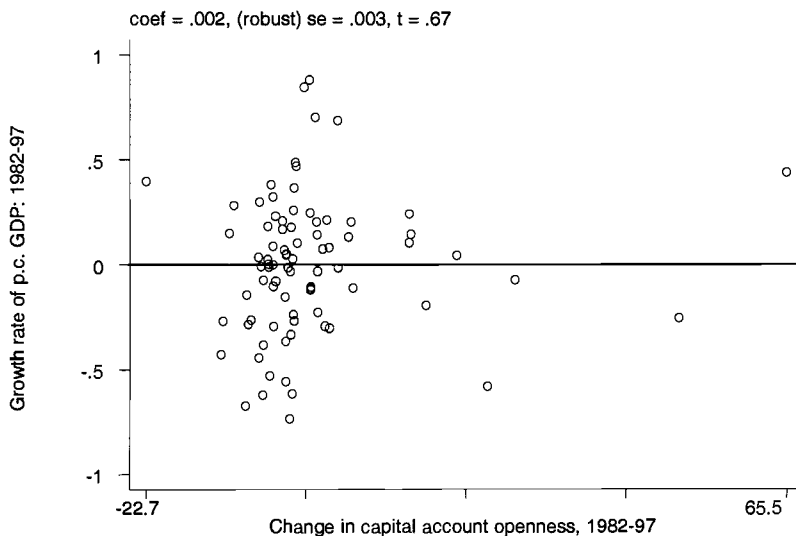


**Table 11.2 Fastest- and slowest-growing economies during 1980–2000 and their status of financial openness**

	Fastest-growing economies	Total % change in per capita GDP	More financially integrated?	Slowest-growing economies	Total % change in per capita GDP	More financially integrated?
1	China	391.6	Yes/no	Haiti	-39.5	No
2	Korea	234.0	Yes	Niger	-37.8	No
3	Singapore	155.5	Yes	Nicaragua	-30.6	No
4	Thailand	151.1	Yes	Togo	-30.0	No
5	Mauritius	145.8	No	Côte d'Ivoire	-29.0	No
6	Botswana	135.4	No	Burundi	-20.2	No
7	Hong Kong SAR	114.5	Yes	Venezuela	-17.3	Yes/no
8	Malaysia	108.8	Yes	South Africa	-13.7	Yes
9	India	103.2	Yes/no	Jordan	-10.9	Yes
10	Chile	100.9	Yes	Paraguay	-9.5	No
11	Indonesia	97.6	Yes	Ecuador	-7.9	No
12	Sri Lanka	90.8	No	Peru	-7.8	Yes

*Source:* These calculations are based on the World Bank's World Development Indicators database.

*Note:* Growth rate of real per capita GDP, in constant local currency units.



**Fig. 11.6 Increase in financial openness and growth of real per capita GDP: Simple correlation, 1982–97**

Source: Wei and Wu (2006).

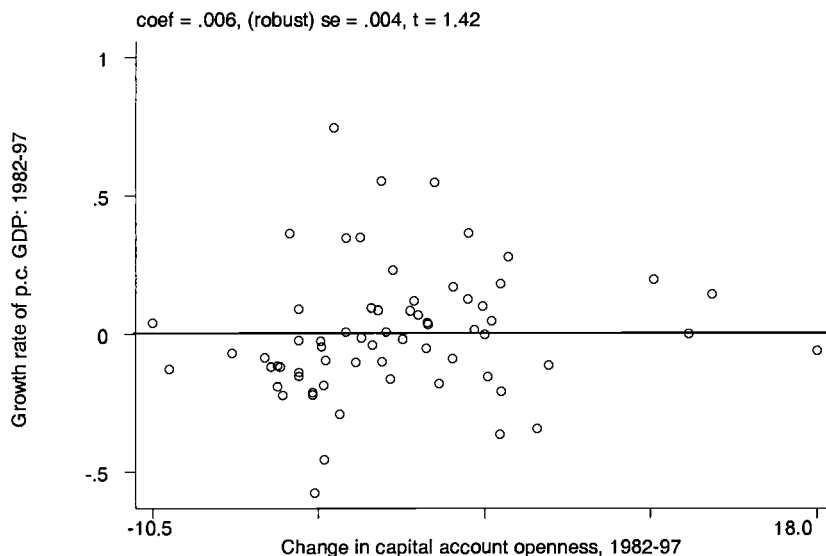
Note: Capital account openness is measured as (gross private capital inflows + gross private capital outflows)/GDP.

A number of empirical studies have tried to systematically examine whether financial integration contributes to growth using various approaches to the difficult problem of proving causation. Table 11.3 summarizes the fourteen most recent studies on this subject.<sup>18</sup> Three out of the fourteen papers report a positive effect of financial integration on growth. However, the majority of the papers tend to find no effect or a mixed effect for developing countries. This suggests that, if financial integration has a positive effect on growth, it is probably not strong or robust.<sup>19</sup>

Of the papers summarized in table 11.3, the one by Edison, Levine, et al. (2002) is perhaps the most thorough and comprehensive in measures of financial integration and in empirical specifications. These authors measure a country's degree of financial integration both by the government's re-

18. This extends the survey in the October 2001 *World Economic Outlook* (IMF 2001) and Edison, Klein, et al. (2002).

19. As discussed in Prasad et al. (2004), there is some evidence that different types of capital flows may have different effects on growth (see appendix I in their paper for details). Recent research suggests that FDI flows are positively associated with domestic investment and output growth in a relatively consistent manner. For example, Bosworth and Collins (1999) find that although the impact of portfolio flows on investment growth is quite minor, there is a strong positive relationship between FDI flows and investment growth. In particular, their findings suggest that there exists an almost one-for-one relationship between FDI flows and domestic investment.



**Fig. 11.7 Increase in financial openness and growth of real per capita GDP: Conditional relationship, 1982–97**

Source: Wei and Wu (2006).

Notes: Increase is conditioning on initial income, initial schooling, average investment/GDP, political instability (revolution and coup), and regional dummies, 1982–97. Capital account openness is measured as (gross private capital flows + gross private capital outflows)/GDP.

**Table 11.3 Summary of recent research on financial integration and economic growth**

Study	Number of countries	Years covered	Effect on growth found
Alesina, Grilli, and Milesi-Ferretti (1994)	20	1950–89	No effect
Grilli and Milesi-Ferretti (1995)	61	1966–89	No effect
Quinn (1997)	58	1975–89	Positive
Kraay (1998)	117	1985–97	No effect/mixed
Rodrik (1998)	95	1975–89	No effect
Klein and Olivei (2000)	Up to 92	1986–95	Positive
Chanda (2001)	116	1976–95	Mixed
Arteta, Eichengreen, and Wyplosz (2001)	51–59	1973–92	Mixed
Bekaert, Harvey, and Lundblad (2001)	30	1981–97	Positive
Edwards (2001)	62	1980s	No effect for poor countries
O'Donnell (2001)	94	1971–94	No effect, or at best mixed
Reisen and Soto (2001)	44	1986–97	Mixed
Edison, Klein, et al. (2002)	Up to 89	1973–95	Mixed
Edison, Levine, et al. (2002)	57	1980–2000	No effect

restrictions on capital account transactions as recorded in the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAER) and by the observed size of capital flows crossing the border, normalized by the size of the economy. The data set in that paper goes through 2000, the latest year analyzed in any existing study on this subject. Furthermore, the authors also employ a statistical methodology that allows them to deal with possible reverse causality—that is, the possibility that any observed association between financial integration and growth could result from the mechanism that faster-growing economies are also more likely to choose to liberalize their capital accounts. After a battery of statistical analyses, that paper concludes that, overall, there is no robustly significant effect of financial integration on economic growth.

### 11.3.3 Synthesis

Why is it so difficult to find a strong and robust effect of financial integration on economic growth for developing countries, when the theoretical basis for this result is apparently so strong? Perhaps there is some logic to this outcome after all. A number of researchers have now concluded that most of the differences in income per capita across countries stem not from differences in capital-labor ratios but from differences in total factor productivity, which, in turn, could be explained by soft factors or social infrastructure like governance, rule of law, and respect for property rights.<sup>20</sup> In this case, although financial integration may open the door for additional capital to come in from abroad, it is unlikely to offer a major boost to growth by itself. In fact, if domestic governance is sufficiently weak, financial integration could cause an exodus of domestic capital and, hence, lower the growth rate of an economy.

This logic can be illustrated using the results reported in Senhadji (2000). Over the period 1960 to 1994, the average growth rate of per capita output for the group of countries in sub-Saharan Africa was the lowest among regional groupings of developing countries. The difference in physical and human capital accumulation is only part of the story of why growth rates

20. See Hall and Jones (1999), Senhadji (2000), Acemoglu, Johnson, and Robinson (2001), Easterly and Levine (2001), and Rogoff (2002) on the role of productivity differences in explaining cross-country differences in income. Gourinchas and Jeanne's (2003) study is the only paper that has made a direct comparison between gains from international financial integration and those from a rise in productivity. In a calibrated model, they show that the welfare gain from perfect financial integration is roughly equivalent to a 1 percent permanent increase in consumption for the typical non-OECD economy. By contrast, a productivity increase of the order of magnitude experienced in postwar Korea yields a welfare benefit that is more than 100 times larger. The low gains from international financial integration come from the fact that less developed countries are on average not very far from their potential level of capital. Non-OECD countries are less developed not primarily because they are capital scarce but because productivity is constrained by quality of institutions, economic policies, and other factors.

differ across countries. The gap in total factor productivity is the major element in explaining the difference in the growth rates.

Another possible explanation for why it is difficult to detect a causal effect of financial integration on growth is the costly banking crises that some developing countries have experienced in the process of financial integration. The results in Kaminsky and Reinhart (1999) suggest that a flawed sequencing of domestic financial liberalization, when accompanied by capital account liberalization, increases the chance of domestic banking crises and/or exchange rate crises. These crises are often accompanied by output collapses. As a result, the benefits from financial integration may not be evident in the data.<sup>21</sup>

It is interesting to contrast the empirical literature on the effects of financial integration with that on the effects of trade integration. There is a large literature suggesting that openness to trade has a positive impact on growth (e.g., Sachs and Warner 1995; Frankel and Romer 1999; Dollar and Kraay 2002; and Wacziarg and Welch 2003), although some of the findings in this literature have been challenged by Rodriguez and Rodrik (2000), who raise questions about the measures of trade openness and the econometric methods employed in these studies. Nevertheless, an overwhelming majority of empirical papers employing various techniques, including country case studies as well as cross-country regressions, find that trade openness helps to promote economic growth. In a recent paper that surveys all the prominent empirical research on the subject, Berg and Krueger (2003) conclude that “varied evidence supports the view that trade openness contributes greatly to growth.” Furthermore, “cross-country regressions of the level of income on various determinants generally show that openness is the most important policy variable.”<sup>22</sup>

The differential effects between trade and financial integration are echoed in recent empirical research. As an alternative to examining the effect on economic growth or level of income, Wei and Wu (2006) examine the effects of trade and financial openness on a society’s health status. In particular, they analyze the following questions: Do trade and financial openness help to raise life expectancy and reduce infant mortality in developing countries? Are their effects different?

There are three motivations for studying these questions. First, as life ex-

21. See Ishii et al. (2002) for country cases in this regard.

22. Baldwin (2003), Winters (2004), and Harrison and Tang (2006) also provide surveys of the literature on trade liberalization and economic growth. Winters (2004) concludes that “while there are serious methodological challenges and disagreements about the strength of the evidence, the most plausible conclusion is that liberalization generally induces a temporary (but possibly long-lived) increase in growth.” Harrison and Tang (2006) argue that “while trade integration can strengthen an effective growth strategy, it cannot ensure its effectiveness. Other elements are needed, such as sound macroeconomic management, building trade-related infrastructure, and trade-related institutions, economy-wide investments in human capital and infrastructure, or building strong institutions.”

pectancy and infant mortality are important dimensions of a society's well-being, they are interesting objects to look at in their own right. Second, data on income level or growth come from national accounts, so all studies on economic growth have to make use of variations of the similar data sources. In comparison, vital statistics come from an entirely different data source (i.e., birth and death records) and are typically collected by different government agencies. Therefore, they offer an independent and complementary check on the effect of openness on the livelihood of people. Third, to compare income levels or growth rates across countries, it is necessary to make certain purchasing power parity (PPP) adjustments to nominal income. However, existing PPP adjustments may not be reliable (Deaton 2001). In contrast, the definitions of life and death are consistent across countries, so there is a higher degree of comparability than in the data on poverty, income, or income distribution.

Wei and Wu (2006) examine data on seventy-nine developing countries over the period 1962–97. Their data set covers all developing countries for which the relevant data exist and for which changes in infant mortality and life expectancy are not dominated by large-scale wars, genocides, famines, or major outbursts of AIDS epidemics. They employ panel regressions with country fixed effects as well as dynamic panel regressions to account for other factors that may affect health and to account for possible endogeneity of the openness variables.

Their results suggest that the effects of trade and financial openness are different. There is no positive and robust association across developing countries between faster increase in financial integration and faster improvement in a society's health. By comparison, there are several pieces of evidence suggesting that higher trade integration is associated with a faster increase in life expectancy and a faster reduction in infant mortality. For example, an 11 percentage point reduction in the average statutory tariff rate—approximately equal to 1 standard deviation of the change in the statutory tariff rate over the 1962–97 period—is associated with between three and six fewer infants dying per thousand live births, even after controlling for the effects of changes in per capita income, average female education, and other factors. These findings suggest that, in the health dimension, as in the growth literature, it is harder to find a beneficial role for financial integration compared to trade integration for developing countries.<sup>23</sup>

In related research, Kose, Prasad, and Terrones (2006) analyze how trade and financial integration affect the relationship between growth and volatility. Running various regression models, first Ramey and Ramey

23. The contrast between financial and trade openness may have important lessons for policies. While there appear to be relatively few prerequisites for deriving benefits from trade openness, obtaining benefits from financial integration requires several conditions to be in place (this is discussed in more detail in Prasad et al. 2003, chap. 5).

(1995), then several other researchers (Martin and Rogers 2000; Fatas 2002; and Hnatkovska and Loayza 2005), document that volatility and growth are negatively correlated. The results by Kose, Prasad, and Terrones (2006) suggest that trade and financial integration weaken the negative growth-volatility relationship. Specifically, in regressions of growth on volatility and other control variables, they find that the estimated coefficients on interactions between volatility and trade integration are significantly positive. In other words, countries that are more open to trade appear to face a less severe trade-off between growth and volatility. The authors report a similar, although slightly less robust, result for the interaction of financial integration with volatility.

It is useful to note that there may be a complementary relationship between trade and financial openness.<sup>24</sup> For example, if a country has severe trade barriers protecting some inefficient domestic industries, then capital inflows may end up being directed to those industries, thereby exacerbating the existing misallocation of resources. Thus, there is a concrete channel through which financial openness without trade openness could *lower* a country's level of efficiency.

Of course, the lack of a strong and robust effect of financial integration on economic growth does not necessarily imply that theories that make this connection are wrong. One could argue that the theories are about the long-run effects, and most theories abstract from the nitty-gritty of institutional building, governance improvement, and other soft factors that are necessary ingredients for the hypothesized channels to take effect. Indeed, developing countries may have little choice but to strengthen their financial linkages eventually in order to improve their growth potential in the long run. The problem is how to manage the short-run risks apparently associated with financial globalization. Financial integration without a proper set of preconditions might lead to few growth benefits and more output and consumption volatility in the short run, a subject that is taken up in the next section.

Since growth and poverty reduction are intimately related, then the question of how financial globalization affects growth is closely linked to the question of how financial globalization affects poverty. The fact that the evidence on growth is indecisive almost surely implies that evidence on poverty reduction is as well. Recent research confirms this conclusion. For example, Easterly (chap. 3 in this volume) documents that neither financial nor trade flows have any significant impact on poverty. On the other hand, research by Dollar and Kraay (2002, 2004) suggests that increased trade flows could lead to higher economic growth, which in turn could reduce poverty. Kraay (2004) provides strong evidence for the importance of economic growth in poverty reduction, as his analysis shows that most of the

24. This point is stressed in the September 2002 *World Economic Outlook* (IMF 2002).

variation in changes in poverty during the 1980s and 1990s is explained by growth in average income in developing countries. Agénor (2003) finds that there is a nonlinear relationship between globalization and poverty. His empirical results indicate that although globalization could reduce poverty in countries with a higher degree of economic integration, it could have an adverse impact on the income levels of the poor in countries with a lower degree of integration.<sup>25</sup> This nonlinearity stems from the fact that globalization has a sizable impact on the quality of institutions only beyond a certain level of trade and financial integration, and institutions (including an efficient social safety net) play a major role in channeling the beneficial effects of globalization to the poor and shielding them from its costs.

Although there has been an intensive debate about the potentially adverse impact of globalization on income inequality, there is no clear empirical evidence that globalization has fostered a sharp rise in worldwide inequality. Several recent studies focus on the impact of globalization on income inequality across countries, but these studies have yet to provide a conclusive answer. For example, globalization could accentuate the already substantial inequality of national incomes and, in particular, lead to stagnation of incomes and living standards in countries that do not participate in this process. Consistent with this view, Quah (1997) has documented that there is evidence in cross-country data of a “twin peaks” phenomenon whereby per capita incomes converge within each of two groups of countries (advanced countries and globalizers) while average incomes continue to diverge across these two groups of countries. In other words, advanced countries and globalizers converge in terms of per capita incomes, and so do nonglobalizers, but these two groups diverge from each other in terms of their average incomes. Sala-i-Martin (2002), on the other hand, argues that a more careful analysis, using individuals rather than countries as the units of analysis, shows that global inequality has declined during the recent wave of globalization.

By the same token, if the institutional preconditions for financial globalization to benefit growth are in place, then it is likely that financial globalization will help to alleviate poverty as well.

#### 11.4 Financial Globalization and Macroeconomic Volatility

International financial integration should, in principle, help countries to reduce macroeconomic volatility. The survey presented in this section, including some new evidence, suggests that developing countries, in particular, have not attained this potential benefit. The process of capital account liberalization has often been accompanied by increased vulnerability to crises.

25. Agénor (2003) uses a weighted average of trade and financial openness indicators as a measure of economic integration.



Globalization has heightened these risks, because financial linkages have the potential of amplifying the effects of both real and financial shocks.

Holding growth constant, higher macroeconomic volatility would normally be associated with an increase in inequality of income, and therefore measures of poverty based on inequality. If the growth benefits are large—as indeed they may well be, although the evidence is clearly very mixed—then of course increased financial integration may increase relative poverty measures in the short run while reducing absolute (but not necessarily relative) poverty measures in the longer run.<sup>26</sup>

#### 11.4.1 Macroeconomic Volatility

One of the potential benefits of globalization is that it should provide better opportunities for reducing volatility by diversifying risks.<sup>27</sup> Indeed, these benefits are presumably even greater for developing countries, which are intrinsically subject to higher volatility because they are less diversified than industrial economies in their production structures. However, recent crises in some MFIs suggest that financial integration may in fact have increased volatility.

What is the overall evidence of the effect of globalization on macroeconomic volatility? In addressing this question, it is important to make a distinction between output and consumption volatility. In theoretical models, the direct effects of global integration on output volatility are ambiguous. Financial integration provides access to capital that can help capital-poor developing countries to diversify their production base. On the other hand, rising financial integration could also lead to increasing specialization of production based on comparative-advantage considerations, thereby making economies more vulnerable to shocks that are specific to industries (Razin and Rose 1994).

Irrespective of the effects on output volatility, theory suggests that financial integration should reduce consumption volatility. The ability to reduce fluctuations in consumption is regarded as an important determinant of economic welfare. Access to international financial markets provides better opportunities for countries to share macroeconomic risk and, thereby, smooth consumption. The basic idea here is that, since output fluctuations are not perfectly correlated across countries, trade in financial assets can be used to delink national consumption levels from the country-specific components of these output fluctuations (see Obstfeld and Rogoff 1998, chap. 5). In an earlier paper (Prasad et al. 2004) we provide a detailed analytical examination of this issue and show that the gains from consumption smoothing are potentially very large for developing economies (see appendix IV in that paper).

26. Mechanically, a rise in the volatility of consumption could lead to a decrease in the poverty head count. However, the increase in the volatility of consumption adversely affects the poor households' welfare.

27. This subsection draws heavily on Kose, Prasad, and Terrones (2003a).

Unlike the rich empirical literature focusing on the impact of financial openness on economic growth, there are only a limited number of studies analyzing the links between openness and macroeconomic volatility. Moreover, existing studies have generally been unable to document a clear empirical link between openness and macroeconomic volatility. Razin and Rose (1994) study the impact of trade and financial openness on the volatility of output, consumption, and investment for a sample of 138 countries over the period 1950–88. They find no significant empirical link between openness and the volatility of these variables.

Easterly, Islam, and Stiglitz (2001) explore the sources of output volatility using data for a sample of seventy-four countries over the period 1960–97. They find that a higher level of development of the domestic financial sector is associated with lower volatility. On the other hand, an increase in the degree of trade openness leads to an increase in the volatility of output, especially in developing countries. Their results indicate that neither financial openness nor the volatility of capital flows has a significant impact on output volatility.

Buch, Döpke, and Pierdzioch (2002) use data for twenty-five Organization for Economic Cooperation and Development (OECD) countries to examine the link between financial openness and output volatility. They report that there is no consistent empirical relationship between financial openness and the volatility of output. Gavin and Hausmann (1996) study the sources of output volatility in developing countries over the period 1970–92. They find that there is a significant positive association between the volatility of capital flows and output volatility. O'Donnell (2001) examines the effect of financial integration on the volatility of output growth over the period 1971–94 using data for ninety-three countries. He finds that a higher degree of financial integration is associated with lower (higher) output volatility in OECD (non-OECD) countries. His results also suggest that countries with more developed financial sectors are able to reduce output volatility through financial integration.

Bekaert, Harvey, and Lundblad (2006) examine the impact of equity market liberalization on the volatility of output and consumption during 1980–2000. They find that, following equity market liberalizations, there is a significant decline in both output and consumption volatility. Capital account openness reduces the volatility of output and consumption, but its impact is smaller than that of equity market liberalization. However, they also report that capital account openness increases the volatility of output and consumption in emerging market countries. The September 2002 *World Economic Outlook* (IMF 2002) provides some evidence indicating that financial openness is associated with lower output volatility in developing countries.

Since the existing literature has been quite limited and provided mostly inconclusive evidence, this paper now presents some new evidence about the impact of financial integration on macroeconomic volatility. Table 11.4 examines changes in volatility for different macroeconomic aggregates over the last four decades. Consistent with evidence presented in the

**Table 11.4** Volatility of annual growth rates of selected variables (percentage standard deviations, medians for each group of countries)

	Full sample (1960–99)	1960s	1970s	1980s	1990s
<i>A. Output (Y)</i>					
Industrial countries	2.18 (0.23)	1.91 (0.26)	2.46 (0.28)	2.03 (0.30)	1.61 (0.14)
MFI economies	3.84 (0.20)	3.31 (0.42)	3.22 (0.37)	4.05 (0.44)	3.59 (0.62)
LFI economies	4.67 (0.35)	3.36 (0.61)	4.88 (1.01)	4.53 (0.69)	2.70 (0.38)
<i>B. Income (Q)</i>					
Industrial countries	2.73 (0.34)	2.18 (0.33)	2.99 (0.40)	2.54 (0.29)	1.91 (0.30)
MFI economies	5.44 (0.50)	3.60 (0.47)	5.43 (0.45)	5.45 (0.65)	4.78 (0.72)
LFI economies	7.25 (0.84)	4.42 (0.53)	9.64 (1.24)	7.56 (1.23)	4.59 (0.54)
<i>C. Consumption (C)</i>					
Industrial countries	2.37 (0.30)	1.47 (0.27)	2.16 (0.25)	1.98 (0.28)	1.72 (0.20)
MFI economies	5.18 (0.51)	4.57 (0.49)	4.52 (1.04)	4.09 (0.94)	4.66 (0.46)
LFI economies	6.61 (0.78)	5.36 (0.58)	7.07 (0.11)	7.25 (0.81)	5.72 (0.78)
<i>D. Total consumption (C + G)</i>					
Industrial countries	1.86 (0.23)	1.38 (0.28)	1.84 (0.18)	1.58 (0.19)	1.38 (0.20)
MFI economies	4.34 (0.47)	3.95 (0.51)	4.19 (0.54)	3.43 (0.84)	4.10 (0.53)
LFI economies	6.40 (0.56)	4.85 (0.55)	6.50 (0.93)	6.34 (0.91)	4.79 (0.82)
<i>E. Ratio of total consumption (C + G) to income (Q)</i>					
Industrial countries	0.67 (0.02)	0.75 (0.09)	0.56 (0.03)	0.61 (0.06)	0.58 (0.06)
MFI economies	0.81 (0.07)	0.92 (0.13)	0.74 (0.12)	0.76 (0.11)	0.92 (0.04)
LFI economies	0.80 (0.08)	0.95 (0.06)	0.68 (0.10)	0.82 (0.51)	0.84 (0.14)

*Notes:* In panel E, the ratio of total consumption growth volatility to that of income growth volatility is first computed separately for each country. The reported numbers are the within-group medians of those ratios. (Note that this is not the same as the ratio of the median of consumption growth volatility to the median of income growth volatility.) Standard errors are reported in parentheses.

September 2002 *World Economic Outlook* (IMF 2002), MFI economies on average have lower output volatility than LFI economies. Interestingly, there is a significant decline in average output volatility in the 1990s for both industrial and LFI economies but a far more modest decline for MFI economies. The picture is similar for a broader measure of income that includes factor income flows and terms-of-trade effects, which are particularly important for developing countries. Figure 11.8 (panel A), which shows the evolution of the average volatility of income growth for different groups of countries, confirms these results and shows that they are not sensitive to the decade-wise breakdown of the data, although there is a pickup in volatility for MFIs toward the end of the sample.<sup>28</sup>

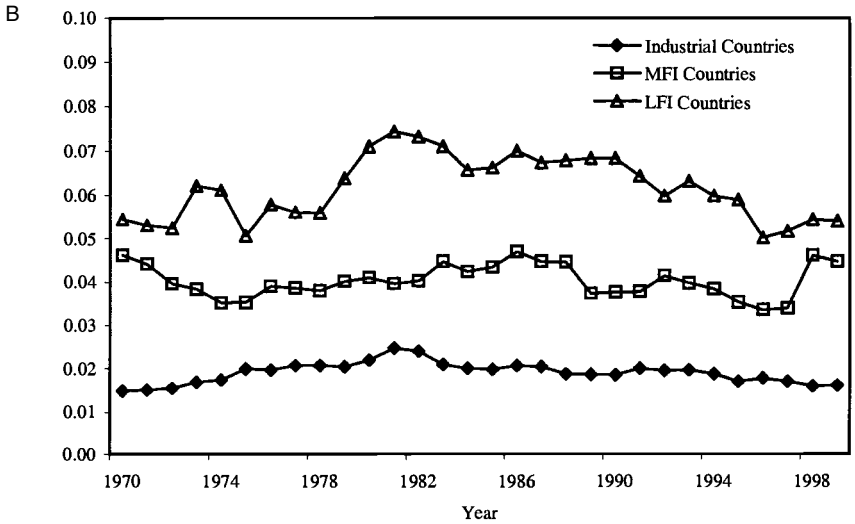
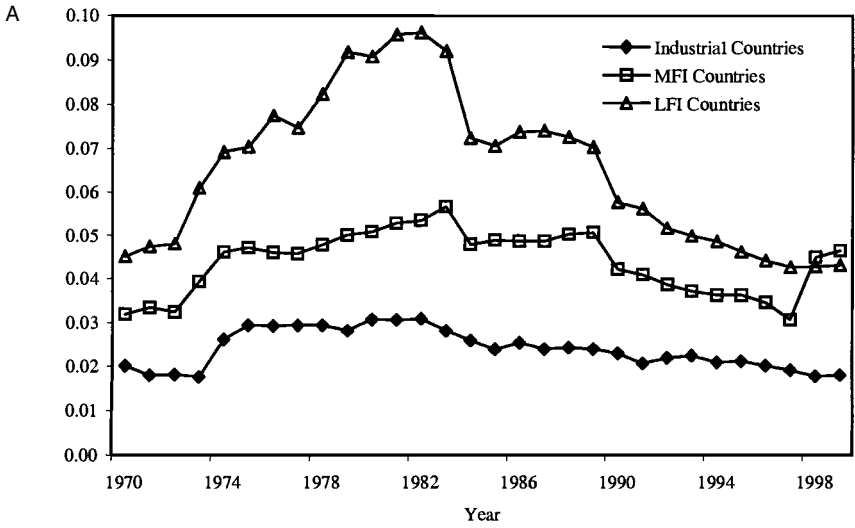
Panel C of table 11.4 shows that average consumption volatility in the 1990s has declined in line with output volatility for both industrial economies and LFI economies. By contrast, for MFI economies, the volatility of private consumption has in fact risen in the 1990s relative to the 1980s for MFI economies. It is possible that looking at the volatility of private consumption is misleading, because public consumption could be playing an important smoothing role, especially in developing economies. It is true, as shown in panel D of table 11.4, that total consumption is generally less volatile than private consumption. However, these results confirm the pattern that, on average, consumption volatility for industrial and LFI economies declined in the 1990s. By contrast, it increases for MFI economies over the same period. Figure 11.8 (panel B), which shows the evolution of the average volatility of total consumption growth over a ten-year rolling window, yields a similar picture. Could this simply be a consequence of higher income volatility for MFI economies?

Strikingly, for the group of MFI countries, the volatility of total consumption relative to that of income has actually increased in the 1990s relative to earlier periods. Panel E of table 11.4 shows the median ratio of the volatility of total consumption growth to that of income growth for each group of countries. For MFI economies, this ratio increases from 0.76 in the 1980s to 0.92 in the 1990s, while it remains essentially unchanged for the other two groups of countries. Thus, the increase in the 1990s in the volatility of consumption relative to that of income for the MFI economies suggests that financial integration has not provided better consumption-smoothing opportunities for these economies.<sup>29</sup>

More formal econometric evidence is presented by Kose, Prasad, and Terrones (2003a), who use measures of capital account restrictions as well

28. The figure shows the median standard deviation of income growth for each country group, based on standard deviations calculated for each country over a ten-year rolling window.

29. It should be noted that, despite the increase in the 1990s, the volatility of both private and total consumption for the MFI economies is, on average, still lower than for LFI economies.



**Fig. 11.8** Volatility of income and consumption growth (ten-year rolling standard deviations; medians for each group of countries); *A*, income; *B*, total consumption  
*Source:* Kose, Prasad, and Terrones (2003a).

as gross financial flows to capture different aspects of financial integration, as well as differences in the degree of integration across countries and over time. This analysis confirms the increase in the relative volatility of consumption for countries that have larger financial flows, even after controlling for macroeconomic variables as well as country characteristics such as trade openness and industrial structure. However, these authors also identify an important threshold effect—beyond a particular level, financial integration significantly reduces volatility. Most developing economies, including MFI economies, are unfortunately well below this threshold.<sup>30</sup>

Why has the relative volatility of consumption increased precisely in those developing countries that are more open to financial flows? One explanation is that positive productivity and output growth shocks during the late 1980s and early 1990s in these countries led to consumption booms that were willingly financed by international investors. These consumption booms were accentuated by the fact that many of these countries undertook domestic financial liberalization at the same time that they opened up to international financial flows, thereby loosening liquidity constraints at both the individual and the national level. When negative shocks hit these economies, however, they rapidly lost access to international capital markets. For the financial integration measure used in this paper, the threshold occurs at a ratio of about 50 percent of GDP. The countries in the sample that have a degree of financial integration above this threshold are all industrial countries.

Consistent with this explanation, a growing literature suggests that the procyclical nature of capital flows appears to have had an adverse impact on consumption volatility in developing economies.<sup>31</sup> One manifestation of this procyclicality is the phenomenon of “sudden stops” of capital inflows (see Calvo and Reinhart 1999). More generally, access to international capital markets has a procyclical element, which tends to generate higher output volatility as well as excess consumption volatility (relative to that of income). Reinhart (2002), for instance, finds that sovereign bond ratings are procyclical. Since the spreads on bonds of developing economies are strongly influenced by these ratings, this implies that the costs of borrowing on international markets are procyclical as well. Kaminsky and Reinhart (2002) present more direct evidence on the procyclical behavior of capital inflows.<sup>32</sup>

30. For the financial integration measure used in this paper, the threshold occurs at a ratio of about 50 percent of GDP. The countries in the sample that have a degree of financial integration above this threshold are all industrial countries.

31. The notion of procyclicality here is that capital inflows are positively correlated with domestic business cycle conditions in these countries.

32. The World Bank's (2001) *Global Development Finance* report also finds some evidence of such procyclicality and notes that the response of capital inflows is typically twice as large when a developing country faces an adverse shock to GDP growth as when it faces a favorable shock. This is attributed to the fact that credit ratings are downgraded more rapidly during adverse shocks than they are upgraded during favorable ones.

#### 11.4.2 Crises as Special Cases of Volatility

Crises can be regarded as particularly dramatic episodes of volatility. In fact, the proliferation of financial crises is often viewed as one of the defining aspects of the intensification of financial globalization over the last two decades. Furthermore, the fact that recent crises have affected mainly MFI economies has led to these phenomena being regarded as hallmarks of the unequal distribution of globalization's benefits and risks. This raises a challenging set of questions about whether the nature of crises has changed over time, what factors increase vulnerability to crises, and whether such crises are an inevitable concomitant of globalization.

Some aspects of financial crises have indeed changed over time, while in other respects it is often *déjà vu* all over again. Calvo (1998) has referred to such episodes in the latter half of the 1980s and 1990s as capital account crises, while earlier ones are referred to as current account crises. Although this suggests differences in the mechanics of crises, it does not necessarily imply differences in some of their fundamental causes. Kaminsky and Reinhart (1999) discuss the phenomenon of "twin crises," which involve balance-of-payments and banking crises. These authors also make the important point that, in the episodes that they analyze, banking-sector problems typically precede a currency crisis, which then deepens the banking crisis, activating a vicious spiral. In this vein, Krueger and Yoo (2002) conclude that imprudent lending by the Korean banks in the early and mid-1990s, especially to the chaebols, played a significant role in the 1997 Korean currency crisis. Opening up to capital markets can thus exacerbate such existing domestic distortions and lead to catastrophic consequences (Aizenman 2002).

One key difference in the evolution of crises is that, while the 1970s and 1980s featured crises that affected both industrial and developing economies, these have become almost exclusively the preserve of developing economies since the mid-1990s.<sup>33</sup> This suggests either that advanced economies have been able to better protect themselves through improved policies or that the fundamental causes of crises have changed over time, thereby increasing the relative vulnerability of developing economies. In this context, it should be noted that, while capital flows from advanced economies to MFI economies have increased sharply, these flows among industrial economies have jumped even more sharply in recent years, as noted earlier. Thus, at least in terms of volume of capital flows, it is not obvious that changes in financial integration can by themselves be blamed for crises in MFI economies.

Is it reasonable to accept crises as a natural feature of globalization,

33. In fact, in the 1990s, the exchange rate mechanism (ERM) crisis is the only significant one among industrial countries. The prolonged Japanese recession is in some sense a crisis, although the protracted nature of Japan's decline, which has not featured any sudden falls in output, would not fit the standard definition of a crisis.

much as business cycles are viewed as a natural occurrence in market economies? One key difference between these phenomena is that the overall macroeconomic costs of financial crises are typically very large and far more persistent. Calvo and Reinhart (2000, 2002) document that emerging-market currency crises, which are typically accompanied by sudden stops or reversals of external capital inflows, are associated with significant negative output effects.<sup>34</sup> Such recessions following devaluations (or large depreciations) are also found to be much deeper in emerging markets than in developed economies. In addition, the absence of well-functioning safety nets can greatly exacerbate the social costs of crises, which typically have large distributional consequences (see, e.g., Baldacci, de Mello, and Inchauste 2002).<sup>35</sup>

What is the impact on poverty of macroeconomic volatility associated with greater openness to trade and financial flows? Mechanically, an increase in the volatility of consumption could lead to a decrease in the poverty head count. However, the increase in the volatility of consumption adversely affects the poor households' welfare. Recent research examines various implications of macroeconomic volatility and financial crises on the dynamics of consumption and poverty in developing countries. For example, Duygan (2004) documents that household expenditure decreased by 5 percent on average during financial crises in sixteen developing countries. Some recent studies focus on the permanent impact of temporary negative income shocks on poverty. For example, Lustig (2000) concludes that crises in Latin America adversely affected the human capital of the poor and have had a permanent impact on poverty and inequality by diminishing the potential of the poor to escape poverty. Agénor (2002a) studies the asymmetric effects of macroeconomic fluctuations and crises on poverty. He finds that while the effects of shocks to income on poverty are quite small during periods of crisis, these shocks could decrease poverty during expansions.<sup>36</sup>

34. Currency crises can also affect firms directly and, by exacerbating the problems of the banking sector, can lead to a broader credit crunch, even for productive and solvent firms. Mishkin (1999) argues that the credit crunch resulting from sharp contractions in domestic bank credit following financial crises has been instrumental in aggravating these crises and reducing investment and economic activity. Rodrik and Velasco (2000) note that difficulties in rolling over short-term debt during crisis episodes rapidly squeeze the availability of liquidity, with immediate effects on investment and output.

35. Work by Wei and Wu (2001) using Chinese regional data shows that increases in trade openness are negatively associated with changes in inequality. However, the process of financial and trade liberalization can sometimes have negative distributional consequences within a country, especially in the short run. Attempts to address these issues using ad hoc redistributive measures can often result in distortions that adversely affect long-term growth. Nevertheless, given the vital need to maintain sociopolitical stability while undertaking significant reforms and liberalization, there is a need for judicious design and use of social safety nets to protect the economically vulnerable segments of the population.

36. Recent research also studies the adverse impact of macroeconomic volatility on food security and hunger (see Barrett and Sahn 2001).



#### 11.4.3 Has Financial Globalization Intensified the Transmission of Volatility?

What factors have led to the rising vulnerability of developing economies to financial crises? The risk of sudden stops or reversals of global capital flows to developing countries has increased in importance as many developing countries now rely heavily on borrowing from foreign banks or portfolio investment by foreign investors. These capital flows are sensitive not just to domestic conditions in the recipient countries but also to macroeconomic conditions in industrial countries. For instance, Mody and Taylor (2002), using an explicit disequilibrium econometric framework, detect instances of “international capital crunch”—where capital flows to developing countries are curtailed by supply-side rationing that reflects industrial-country conditions.<sup>37</sup> These North-South financial linkages, in addition to the real linkages described in earlier sections, represent an additional channel through which business cycles and other shocks that hit industrial countries can affect developing countries.

The effects of industrial-country macroeconomic conditions, including the stage of the business cycle and interest rates, have different effects on various types of capital flows to emerging markets. Reinhart and Reinhart (2001) document that net FDI flows to emerging-market economies are strongly positively correlated with U.S. business cycles. On the other hand, bank lending to these economies is negatively correlated with U.S. cycles. Edison and Warnock (2001) find that portfolio equity flows from the United States to major emerging-market countries are negatively correlated with both U.S. interest rates and U.S. output growth. This result is particularly strong for flows to Latin America and less so for flows to Asia. Thus, the sources of capital inflow for a particular MFI can greatly affect the nature of its vulnerability to the volatility of capital flows arising from industrial-country disturbances.<sup>38</sup>

The increase in cross-country financial market correlations also indicates a risk that emerging markets will be caught up in financial market bubbles. The rise in comovement across emerging- and industrial-country stock markets, especially during the stock market bubble period of the late 1990s, points to the relevance of this concern. This is a particular risk for the relatively shallow and undiversified stock markets of some emerging economies. For instance, as noted earlier, the strong correlations between emerging and industrial stock markets during the bubble period reflects the

37. This paper examines bond, equity, and syndicated loan flows to Brazil, Mexico, Korea, and Thailand over the period 1990–2000.

38. However, notwithstanding the differences in the types of sensitivities to industrial-country business cycle conditions, the fact still remains that FDI flows are generally less volatile and less sensitive to the factors discussed here than either portfolio flows or bank lending.

preponderance of technology and telecommunication-sector stocks in the former set of markets. It is, of course, difficult to say conclusively whether this phenomenon would have occurred even in the absence of financial globalization, since stock market liberalizations in these countries often went hand in hand with their opening up to capital flows.

The increasing depth of stock markets in emerging economies could alleviate some of these risks but, at the same time, could heighten the real effects of such financial shocks. In this vein, Dellas and Hess (2002) find that a higher degree of financial development makes emerging stock markets more susceptible to external influences (both financial and macroeconomic) and that this effect remains important after controlling for capital controls and trade linkages.<sup>39</sup> Consequently, the effects of external shocks could be transmitted to domestic real activity through the stock market channel.

Even the effects of real shocks are often transmitted faster and amplified through financial channels. There is a large literature showing how productivity, terms-of-trade, fiscal, and other real shocks are transmitted through trade channels.<sup>40</sup> Cross-country investment flows, in particular, have traditionally responded quite strongly to country-specific shocks.<sup>41</sup> Financial channels constitute an additional avenue through which the effects of such real shocks can be transmitted. Furthermore, since transmission through financial channels is much quicker than through real channels, both the speed and the magnitude of international spillovers of real shocks are considerably heightened by financial linkages.<sup>42</sup>

Rising financial linkages have also resulted in contagion effects. Potential contagion effects are likely to become more important over time as financial linkages increase and investors in search of higher returns and better diversification opportunities increase their share of international holdings and, due to declines in information and transaction costs, have access to a broader array of cross-country investment opportunities.<sup>43</sup>

There are two broad types of contagion identified in the literature—

39. These authors use standard measures of financial-sector development that are based on the competitive structure and the size of the financial intermediation sector in each country.

40. See Kouparitsas (1996); Blankenau, Kose, and Yi (2001); Kose and Riezman (2001); and Kose (2002).

41. See Glick and Rogoff (1995) for an empirical analysis of how country-specific productivity shocks affect national investment and the current account. These authors show how the responses to such shocks depend crucially on the persistence of the shocks. Kose, Otrok, and Whiteman (2003) examine the impact of world and country-specific factors in driving fluctuations in output, consumption, and investment.

42. For instance, a shock to GDP growth in one country may be transmitted gradually through trade channels but could far more quickly have an impact on economic activity in another country via correlations in stock market fluctuations. If the two countries were perfectly integrated through trade and financial linkages this outcome could, of course, simply reflect an optimal risk-sharing arrangement.

43. Contagion effects aside, Kose, Prasad, and Terrones (2003b) find that increasing financial linkages have only a small effect on cross-country output and consumption correlations.

fundamentals-based contagion and pure contagion. The former refers to the transmission of shocks across national borders through real or financial linkages. In other words, while an economy may have weak fundamentals, it could get tipped over into a financial crisis as a consequence of investors' reassessing the riskiness of investments in that country or attempting to rebalance their portfolios following a crisis in another country. Similarly, bank lending can lead to such contagion effects when a crisis in one country to which a bank has significant exposure forces it to rebalance its portfolio by readjusting its lending to other countries. This bank transmission channel, documented in van Rijckeghem and Weder (2000) and Kaminsky and Reinhart (2001), can be particularly potent since a large fraction of bank lending to emerging markets is in the form of short-maturity loans. While fundamentals-based contagion was once prevalent mainly at the regional level, the Russian crisis demonstrated its much broader international reach (Kaminsky and Reinhart 2002).<sup>44</sup>

Pure contagion, on the other hand, represents a different kind of risk since it can not easily be influenced by domestic policies, at least in the short run. There is a good deal of evidence of sharp swings in international capital flows that are not obviously related to changes in fundamentals. Investor behavior during these episodes, which is sometimes categorized as herding or momentum trading, is difficult to explain in the context of optimizing models with full and common information. Informational asymmetries, which are particularly rife in the context of emerging markets, appear to play an important role in this phenomenon. A related literature suggests that pure contagion may reflect investors' shifting appetite for risk, but it is no doubt difficult to disentangle such changes in risk appetite from shifts in underlying risks themselves (Kumar and Persaud 2001). Thus, in addition to pure contagion, financial integration exposes developing economies to the risks associated with destabilizing investor behavior that is not related to fundamentals.<sup>45</sup>

#### 11.4.4 Some Factors That Increase Vulnerability to the Risks of Globalization

Empirical research indicates that the composition of capital inflows and the maturity structure of external debt appear to be associated with higher vulnerability to the risks of financial globalization. The relative impor-

44. Kim, Kose, and Plummer (2001) examine the roles of fundamentals-based contagion and pure contagion during the Asian crisis.

45. The paper by Claessens and Forbes (2001) contains a compilation of essays on the different dimensions of contagion effects. Boyer, Gibson, and Loretan (1999) and Forbes and Rigobon (2001) argue that the evidence for pure contagion against the alternative of fundamentals-based contagion is very weak. Corsetti, Pericoli, and Sbracia (2002) argue that, under more general assumptions, there is greater evidence of the former type of contagion. Bayoumi and others (2003) find evidence of "positive" contagion related with herding behavior of capital inflows to emerging markets.

tance of different sources of financing for domestic investment, as proxied by the following three variables, has been shown to be positively associated with the incidence and the severity of currency and financial crises: the ratio of bank borrowing or other debt to FDI, the shortness of the term structure of external debt, and the share of external debt denominated in foreign currencies.<sup>46</sup> Detragiache and Spilimbergo (2002) find strong evidence that debt crises are more likely to occur in countries where external debt has a short maturity.<sup>47</sup> However, the maturity structure may not entirely be a matter of choice since, as argued by these authors, countries with weaker macroeconomic fundamentals are often forced to borrow at shorter maturities since they do not have access to longer-maturity loans.

In addition to basic macroeconomic policies, other policy choices of a systemic nature can also affect the vulnerability of MFIs. Recent currency crises have highlighted one of the main risks in this context. Developing countries that attempt to maintain a relatively inflexible exchange rate system often face the risk of attacks on their currencies. While various forms of fully or partially fixed exchange rate regimes can have some advantages, the absence of supportive domestic policies can often result in an abrupt unraveling of these regimes when adverse shocks hit the economy.

Financial integration can also aggravate the risks associated with imprudent fiscal policies. Access to world capital markets could lead to excessive borrowing that is channeled into unproductive government spending. The existence of large amounts of short-term debt denominated in hard currencies then makes countries vulnerable to external shocks or changes in investor sentiment. The experience of a number of MFI countries that have suffered the consequences of such external debt accumulation points to the heightened risks of undisciplined fiscal policies when the capital account is open.

Premature opening of the capital account also poses serious risks when financial regulation and supervision are inadequate.<sup>48</sup> In the presence of weakly regulated banking systems and other distortions in domestic capital markets, inflows of foreign capital could exacerbate the existing inefficiencies in these economies. For example, if domestic financial institutions tend to channel capital to firms with excessive risks or weak fundamentals, financial integration could simply lead to an intensification of such flows.<sup>49</sup>

46. See, for example, Frankel and Rose (1996), Radelet and Sachs (1998), and Rodrik and Velasco (2000).

47. Some authors have found that the currency composition of external debt also matters. Carlson and Hernandez (2002) note that, during the Asian crisis, countries with more yen-denominated debt fared significantly worse. These authors attribute this to the misalignment between the countries' de facto currency pegs and the denomination of their debt.

48. See Ishii et al. (2002) and Bakker and Chapple (2002).

49. Krueger and Yoo (2002) discuss the interactions of crony capitalism and capital account liberalization in setting the stage for the currency-financial crisis in Korea. See also Mody (2002).

In turn, the effects of premature capital inflows on the balance sheets of the government and corporate sectors could have negative repercussions on the health of financial institutions in the event of adverse macroeconomic shocks.

## 11.5 Conclusions

The empirical evidence has not established definitive proof that financial integration has enhanced growth for developing countries. Furthermore, it may be associated with higher consumption volatility. Therefore, it may be valuable for developing countries to experiment with different paces and strategies in pursuing financial integration. Empirical evidence does suggest that improving governance, in addition to sound macroeconomic frameworks and the development of domestic financial markets, should be an important element of such strategies. This conclusion does not necessarily imply that a country must develop a full set of sound institutions matching the best practices in the world before embarking on financial integration. As we emphasized in Prasad et al. (2003, chap. 5), as a country makes progress in transparency, control of corruption, rule of law, and financial supervisory capacity, it will be in an increasingly better position to benefit from financial globalization.

Equally important is to avoid some of the recurrent traps that countries have fallen into as they have moved to liberalize domestic financial markets and engineer increased financial globalization. If, as appears to be the case, overly fixed exchange rates are a leading determinant of financial crises in emerging markets, then moving to more flexible exchange rate regimes should greatly improve a country's chances of being a winner from financial globalization even in the short term. Likewise, assuming a large external debt burden, especially if it is of a relatively short maturity structure, can be a damaging way to undertake financial integration.

It is also important to stress that financial integration is not necessarily a variable that can be tightly controlled by policy. Capital controls, aside from coming in myriads of forms with effects that are difficult to manage, are often ineffective. Even in countries where they are relatively more effective, such controls tend to become less so over time as the rising sophistication of international capital markets and investors, along with the global expansion of trade, increases the opportunities for evading capital controls. Some of the most consistently financially integrated countries based on our *de facto* measure—including, for example, many Latin American countries—have often been ones where capital controls are quite stringent, at least on paper. On the other hand, many countries in Africa offer unimpeded capital market access but have not yet succeeded in achieving a significant degree of integration.

Given that we have not been able to draw strong conclusions about the empirical links between financial globalization, growth, and macroeconomic volatility, one must conclude that there will almost surely be similar ambiguity in an investigation of the links between financial globalization and poverty, although we have not directly examined those links in this paper. Of course, in such an exercise one would ideally like to look at a broader range of human development indicators and measures of poverty than just income (for example, even in some countries such as Brazil that have experienced relatively slow income growth over the past fifteen years, educational attainment levels have continued to rise).<sup>50</sup>

In addition, to provide a comprehensive analysis of the complex relationship between globalization and poverty, one has to acknowledge that poverty is fundamentally a relative measure, which will probably gain an entirely different meaning as the world economy becomes more integrated (Rogoff 2004). For example, if global growth continues at a rapid pace during the next century, it is possible that by the end of the century emerging-market economies, including China and India, could attain income levels exceeding those of Americans today. This implies that Malthusian notions of poverty are likely to become a distant memory in most parts of the world as global income inexorably expands over the next century, and issues of inequality, rather than subsistence, will increasingly take center stage in the poverty debate.

However, our findings support the importance of employing various complementary policies to increase the benefits of globalization for the poor, as discussed in several other chapters of this volume. In particular, policies encouraging labor mobility, improving access to credit and technical know-how, and establishing social safety nets seem to increase the benefits of increased financial and trade integration for the poor. As discussed in other chapters of this volume, these policies are well defined in the case of trade liberalization. For example, trade liberalization could lead to contraction in some previously protected industries. Policies that could help workers move from such sectors to expanding ones could diminish the adverse effects on the poor in the short run while also contributing to poverty reduction in the long run.

The results that we have highlighted in this paper provide a framework to examine the different channels through which the forces of financial globalization could affect poverty and inequality outcomes. A great deal of additional work is clearly called for to gain a better understanding of these dimensions of the effects of financial globalization.

50. Ravallion (2003) argues that differences in the concept and definitions of poverty could lead to different conclusions about the impact of globalization on poverty and inequality.

## Appendix

### *Data Sources*

Unless indicated otherwise, the primary sources for the data used in this paper are the IMF's *International Financial Statistics* and the World Bank's World Development Indicators database. The basic data sample comprises seventy-six countries: twenty-one industrial and fifty-five developing.<sup>51</sup>

#### **Industrial countries**

Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Ireland (IRL), Italy (ITA), Japan (JPN), the Netherlands (NLD), New Zealand (NZL), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), the United Kingdom (GBR), and the United States (USA).

#### **Developing countries**

These are grouped into MFI countries (numbering twenty-two) and LFI countries (thirty-three) countries.

##### MFI

Argentina (ARG), Brazil (BRA), Chile (CHL), China (CHN), Colombia (COL), Egypt (EGY), Hong Kong (HKG), India (IND), Indonesia (IDN), Israel (ISR), Korea (KOR), Malaysia (MYS), Mexico (MEX), Morocco (MAR), Pakistan (PAK), Peru (PER), the Philippines (PHL), Singapore (SGP), South Africa (ZAF), Thailand (THA), Turkey (TUR), and Venezuela (VEN).

##### LFI

Algeria (DZA), Bangladesh (BGD), Benin (GEN), Bolivia (BOL), Botswana (BWA), Burkina Faso (BFA), Burundi (BDI), Cameroon (CMR), Costa Rica (CRI), Côte d'Ivoire (CIV), the Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Gabon (GAB), Ghana (GHA), Guatemala (GTM), Haiti (HTI), Honduras (HND), Jamaica (JAM), Kenya (KEN), Mauritius (MUS), Nicaragua (NIC), Niger (NER), Nigeria (NGA), Panama (PAN), Papua New Guinea (PNG), Paraguay

51. The following were excluded from the analysis: small countries (those with population below 1 million), transition economies, some oil producers, and other countries with incomplete or clearly unreliable data.

(PRY), Senegal (SEN), Sri Lanka (LKA), Syrian Arab Republic (SYR), Togo (TGO), Tunisia (TUN), and Uruguay (URY).

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**Comment** Susan M. Collins

This paper promises a comprehensive assessment of empirical evidence about the impact of financial integration on growth and on volatility in developing countries. Given that this complex topic is the focus of a large and growing academic literature, not to mention perhaps an even larger and more heated nonacademic one, the goal is ambitious. The authors cover a lot of ground—carefully defining terms, establishing basic stylized facts, reviewing relevant economic theory, summarizing available empirical evidence, and presenting findings of new empirical analysis. In my view, the result is a thoughtful, informative, balanced, and well-written assessment—most of which I agree with. There is a lot in this very useful paper. Thus, my comments will necessarily be selective. I will begin by briefly summarizing the main conclusions. Then, taking my job as a discussant seriously, I will devote most of my comments to the two areas in which I see things somewhat differently: the implications of financial integration and of increased capital for economic growth. Both of these are areas in which the way that key concepts are measured affects interpretation.

The authors reach two main conclusions. First, they argue that a systematic examination of available evidence suggests that it is difficult to establish a robust causal relationship between the extent to which a country is integrated with global financial markets and its output growth. This is one area in which I think the evidence suggests a more nuanced view, as explained below.

Second, largely on the basis of their new analysis, they argue that there is little evidence that financial integration has helped developing countries to stabilize fluctuations in consumption. Indeed, they find that things may get worse at low to moderate levels of financial integration. They also argue that the problem may arise from the procyclicality of capital flows to developing countries. I see this section, and its focus on consumption instead of output volatility, as a convincing and important contribution of the paper. I also agree with the authors that more work is needed to better understand when and why integration may raise volatility.

Thus, the authors conclude that “it may be valuable for developing countries to experiment with different paces and strategies in pursuing financial integration.” I fully agree. While this resulting cautionary take on financial integration may be in accord with today’s conventional wisdom, it is a notable shift from the considerably more positive view of financial integration

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associated with the IMF until quite recently. Further, the paper's focus on backing up claims with empirical evidence is refreshing in a subject area rife with undocumented assertions.

Let me turn now to the two areas on which I have a somewhat different take. The first has to do with what we mean by financial integration. The paper quite appropriately makes a clear distinction between *de jure* and *de facto* measures. However, this distinction is not made explicit in the review of existing empirical studies on which the authors base their main conclusions in the section on financial integration and growth. (This discussion draws from Collins 2004.)

*De jure* measures are intended to capture the existence (and degree) of capital controls—in other words a measure of each country's official policy toward capital flows. The most widely used indicator is one constructed by the IMF, which takes the value of 1 when controls exist and 0 otherwise. An alternative, constructed by Dennis Quinn, attempts to measure the degree of capital account openness, ranging from 0 (closed) to 4 (fully open).<sup>1</sup> In contrast, *de facto* measures are intended to capture the actual amount of financial integration. Some studies use indicators based on realized capital flows, while others focus on accumulated stocks.<sup>2</sup>

As the authors here point out, *de jure* and *de facto* indicators of changes in financial integration show much lower correlation for developing countries than they do for industrial countries. Is one concept better than the other? I would argue that both are relevant. We are interested in whether policy stance and changes in policy matter, as well as in the effects of whatever capital flows actually materialize. I agree with the authors of this paper that actual controls and how they are enforced vary considerably across countries. Available indicators of policy (the *de jure* measures) seem quite rough, may not be very informative, and are difficult to interpret. From this perspective, it makes sense to focus, as they claim to, on *de facto* indicators. But as they recognize, the *de facto* measures, particularly the capital flow indicators, are clearly endogenous in a growth regression, making the causality difficult to pin down conclusively.

My main point about this section of the paper, however, is that which concept or indicator is used in empirical analyses appears to make a considerable difference. Thus, distinguishing between them is very important. The summary of existing studies presented here does not do this consis-

1. The IMF indicator is available annually for a large sample of countries during 1966–95. Unfortunately, the IMF replaced this single yes/no measure with a more informative, but not directly comparable, set of indicators for particular restrictions on capital inflows and outflows. The Quinn measure is available for a smaller set of countries and for selective years.

2. It is important to note that this paper (like the relevant literature) is not making a distinction between *de jure* as policy on the books versus *de facto* as the true effect of that policy. Instead, the distinction is between *de jure* (policy on the books) versus *de facto* (the outcome).



**Table 11C.1** Recent research on financial integration and growth

Total no. of studies	Type of indicators		
	De jure	De facto	
<i>A. Studies in PRWK table 11.3</i>			
13	12	4	
Indicator	Positive effect on growth?		
	Yes	Mixed	No
<i>B. Recent research using de jure indicators<sup>a</sup></i>			
IMF (12)	1	3	8
Quinn (5)	1	2	2
<i>C. Recent research using de facto indicators</i>			
Total capital flow or stock <sup>b</sup>	2 (OLS)	1 (OECD)	3 (LDC, IV)
FDI flows <sup>c</sup>	7	1	1

Source: Collins (2004) and author's calculations.

Notes: PRWK = Prasad et al.'s chapter in this volume; OLS = ordinary least squares; LDC = less developed countries; IV = instrumental variables.

<sup>a</sup>Includes a total of thirteen studies, one of which is not in PRWK.

<sup>b</sup>Includes three studies, all in PRWK.

<sup>c</sup>Includes eight studies, one in PRWK.

tently—and indeed, most of the studies listed in table 11.3 of the paper actually use de jure measures, not the de facto ones that are the focus of the text discussion.

The point can be made most clearly by regrouping the papers summarized in table 11.3 of the paper. In doing this, I exclude the one paper that studies effects of stock market liberalizations—which I would classify as a separate dimension of financial integration. As shown in panel A of table 11C.1, this leaves a total of thirteen studies. Of these, twelve report results using one or more de jure indicators, while only four report results based on de facto indicators.<sup>3</sup> Clearly, the conclusions in the paper are dominated by results based on de jure indicators. Panel B focuses on the results using de jure indicators. One study that was not reviewed in the authors' paper has been added to the twelve. As shown, only one of twelve studies using the IMF indicator finds clear evidence that financial liberalization positively affects growth. The evidence is somewhat more mixed using the Quinn indicator, suggesting that the difficulty in finding a relationship may be due, in part, to the coarseness of these measures. But like the IMF mea-

3. Three of the studies report both.

sure available since 1996, the Quinn indicator provides a limited picture of the differences in policy stance across countries and over time.

Panel C of table 11C.1 focuses on results based on *de facto* indicators. Here eight studies have been added to the three reviewed in table 11.3 of the paper. The top line shows results in which total capital flows or stocks (usually relative to each country's GDP) are used to proxy financial integration. An interesting picture emerges. Studies that use simple ordinary least squares (OLS) find a positive, and often quite strong, link to growth. However, it is unclear whether this reflects causality or simply a positive correlation. Those that use instrumental variables in an attempt to deal with the endogeneity of capital flows fail to find a significant effect. The causality may run mainly from faster growth to increased capital inflow. But in at least some of these cases, the first stage of the regression is quite weak, and the second-stage result may simply reflect difficulties in finding strong instruments. Finally, the last line in the table adds results in which *de facto* financial integration is measured using FDI flows only. Seven out of nine of these studies do find a strong positive effect on growth, including some that attempt to address endogeneity. The authors of the current paper are clearly aware of these results and seem to find them convincing. However, their discussion of these findings is relegated to a footnote (note 19), allowing the results based on *de jure* indicators to take central stage in the text discussion.

In sum, a statement such as “if financial integration has a positive effect on growth, it is probably not strong or robust” seems to me to be an overly stark and potentially misleading summary of what the evidence shows. Instead, my reading of the existing literature is as follows: There is little evidence relating available indicators of *de jure* financial integration to growth, which may reflect relatively uninformative indicators. Countries that are able to attract capital inflows tend to grow faster, but evidence does not suggest that this is a causal relationship. However, somewhat more support exists for a positive causal link between FDI and growth.

The second issue I would like to raise concerns the role of increased physical capital for economic growth. There is a well-known debate on this topic, with some claiming that capital accumulation explains most of the cross-country variation in output growth (or levels of output per capita) and others that it is total factor productivity (TFP), not capital, that really matters. Authors on both sides present empirical evidence to back up their claims. And in the recent development literature, those who come down on the side of TFP seem to be emerging on the top. The authors of this paper seem to agree. For example, they assert that “most of the cross-country differences in per capita incomes stem not from differences in the capital-labor ratio but from differences in total factor productivity.” However, as I have argued with Barry Bosworth, much of the difference between whether one finds

that capital accumulation is important or that it matters very little is related to issues of measurement, which are typically ignored. My point in the remainder of these remarks is not to minimize the role of TFP, which is clearly critical to growth. Instead, it is to caution against interpretations of available evidence that suggest little or no role for capital accumulation. (This discussion draws from Bosworth and Collins 2003. Readers are referred to that paper for a fuller treatment and additional references.)

Consider first the way that capital accumulation is incorporated into growth regressions. Many of those that find a relatively weak role for capital accumulation use each country's average investment rate to proxy accumulation. The change in each country's capital stock over the relevant time period is clearly the more direct measure. We have looked at both, using data for eighty-four countries over the period from 1960 to 2000. Perhaps surprisingly, we find that there is a relatively low cross-country correlation between average investment and change in capital stock. (Countries with similar investment rates will have low capital accumulation if they grow slowly, but high accumulation if they grow rapidly.) And in a regression, investment rates exhibit a much smaller and less statistically significant correlation with output growth than changes in the capital stock. This is illustrated in table 11C.2. (We note that the point is robust to the inclusion of additional right-hand-side variables.)

A number of studies use growth (or levels) accounting to relate increases in capital to output across countries. The traditional approach puts change in output per worker on the left-hand side and uses change in capital per worker to measure capital input (deepening). This results in the growth decomposition in equation (1). More recently, it has become popular to measure capital's contribution to growth in terms of increases in the capital-

**Table 11C.2** Comparative performance: Investment and the change in the capital stock (eighty-four countries; dependent variable: growth in output per worker)

	1960–2000		1960–80		1980–2000	
	(1)	(2)	(3)	(4)	(5)	(6)
Growth in physical capital per worker	0.56 (13.0)		0.38 (8.9)		0.70 (13.5)	
Investment share per worker		0.13 (5.3)		0.05 (2.5)		0.21 (7.7)
Adjusted $R^2$	0.67	0.25	0.48	0.06	0.69	0.41
Standard error	0.82	1.24	1.08	1.46	1.04	1.42

Source: Bosworth and Collins (2003).

Notes:  $t$ -statistics are reported in parentheses; constant term is included but not reported. Growth in capital per worker is measured as mean of annual log changes ( $\times 100$ ); investment per worker is measured as a share of GDP in constant national prices.

output ratio. The decomposition in equation (2) shows such a decomposition.

$$(1) \quad \Delta \ln \left( \frac{Y}{L} \right) = \alpha \left[ \Delta \ln \left( \frac{K}{L} \right) \right] + (1 - \alpha) \Delta \ln H + \Delta \ln A$$

$$(2) \quad \Delta \ln \left( \frac{Y}{L} \right) = \frac{\alpha}{1 - \alpha} \cdot \left[ \Delta \ln \left( \frac{K}{Y} \right) \right] + \Delta \ln H + \frac{1}{1 - \alpha} \Delta \ln A$$

( $Y$ ,  $L$ ,  $K$ ,  $L$ , and  $A$  are GDP, labor force, physical capital, human capital, and TFP, respectively, and  $\alpha$  is capital's share.)

The rationale for the second decomposition is that using capital per worker ignores the endogeneity of capital accumulation, and that a portion of any change in capital is likely to have been induced by increases in TFP. However, as we discuss in Bosworth and Collins (2003), the assumption that countries' capital stocks adjust proportionately to all deviations in output growth induced by TFP seems to us extreme. Furthermore, one can recognize that changes in a country's capital stock are partially induced by changes in TFP without concluding that this induced portion should be excluded from measures of capital's contribution to growth. In any case, changing the definition of how to measure capital's contribution from that in equation (1) to that in equation (2) hardly seems the appropriate way to resolve the underlying conceptual dispute. And the formulation in equation (2) clearly increases the role for TFP by scaling it upward by a factor of  $[1/(1 - \alpha)]$  equal to 1.54 in our analysis.

Table 11C.3 reports a variance decomposition of growth in output per worker using both formulations. As shown, the two definitions do suggest very different roles for capital accumulation. Measuring capital's contribution using changes in capital per worker implies that 34 percent of the variation in growth across countries can be related to capital, compared with 54 percent for TFP. However, measuring capital's contribution only by changes in the capital output ratio relates just 12 per-

**Table 11C.3** Variance/covariance analysis of income per worker, 1960–2000

Equation	Contribution to $Y/L$		
	Physical capital	Education	Factor productivity
(1) $K/L$	0.43	0.03	0.54
(2) $K/Y$	0.12	0.05	0.83

Source: Bosworth and Collins (2003).

Notes: For row (1) the contribution of each factor to the growth in output per worker is defined as in equation (1) of the text. For row (2) contributions are defined as in equation (2).

cent of the output variation to capital, compared with 83 percent to TFP.

### References

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